

aspiring
*
GEOPARK
des Monts d'Ardèche



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Table of Contents

A. Definition of the candidate territory of Monts d'Ardèche	1
A.1 Name	1
A.2 Localization	1
A.3 Physical and social characteristics	1
A.3.1. Area and boundaries	1
A.3.2. Landscapes	2
A.3.3. Natural and cultural environments	3
A.3.4. Climate	4
A.3.5. Hydrography	5
A.3.6. Ecology	6
A.3.7. Human geography	8
A.4 Organization in charge of the Geopark of Monts d'Ardèche project	9
A.4.1. What is a Regional Natural Park (RNP)?	9
A.4.2. The Charter, founding base of the RNP	9
A.4.3. How does the organization work?	10
A.4.4. The budget	11
A.5 Enclosures	12
B. Scientific description of the European Geopark territory	13
B.1 Definition of the geographic region	13
B.1.1. Lithology and domains	13
B.1.2. Hydrography	15
B.2 General geological description and remarkable features	15
B.2.1. The metamorphic and plutonic rocks	15
B.2.2. The sedimentary cover	15
B.2.3. The volcanic flows	16
B.2.4. Quaternary	17
B.3 Description of the geosites	17
B.3.1. Geosites by type	17
B.3.2. Palaeozoic : metamorphism and continental sedimentation	19
B.3.3. The Mesozoic : marine sedimentation, fauna, flora and habitat	20
B.3.4. Tertiary : uplift, fluvial erosion and volcanism of Velay	20
B.3.5. Quaternary : the young volcanoes of the Ardèche and periglacial influence	21
B.3.6. Thermal Spas and Springs	21
B.4 Details on the interest of the sites	21
B.4.1. Geosites studied for more than 200 years : scientific value	21
B.4.2. An important geocultural imprint	22
B.4.3. Attractive and educational sites, early geotourism	22
B.5 Current pressure on the sites	22
B.6 Current status in terms of protection of the sites	23
B.7 Data on the management of the sites	25
B.8 The geocultural sites and their integration into the geopark framework	25



C. Arguments for nominating the territory as a European Geopark.....	27
C.1 Comprehensive analysis of the potential for the development of geotourism	27
C.1.1. An attractive geological heritage	27
C.1.2. A wide geotourism offer	27
C.1.3. A dynamic management organization, a powerful local involvement	28
C.1.4. Local products and geological heritage	28
C.1.5. A strategy plan for the development of sustainable tourism	29
C.1.6. Outdoor activities	29
C.1.7. Catchment areas and access	30
C.1.8. Catering and accomodation	30
C.2 Overview of the geo-institution and geo-activities in the region	31
C.2.1. Multiple actors ensure a rich offering of geo-activities	31
C.2.2. Geo-actors network of the RNPMA	34
C.3 Policies for geoheritage conservation and promotion	34
C.3.1. Multiple methods of conservation	34
C.3.2. Existing Actions of Communication and Promotion	35
C.4 The Territory's Interest in Joining the European Geopark Network	36
C.4.1. A Global Strategy Beyond Geological Themes	36
C.4.2. A Project Inscribed in a Network	36
D. General information on the territory.....	37
D.1 Economic activities	37
D.1.1. The general context of the branches of industry	37
D.1.2. Agriculture	37
D.1.3. Tourism	37
D.1.4. Crafts, trade and industry	39
D.2 The perspectives for the protection of the territory	39
D.3 A Brief Analysis of the Current Status of the Protection of the Territory	40
D.3.1. Legal Protection	40
D.3.2. Contractual Protection	40
D.3.3. The Inventory Areas of the Natural Heritage (ZNIEFF)	41
D.3.4. Natural Sites Listed as Remarkable	41
D.4 Existing Facilities	41
D.4.1. The "Maison du Parc", a Showcase for the Territory	41
D.4.2. Interpretive Trails	41
D.4.3. Geotourism Tours	42
D.4.4. Belvederes and Viewpoints	42
D.4.5. Museums and Centres	43
D.4.6. Spas	43
D.5 Planned facilities	43
D.5.1. "Maison de site du Gerbier de Jonc"	43
D.5.2. Artistic Path	43
D.5.3. Geototems	44
D.5.4. Call tenders for the project Promote a geosite	44
E. Selected bibliography.....	45
F. Credits for the Figures	47

A. Definition of the candidate territory of Mots d'Ardèche

A.1 Name

The name of the candidate territory to European label Geopark is Mots d'Ardèche Geopark. Its geographical and geological location is a transitional area between the well identified regions of Massif Central and Rhone river valley (fig. 1). It offers a surprising geological diversity that covers a long period of time. This exceptional variety enables the candidate territory to present the whole geological and geomorphological construction of this region. The territory matches the area of the Regional Natural Park of Mots d'Ardèche (fig. 2), which will further be referred to as RNPMA.

A.2 Localization

It is situated opposite the Alps, at the south easterly flank of the Massif Central in the Rhodanien depression. The RNPMA covers one third of the Ardèche department and straddles both the Rhône-Alpes and Auvergne regions (south-east borders of Haute-Loire department). The territory is surrounded by the main cities of Lyon (180 km to the north), Montpellier (200 km to the south) and notably Valence (80 km to the East) (fig. 3). The headquarters of the Park is in Jaujac (WGS84 coordinates X : 4,25918 and Y : 44,63447).

A.3 Physical and social characteristics

A.3.1. Area and boundaries

The Regional Natural Park of Mots d'Ardèche was created in 2001. Its territory is formed by 145 communes

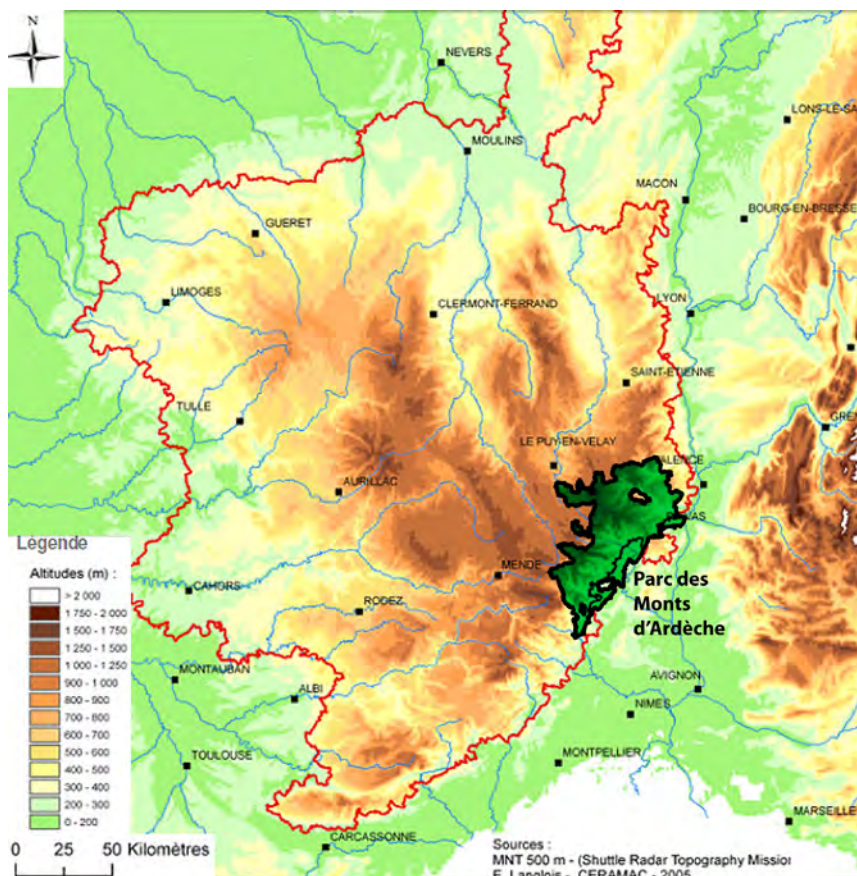


Figure 1. The RNPMA territory, between mountains and plain.



Figure 2. The RNPMA among the others natural spaces of the southwestern France.



Figure 3. Boundaries of the RNPMA.

which have signed up to the governance convention of the park. The RNPMA covers an area of 2280 km²; it has sharp contrasts in population density and a mean density of 33 people/km². The territory is mainly located in Ardèche department, but also includes some communes from Haute-Loire department. The Ar-



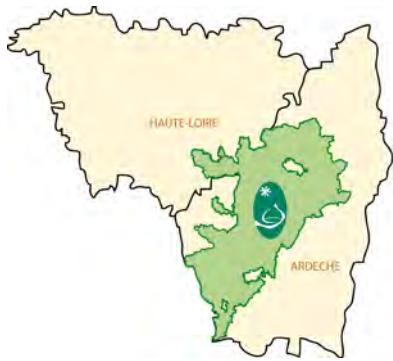


Figure 4. The RNPMA territory straddles two departments.

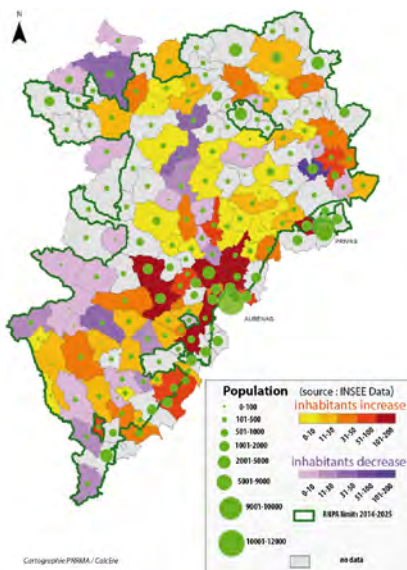


Figure 5. Demographic characteristics of the RNPMA and its surroundings.

dèche is part of Rhône-Alpes region whereas the Haute-Loire belongs to Auvergne region (fig. 4). The French regions are administrative entities larger than departments (22 regions for 96 departments).

Three urban centers, the main source of the park's visitors, surround the park (fig. 5): at the east, the gateway-cities of Aubenas (11 325 inh.) and Privas (8 646 inh.); at the west, Le Puy-en-Velay (18 810 inh.) in Haute-Loire.

A.3.2. Landscapes

The RNPMA territory is characterized by rugged terrain, with altitudes from 170 m in Les Vans (south of the Park) or Aubenas (east of the Park) to 1 753 at the highest summit inside the Park's boundaries, the Mont Mézenc (north-west). The western bounda-

ry cuts across the limit between the watersheds of the River Rhone to the east and the River Loire to the west.

The administrative boundaries of RN-PMA contain six different landscape units (fig. 7) each with an individual identity and landscape. The variation of these landscapes is linked to the diversity of geological context and the strong bioclimatic gradient due to the contrasts of altitude in the Park, from piedmont to mountainous areas.

La Cévenne méridionale

The Southern Cévenne is topped by the Grand Tanargue (1 511 m). The terrain is very uneven, with narrow crests and west-east oriented V-shaped valleys. This landscape is called "serres cévenoles" (fig. 6).

Le Piémont cévenol

The Cévenne's Piémont is a transitional area between the rugged topography of the Cévennes (at the West) and the Alès basin and the calcareous plateau of Les Gras (to the east). This hybrid and partitioned relief is formed in Triassic sandstone and Jurassic limestone, with lower altitudes and gentler slopes (fig. 6).

La Haute Cévenne

La Haute Cévenne is crossed by the River Ardèche. On the right bank of the river the landscape is dominated by the crystalline crests of the Tanargue massif ("serres"). On the other bank, the tributaries of the River Ardèche have cut deep valleys which have channeled the recent volcanic flows (Vivarais phase). The lava flows formed flat surfaces nested in the valleys which were then cut by torrential rivers, these support the major part of human settlement and activity. Of these activities, thermal spas and the exploitation of mineral water directly benefit from the volcanic heritage of this region.

Les Boutières

Les Boutières area is drained by the tributaries of the right bank of River Eyrieux. The orientation of the crests and valleys are strongly influenced by the Variscan fracturing at the border

of the Vivarais (NE-SW). To the north-west, at the edge of the plateaus of Mézenc-Gerbier area, the higher Boutières have a mountainous character. The landscape of crystalline crests ("serres") is made unique by the superposition of volcanic landforms over crystalline bedrock. As in the Haute Cévenne, this context is favorable to hydrothermal resources, and these are only partially developed and exploited. To the south-east, the lower Boutières are more exclusively crystalline and less mountainous. However, steep slopes and poor soils remain strong constraints to human activities (fig. 6).

Les "Sucs"

Les "Sucs" area is called after the local morphological term "suc" referring to a summit. The phonolite sucs and scoria deposits testify to a quite recent and easy to follow geological past. They make up an outstanding

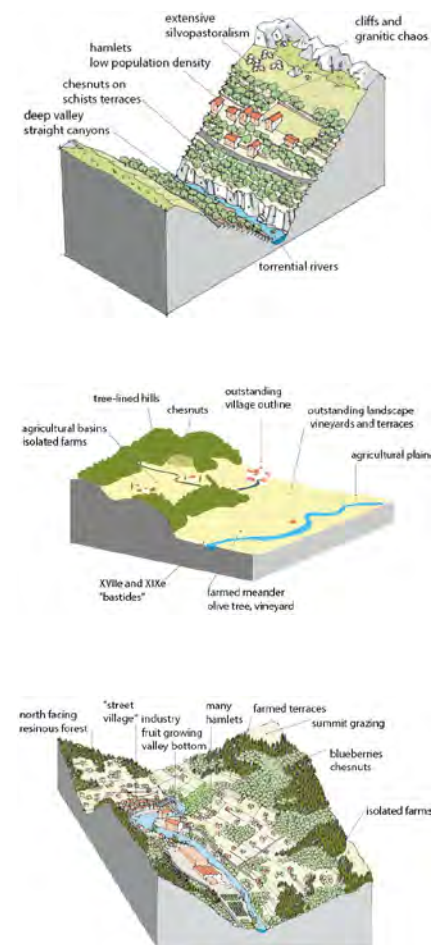


Figure 6. The three main landscapes of the RNPMA : (from top) Haute Cévenne, Piémont cévenol, and Les Boutières landscape units.

set in Europe because of their density and landscape impact. Although an extension of Les Boutières area, the Sucs country is characterized by the presence of two prestigious sucs: the Gerbier and the Mézenc. Large basaltic flows such as the Saint-Clément flows are also major geological features of this area.

Le plateau de Vernoux

Le plateau de Vernoux is located between Les Boutières and the River Rhone. This massive crystalline unit is linked to the Vivarais Mountains. It overlooks the River Eyrieux and Les Boutières to the west, and is separated from the "Rhodanian Piedmont" to the east by a strong flexure. Subject to less intense river down-cutting, the plateau corresponds with the remains of a tertiary erosion surface formed before the major uplift phase of the eastern border of Massif Central. The poor soil is offset by the low altitude (around 700 m) and smooth topography characteristic of old crystalline basement.

A.3.3. Natural and cultural environments

In addition to these six landscape types, four different natural and/or cultural environments are emblematic of the Park's territory.

The terraces

An inherited landscape built in order to overcome the constraints of the hillsides. This was at a period of demographic maximum (17th and 19th centuries) when there was abundant manpower and also a strong need for food supply. Every parcel of cultivable land has therefore been reclaimed from the mountain. Since the middle of the 20th century agricultural decline has threatened this remarkable heritage: encroachment of shrubs, reforestation and unmaintained terrace walls. Recently, several separate rehabilitation and reconstruction projects have been conducted.

The chestnut groves

Often associated with the terraces, the chestnut groves are the other important symbol of the traditional de-



Figure 7. The landscape units composing the RNPMA territory.

velopment of agriculture on crystalline or metamorphic slopes. Indeed the chestnut tree neither tolerates limestone soils nor a harsh climate; it therefore grows only below the altitude of 800 m, below the beech forests. The plantation and culture of the chestnut trees have been so widespread by man because of its nourishing fruit (bread of the poor men), that it is sometimes referred to as the civilization of chestnut tree. Such as the terraces, these cultural landscapes are threatened by abandonment but also by parasites and disease. Nevertheless, the human value of this heritage justifies the multiplying operations of rehabilitation.

The volcanoes

Three landscape units of the Park are concerned by volcanism: La Haute

Cévenne (excluding the Tanargue massif), Les Sucs (with the Mézenc, the Gerbier and the springs of the River Loire) and the High Boutières.

Late Miocene volcanism (10-6 Ma) is present in the upper parts of Les Sucs and Les Boutières areas where plateaus formed by lava flows have later been pierced by outpourings of phonolite that had built up in domes and extrusions (Mézenc-Gerbier) or protrusions which erosion has now exposed (those forming the sucs of Les Boutières). The initial volcanic plateau

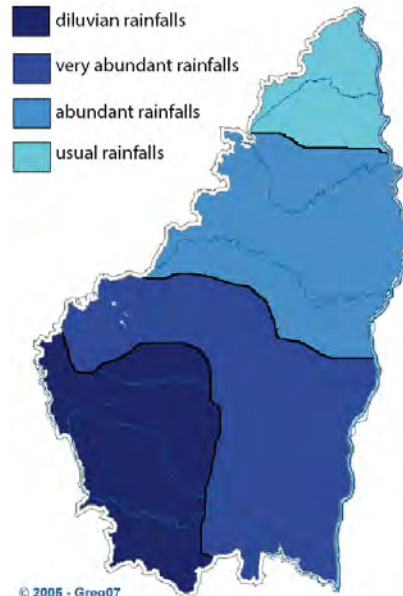
only remains as narrow bands on the crests in the Boutières side. The phonolitic sucs are still the most remarkable character of the landscape both in Les Boutières and Les Sucs areas.

The recent basaltic volcanism (166 000 - 40 000 or 45 400 years ago) is spread out in the three landscape units with individual landforms such as strombolian cones, locally called "sucs" (which simply means summit) or "coupes" and maars. The lava flows have followed the already deep valleys in the Les Boutières and Haute Cévenne areas. It is in this latter area that you find the greatest number of volcanic cones as well as the most recent. They are contemporaneous with the volcanoes of the Les Puys massif.

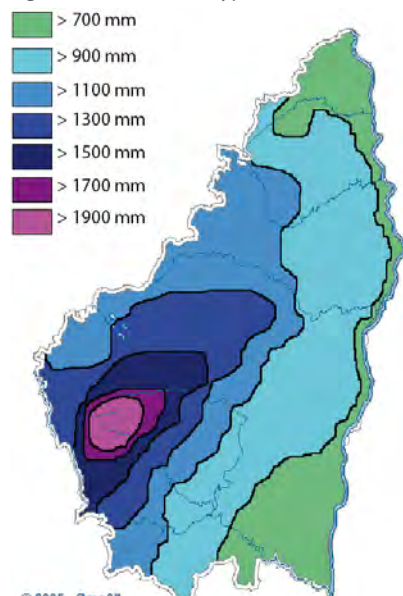
The rivers

Apart from the River Loire and its tributaries at the western boundaries of the Park which drain to the Atlantic, many torrential rivers with frequent rapids flow from the eastern flank of the plateaus: from North to South the most important rivers are the Doux, Eyrieux, Ardèche and its four tributaries, Beaume, Drobie, Borne and Chassezac.

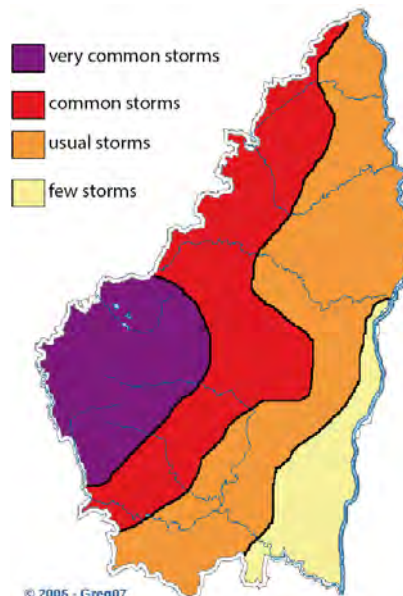
Their erosive power is due to the steepness of slopes (between the spring to the River Rhone there is an average elevation difference of 1 500m over 50 km as the crow flies) and the specific hydrological regime due to frequent and intense rainfall in the Cévenne region. However, man has long been modifying these torrents through the construction of weirs (called "levades") and a network of channels (called "béalières") for irrigation and industrial purposes (watermills for flour and textile production). In this way the Ardèche became the fifth largest industrial region in France during the 19th century. Nowadays energy sources have changed but this small industrial activity has come through crises in the industry and today the valleys are notable for their local population and working-class traditions.



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Figure 8. Main rainfall types in Ardèche.



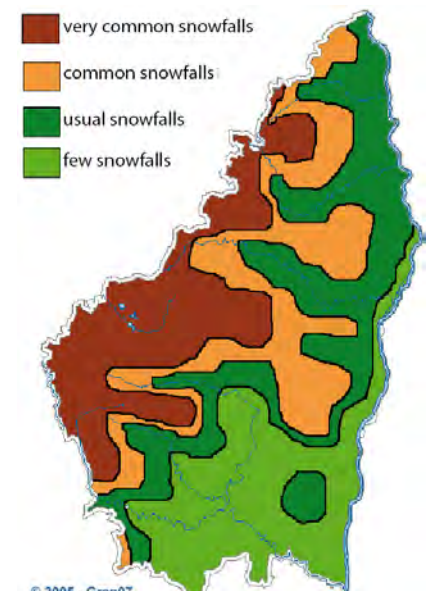
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Figure 9. Mean rainfall distribution.



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Figure 11. Main storm types in Ardèche.

A.3.4. Climate

The Ardèche landscapes vary according to geological context and topography. This diversity is also expressed in the way that climate changes following altitude and latitude (fig. 8, 9). The different regional climates are however based on a temperate climate with Mediterranean and oceanic influences (the River Rhone valley) changing to that of the Ardèche mountains. The altitude gradient transitions from a mild valley and the harsher mountain climate, the latter characterized by storms (fig. 10) and harsh winters (fig. 11). Another climatic transition can also be observed, from a northerly continental



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Figure 10. Main snowfall types in Ardèche.

influence to Mediterranean influence, clearly Provencal, in the south.

The most specific aspect of the regional climate is the storms (fig. 10), particularly intense during certain periods of the year. The total amount of precipitation during the "cévenol episodes" in autumn is quite impressive. For instance, in Loubaresse, in November 2011, 323 mm of rain fell in 24 hours, and 910 mm in five days. Another regional peculiarity is the winter wind called "Burle" that comes from the north and blows across the bare plateaus in the eastern Massif Central. This glacial blizzard can cause snowdrifts several meters high.

Climatic sectors can be distinguished due to their differing pluviometry :

The piedmont

The piedmont toward Rhone River valley has a mean pluviometry of 900 mm/y ; it has warm and dry summers, very wet autumns and mild winters, during which snow may fall.

Les Cévennes

Les Cévennes has more uniform climate, with the extremes accentuated by altitude. Storms are many more frequent during summer and the rain is more intense ("cévenols episodes"). Snow is also frequent during winter, and sometimes very abundant. The mean pluviometry is quite high (around 1600mm) in some places more than 2000mm/y (for example, 1823 mm in Valgorge and a maximum of 2080 mm in Loubaresse).

The mountains

The mountains of Les Boutières and the Hauts Plateaux have harsh winters with a lot of snow. Because of the snow and the icy wind "la Burle", driving conditions can be difficult around the Hautes Boutières. Summers are mild but sometimes stormy in the evening. The short Spring and Autumn seasons make these transitions and temperature contrasts notable. The mean pluviometry is between 1100 and 1300 mm/y, sometimes more (Issarlès : 1149 mm, Arcens : 1126 mm, Cros de Géorand : 1341 mm).

A.3.5. Hydrography

The wet air masses coming from the Mediterranean are blocked the Cévennes Massif. Therefore in the mountains of the Ardèche, the water system is of Mediterranean type, with sudden and irregular river flows and strong erosive power. Two drainage basins can be distinguished (fig. 12) :

1. The Atlantic drainage basin in the north of the Park which captures the River Loire.
2. The Mediterranean drainage basin which includes the Ouvèze and Eyrieux basins (collecting water of the northern crystalline areas),

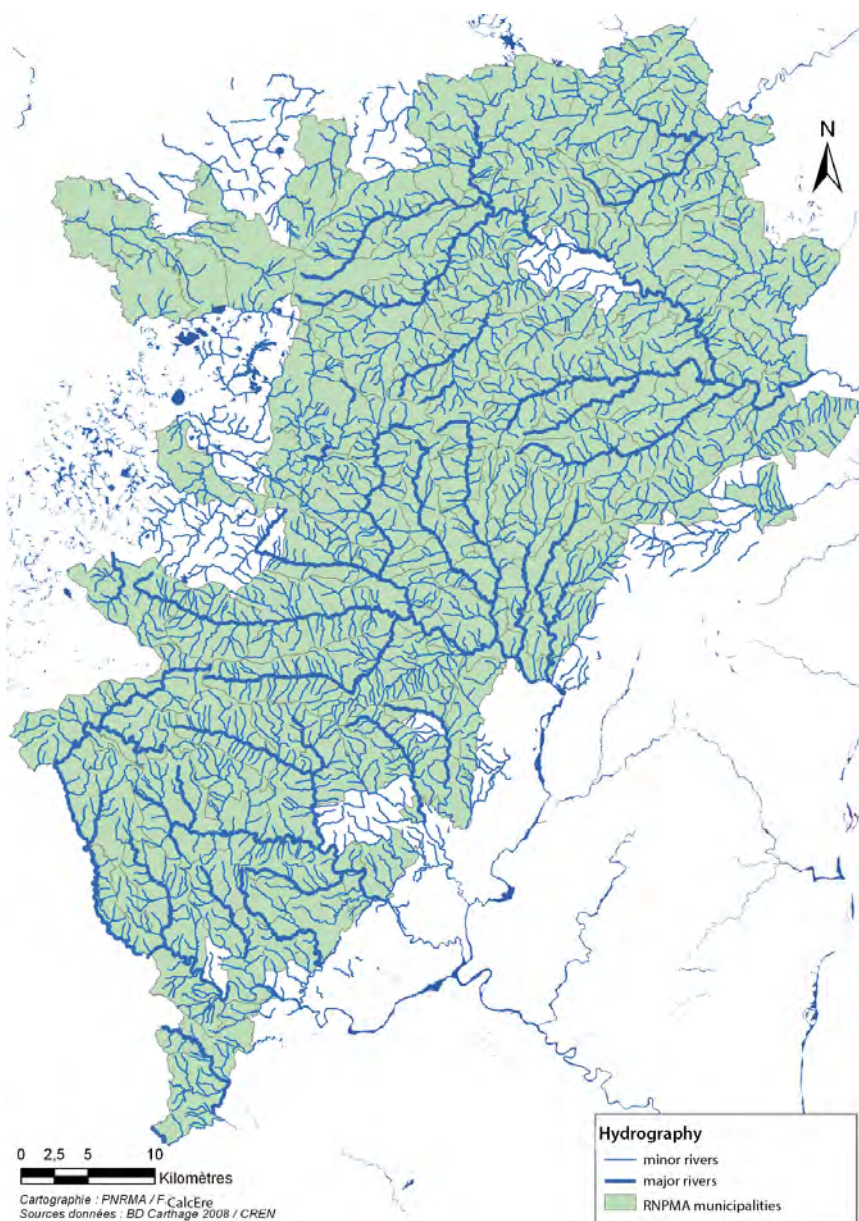


Figure 12. Hydrography of the RNPMA territory.

and the Ardèche basin (which drains the southern waters from crystalline areas upstream and sedimentary areas downstream). This drainage basin can be called Rhodanian as all waters finish in the River Rhone to the east.

Because of the steep slopes characterizing the water system, and the fact that the soils generally have poor water retention capacity, the hydrological regime is closely linked to pluviometry (fig. 13). There is a first maximum in autumn, with the most dangerous peaks during September-October, and a second during March-April ; the lowest water level is during June-September, with a less pronounced minimum during winter

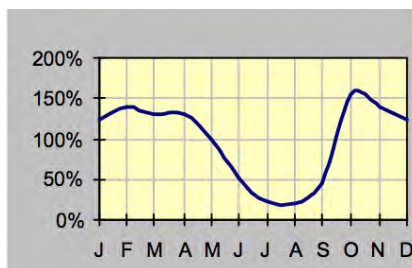


Figure 13. Rainfall graph of pluvial-cévenol regime.

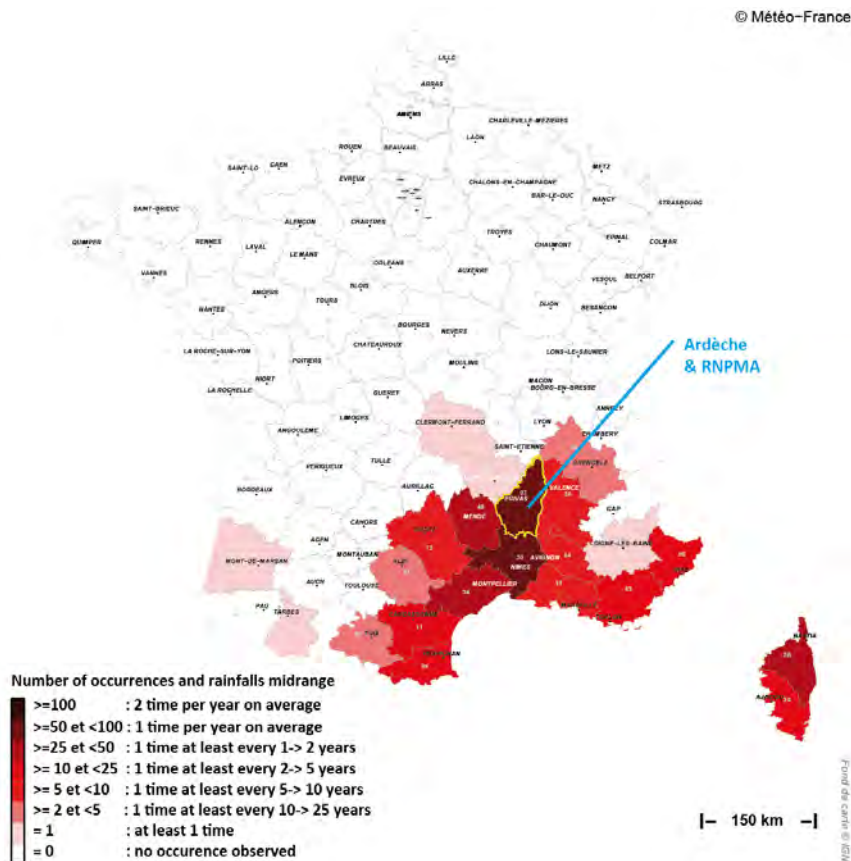


Figure 14. Extreme rainfall occurrences in the French departments.

(January-February). In autumn in the Ardèche the rivers are in spate during the “cévenols episodes” (fig. 14) which cause severe material damage and sometimes loss of life. An example is the flooding of the River Ardèche on the 22nd of September 1992 which left five people dead.

There are many, dispersed springs in the crystalline areas. In sedimentary areas karstification has led to the concentration of springs at the end of underground drainage networks.

There are very few lakes in the territory of RNPMA : the lakes of Issarlès at the edge of the Park, Saint-Front and Ferrand are the only natural lakes and they occupy ancient volcanic craters.

A.3.6. Ecology

The territory of the RNPMA contains an extremely rich natural diversity. The physical constraints, such as steep slopes and deep valleys have preserved this region from intensive agriculture, urbanization, large infrastructure etc.

In this context, natural and semi-natural spaces occupy wide areas and present wide biodiversity and a great variety of habitats. The Park straddles two biogeographic domains : continental and Mediterranean. The habitats are under multiple climatic influences (mountainous, Atlantic, continental, Mediterranean) with a broad altitude gradient (from 170 m to 1753 m) and a great variety of geological contexts (plutonic, volcanic, metamorphic and sedimentary rocks) (fig. 29, part B). This situation has led to a wide biodiversity : 40 natural habitats of Community interest, 1 400 plant species of which 30 are protected or endemic in Cévennes or Massif Central, and 50 remarkable animal species.

When the RNPMA was been created, 26 000 hectares of Espaces Naturels Remarquables (ENR, Remarkable Natural Spaces) were identified and grouped as 68 sites (now replaced by ZNIEFF (zone of floristic, faunal and ecological value). 194 groups of plants have been described. Among them 38 are of Community significance, of which 7 are considered priority.

The Park has 1 489 vascular plants species (indigenous or naturalized-indigenous) of which 180 rare or protected species, and around 400 bryophytes of which are 29 remarkable. The RNPMA also has strong animal diversity with 69 species of dragonfly, 145 species of butterfly, 70 species of orthopteran, more than 180 species of bird, 170 species of mammals (of which 25 are bats), 25 species of fish, 13 species of amphibian and 18 reptile species.

Ecosystems

The geological diversity in the territory generates very different ecosystems :

1. The **peat bogs** are mainly to be found in the mountain area. They are formed on acid ground and sometimes at the heart of maars. Typical species shelter in these rare and localized habitats : the *Drosera* (small carnivorous plant), the Alcon blue (small blue butterfly) or the *Somatochlora arctica* (dragonfly) ;

2. The **grasses and subalpine scrublands** to be found on the top of the Sucs harbour a special flora. This is similar to that of the Alps and the Pyrenees and as such we find : *Saxifraga pedemontana* subsp. *prostii* in certain scree, Alpine club moss, *Rosa pendulina*, *Arctostaphylos uva-ursi* and the *Senecio leucophyllus*. The Common Rock Thrush, the Ring Ouzel and the Apollo butterfly also develop in these environments ;

3. The **rivers and their valleys** are particular biotopes where several heritage species live. The *Austropotamobius pallipes*, the otter (fig. 15) and the Yellow-bellied Toad notably live in these mostly mineral environments ;



Figure 15. The otter, the biggest European mustelid, is living in the RNPMA.



Figure 16. ENS of the department.

4. The **escarpments** found throughout the territory enable peregrine falcons, golden eagles and the Eurasian eagle-owl to nest in a particularly well suited biotope.

Because of this ecosystem diversity the territory of RNPMA is covered by 6 Espaces Naturels Sensibles (ENS, Sensible Natural Space), 1 Réserve Biologique Intégrale project (RBI, Wilderness Biologic Reserve), 2 Réserves Biologiques Dirigées (RBD, Specific Biologic Reserve), 4 Natura 2000 sites, 2 classified sites, 13 type 2 ZNIEFF zones and 54 type 1 ZNIEFF zones. In recent years the RNPMA and its partners have lead conservation actions for the most remarkable natural sites, for instance the LIFE programs at Le Mézenc, Le Tanargue or Le Plateau de Montselgues, the Natura 2000 sites, the biological reserves or the ENS sites (fig. 16, 17, 18).

Forests

Concerning the forests the Ardèche is within the top ten mainland departments both for its proportion of forested surface as well as having the highest rates of reforestation. In the Rhône-Alpes region the Ardèche is the third department for forested area (253 000 hectares), the first for the forested proportion of its surface (45%) but the fifth for standing timber volume (26 million of m³, 60% of resinous wood). Finally the Ardèche



Figure 17. Natura 2000, classified and listed sites, and biological reserves.

differs from other departments because of its significant proportion of private forest (third ranked department in France).

Around 60% of the RNPMA is currently covered by forest (more than 110 000 hectares). The RNPMA is therefore one of the most wooded parks in France. It gathers around 45% of the forest in the department, but collects a higher proportion of public forest than the other parts of Ardèche (14% vs 10%, i.e. 14 500 ha), and also the majority of the national forests in the department (10 500 ha, i.e. ~75%). However the majority of the wooded area is privately owned (86%) and is very fragmented.

The chestnut tree is the dominant species (30 000 ha, i.e. 25% of the wooded area). A study conducted in 2007 by the Centre Régional de la Propriété Forestière (CRPF, Regional Centre for Forest Ownership) indicates that 46% of the chestnut groves are located in favourable areas (slope less than 40%, altitude over 400 m), with 23% of the total area in zones where mechanical exploitation could be possible (i.e. 7 000 ha).

Overall broadleaved trees dominate the forest (60%), for the main part these are oaks and beeches. Among the coniferous tree the Scots pine is



Figure 18. ZNIEFF I and II.

the most common species along with the maritime pine. Silver fir, Norway spruce and Douglas fir cover around 10% of the area.

In the Haute-Loire zone national forests are to be found in the communes of Les Estables and Freycenet, and municipal forests in the communes of Fay and Chaudeyrolles. They are mainly composed by regular coniferous plantations (Douglas fir and Scots pine, Norway spruce and silver fir), but there are also more natural forests, mostly with broadleaved trees in lower altitudes (Moudeyres). With the exception of the municipal forests the afforestation is mostly due to the action of the Restauration des Terrains de Montagne (RTM, Restoration of Mountain Terrains) started in the late 19th century. At that time the region was nearly completely deforested. Two major phases of afforestation took place : one between the end of the 19th and beginning of the 20th centuries (State owned forest), and another during the 1960's (both State forests and tiny privately owned parcels).

A.3.7. Human geography

Population and demographic evolution

Between 1999 and 2010 the population of the RNPMA has risen from 71 694 to 76 649, growing by around 450 new inhabitants per year. The 145 municipalities covering the 228 000 hectares have an average population density of 33 inhabitants per km² (for comparison this is 137 inhabitants per km² in the Rhône-Alpes region and 52 inhabitants per km² in the Auvergne region). Some communes have a density lower than 5 inhabitants per km². This very low density

allows the RNPMA to keep its natural landscape especially outside of valleys where the population is concentrated. This "raw and natural" character contributes to the beauty of the wide spaces of the Monts d'Ardèche.

The territory has suffered during many years from a strong decline in population. This applied to more than half of the communes between 1982 and 1990. But during the period 1990-2010 this trend has changed, especially on the eastern border of the territory around the principal urban centres of Aubenas, Les Vans, Vernoux-en-Vivarais and Privas, where the increase

varies from 0.8% to 3% (compared to 0.6% for the Park and 0.9% for the region). On the other hand communes located in mountainous or sloped areas are still losing inhabitants and the populations are aging: one third is more than 60 years old (fig. 20).

The RNPMA has two gateway cities which provide the main geographical access to the territory as well as the large potential from the neighbouring populations: Aubenas (57 800 inhabitants in the agglomeration, 11 323 in the city centre only), Privas (20 400 inhabitants in the agglomeration, 8 646 inhabitants in just the city centre). The city of Le Puy-en-Velay, at the western border of the RNPMA, should also be taken into account. The situation of these cities is related to historical factors: industry (silk, mines, paper), agriculture (terraced farms, chestnut groves) or most recently tourism.

The first known prehistoric human presence in Ardèche was during Middle Palaeolithic (150 000 years ago), as known from the Musterian deposits in the Soyons Cave bordering the River Rhone. 20 km east of the aspiring Geopark in the Ardèche Gorges, the Chauvet Cave is an extraordinary example of the parietal art of the Aurignacian culture (around 32 000 BC) which is in a process of being classed as a World Heritage site.

Access

The location of the RNPMA, close to the Rhone Valley but a bit apart, is an undeniable asset. However, the Park is globally not really easy to access. There is neither SNCF train station nor motorway in the Ardèche.

Despite being some distance from the Rhone Valley, the RNPMA is well easily when from the gateway cities of Aubenas or Privas. Another major road comes from the middle of the Massif-Central, via Le Puy-en-Velay and crosses the Park. It constitutes a key transport artery for the territory. The RNPMA is also relatively close to some airports (Lyon St-Exupéry, Marseille-Provence, Grenoble-Isère, St-Etienne Bouthéon, Avignon and Nîmes). These can be interesting en-

	Ardèche 1999-2006	France 1999-2006
Birth rate	+ 7.60 ‰	+ 12.80 ‰
Mortality	+ 9.96 ‰	+ 8.96 ‰
Population increase	- 2.36 ‰	+ 0.43 ‰ (1999-2004)

Figure 19. Demographic data comparison between Ardèche department and France.

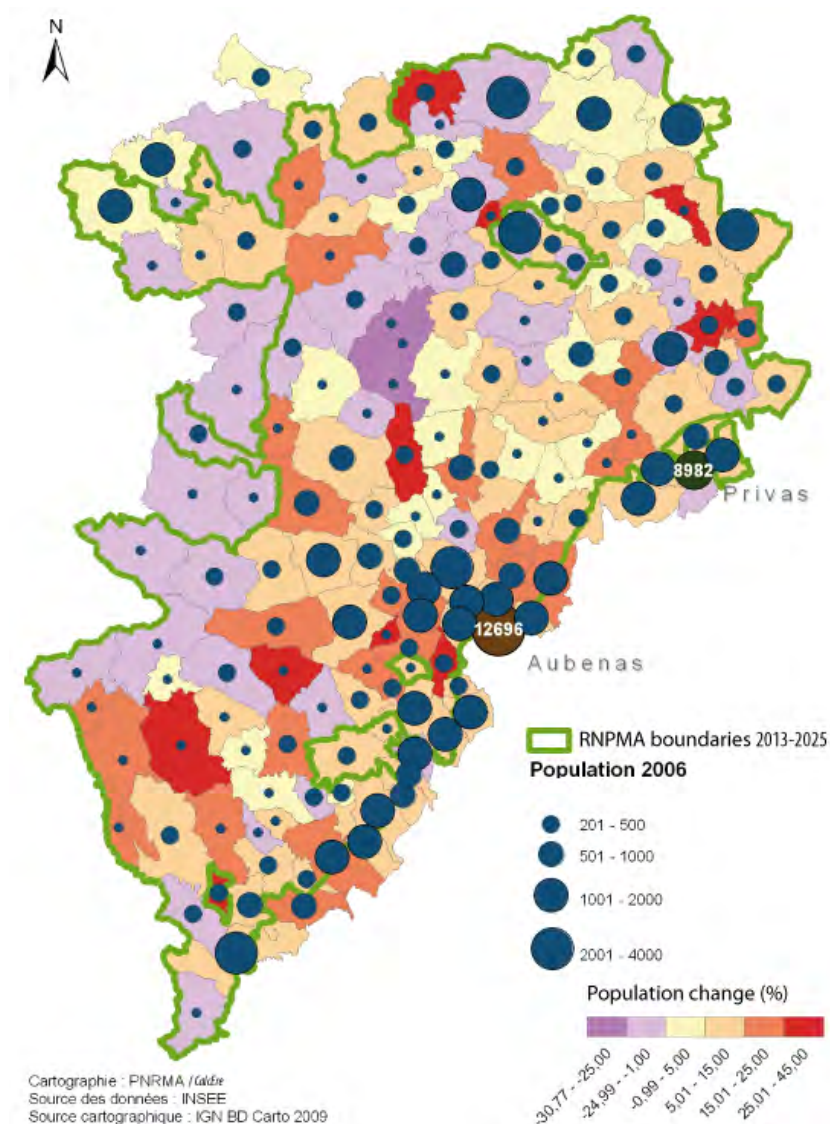


Figure 20. Population number (2006) and change (in 7 years).

trance points for visitors coming from national or international cities.

Traveling in the Park from North to South is a unique experience because of the winding topography with deep east-oriented gorges and valleys. There are many panoramic viewpoints along the road, like windows which open wide across the landscape. In the region it is better to count in time-distance units than in kilometres.



Figure 21. Access to the RNPMA territory.

Finally, concerning the promotion of geology, the RNPMA is ideally surrounded by universities or schools for higher education with important Earth Sciences research and teaching units: Clermont, Saint-Etienne, Lyon, Grenoble, Alès and Montpellier (fig. 21).

A.4 Organization in charge of the Geopark of Monts d'Ardèche project

The organization in charge of the Geopark of Monts d'Ardèche project is the Regional Natural Park of Monts d'Ardèche which was created in 2001. This arose from the wish of the chestnut farmers, initially expressed in 1992.

A.4.1. What is a Regional Natural Park (RNP)?

The RNP of Monts d'Ardèche is part of the 48 RNP network in France. Such an area is defined as a rural territory of national significance because of the quality of its cultural heritage and the fragile equilibrium of its landscapes. The two main complementary goals of a Regional Nature Park are the preservation and the promotion of its natural and cultural heritage as well as the sustainable local economic development. The basic missions of a RNP aim to :

- protect the territory's natural and cultural heritage, through suitable management of natural environments and landscapes ;
- contribute to the land use planning of the territory through the definition and orientation of the land use projects ; the land use plans must be compatible with the RNP's charter, guaranteeing the long term preservation of the landscapes ;
- enhance economic, social and cultural development, such as to guarantee a good quality of life ;
- offer visitors suitable infrastructure, education and information ; a RNP facilitates the access to nature, and raises the awareness of the inhabitants about the environmental issues ;
- contributes to research projects and carrying out relevant experimental/innovative actions which can be transferred to other rural territories.

A.4.2. The Charter, founding base of the RNP

The founding document of the RNP is its charter which defines the detailed project for the protection and sustainable development of the territory (Master Plan). It is signed by the local authorities wishing to adhere to the Park's project. In the case of the Monts d'Ardèche the charter has been signed after deliberation by :

- 145 communes, which make up the geographical entity of the park ;

- 12 associations of communes ;
- 2 gateway cities, not belonging to the territory but closely linked to it by their geographical proximity and the exchanges they have with it ;
- 2 departments : Ardèche and Haute-Loire ;
- 2 regions : Rhône-Alpes and Auvergne.

The original charter has come to an end in 2013 and a new charter has been recently approved for the next 12 years. It includes general and specific reports, plans and maps defining the main axis and a list of concrete actions that will be lead. The project for the territory until 2025 is structured by three "vocations" or characteristics :

- vocation I : a remarkable territory to be conserved ;
- vocation II : a productive territory with sustainable promotion of its products ;
- vocation III : an active and unified territory.

These characteristics are detailed in 15 guidelines. Four of them are of particular interest for geoheritage :

- vocation I, orientation 4 : the geology is part of the remarkable landscape entities to be conserved ;
- vocation II, orientation 7 : one of the objectives of the RNPMA is to obtain the Geopark label ;
- vocation II, orientation 9 : geology is highlighted for the knowledge-based economy in research and education ;
- vocation II, orientation 10 : geology is included in the context of equipping of sites in order to develop an attractive tourism.

These major axis are inscribed in the new charter and graphically presented in the Plan de Parc – charte 2013-2025 (in Enclosure A).



A.4.3. How does the organization work?

The organization of the RNP

The organisation of the Regional Nature Park can be divided into three streams, acting parallel one to the other: the political group, the technical group and the external local group (fig. 22).

The political support

The managing body is an association of the local authorities which have signed the Charter (Syndicat Mixte). It includes the 145 communes, 12 groups of communes, the 2 gateway cities, the 2 departments (Ardèche and Haute-Loire) and the 2 regions (Rhône-Alpes and Auvergne).

The resulting management committee (Comité syndical) has 188 members, representatives of these authorities distributed in three colleges: regions (9 delegates), departments (20 delegates), territories i.e. com-

munes, groups of communes and gateway cities (159 delegates). They meet at least twice a year (but often 3 or 4) to take the main strategic decisions, including voting the budget.

The executive board (Bureau syndical) is elected by the management committee within its members. Its 28 members, include a president and 7 vice-presidents, are composed of 4 delegates from the Region college, 4 from the Department college and 20 from the territories college. They meet approximately once a month when invited by the president, and follow the implementation of the Park's charter.

The involvement of the local authorities in the Park's project is strong. They are very committed to the application of their territory to become a European Geopark. Following six months of discussions and reflexion between the Park's partners, the candidate project was formally present-

ed to the executive board September the 18th 2012. That day, it was decided to apply for the Geopark label.

Additionally, this project has been officially presented to the Syndicat de gestion de l'Espace de reconstitution de la Grotte Chauvet. A management committee is responsible for defining the main orientation of the Geopark, the committee first met on January 2013. It represents the institutional, geological, tourism, and environmental education actors. A scientific committee is has also been constituted. The RNPMA has consulted and solicited the other French Geopark. Les Bauges Geopark was represented when the project was shown to the local communes.

The population also has been informed about the EGN and the application of the territory through many articles and media events (see in particular the Park's Autumn 2012 and Autumn 2013 newspaper editions).

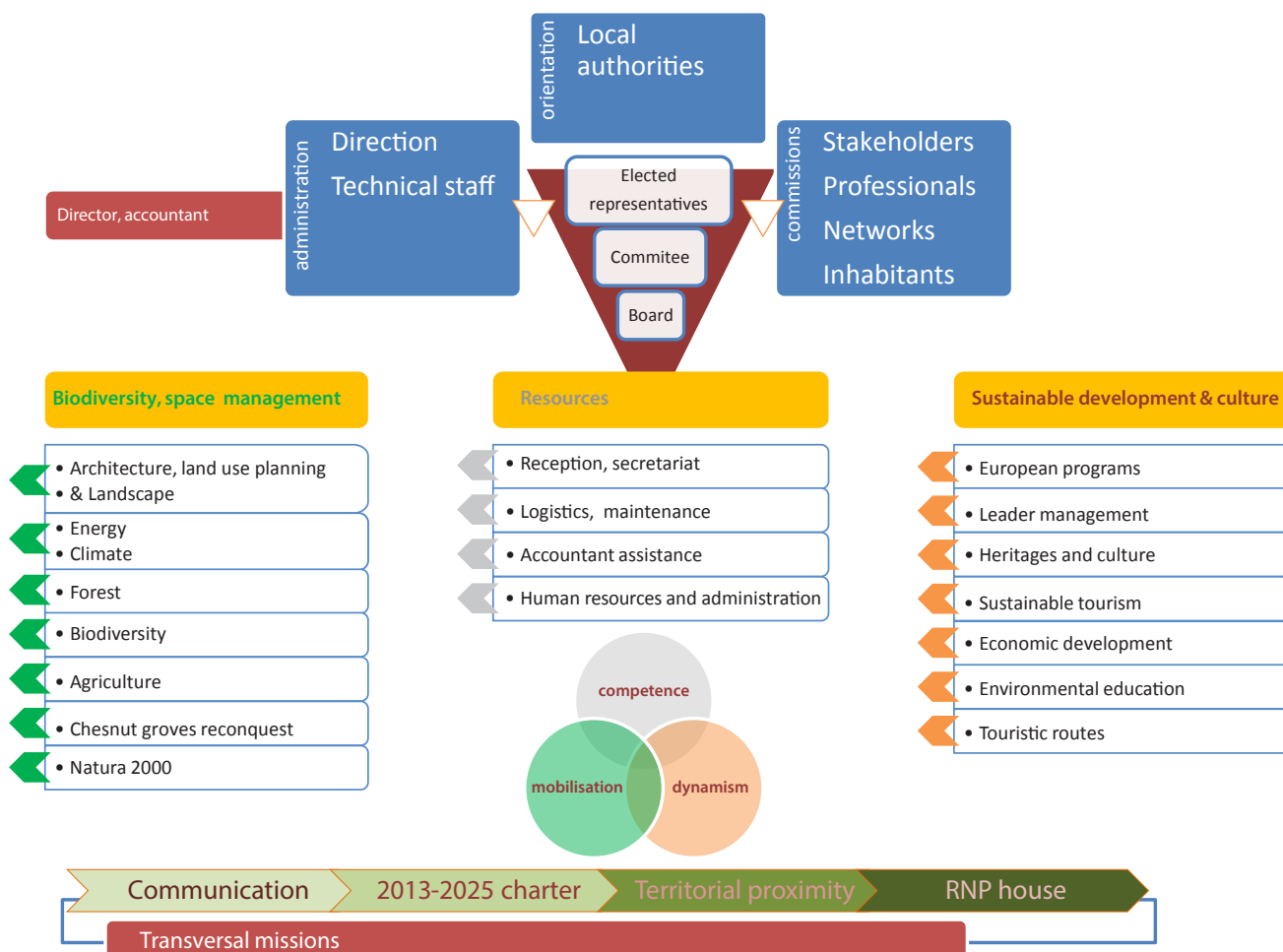


Figure 22. Organization of the RNPMA.

The technical support

For defining and carrying out the detailed actions of the action plans, the Park leans on a technical team of 25 employees including 17 permanent research associates of varied and complementary competences. It is organized (fig. 22) under the management of a director and 2 department heads, in 3 main services :

- biodiversity and space management
- resources
- sustainable development and culture

and with 4 interdisciplinary missions :

- Communication/Media
- Charter 2013-2025 coordination
- Territorial proximity
- The Park Centre

During the summertime, a staff member is employed to perform guided tours and workshops on volcanism and geology. The team is very competent and dynamic, young and innovative. Their strength is to work in a strong interaction with each other. That way each specific action draws from many competences as possible and fits in a coherent framework.

Maison du Parc

The whole team works in “la Maison du Parc”, the Park Centre which is a specific building located in Jaujac in the domaine de Rochemure in the middle of the territory, and at the foot of the most recently extinct volcano of the Ardèche. Its typical local architecture is a symbol of the cultural local heritage (fig. 23).

This building is also used as an information centre which is open to the public with information available about the Park, its activities, collaborators and local products (see part D). This property also helps to make the regional Park visible and gives it a strong identity.



Figure 23. Maison du Parc.

Website

The team take care of the RNPMA's website which inform about the different missions and actions of the Park.

The website also enables discovery of the territory's diversity in terms of heritage, installation/infrastructure and activities (the calendar of activities is also updated).

<http://www.parc-monts-ardeche.fr>

A specific webpage is dedicated to the **geotourism** :

<http://www.parc-monts-ardeche.fr/actions-du-parc-en-faveur-du-territoire/tourisme/geotourisme>

and

<http://www.parc-monts-ardeche.fr/decouvrir-les-monts-d-ardeche/decouvrez-les-patrimoines-et-savoir-faire/bijoux-de-nature.html>

A small website is dedicated to the **Geopark process** :

<http://geopark-monts-ardeche.fr/accueil-geopark.html>

Webpage of **environmental education** :

<http://education.parc-monts-ardeche.fr/>

Webpage of “**la Maison du Parc**”

<http://www.parc-monts-ardeche.fr/votre-parc/la-maison-du-parc-a-jaujac.html>

Facebook webpage :

<https://fr-fr.facebook.com/pages/Parc-naturel-r%C3%A9gional-des-Monts-dArd%C3%A8che/140996902704133>

A.4.4. The budget

The Monts d'Ardèche RNP has a dedicated annual budget of on average of 3.1 million euros. The variety of the financing sources ensures both its long-term durability and its short-term adaptability.

The accountant of the RNP is fully in charge of the budget (operating and investment) which is ruled by the accounting regulation for the local authorities.

The operating budget mainly comes from the members of its managing body, which are engaged through the charter over a period of 12 years. The greatest part is allotted by the Region (around 51 %) and the two departments (17 %). It is completed by a contribution of the Ministry of the Environment (12 %) (fig. 24).

The actions and infrastructures are jointly financed by the local authorities, the concerned ministries (mainly Environment, but also Agriculture, Culture, Education, etc.) and various European programs (FEDER, Natura 2000, Interreg, LEADER...) depending on the actions and the opportunities (fig. 25).

The distribution among the different sectors is homogenous for 10 years. The tourism sector receives 25 % of the total amount. In terms of volume, and over the period concerned, this global budget reaches 7 947 589 € (fig. 26, 27).



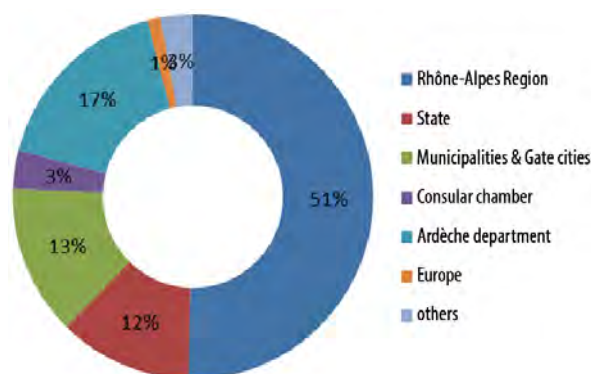


Figure 24. Members financial repartition by statutory participation.



Figure 26. Budget repartition by allocation [%].

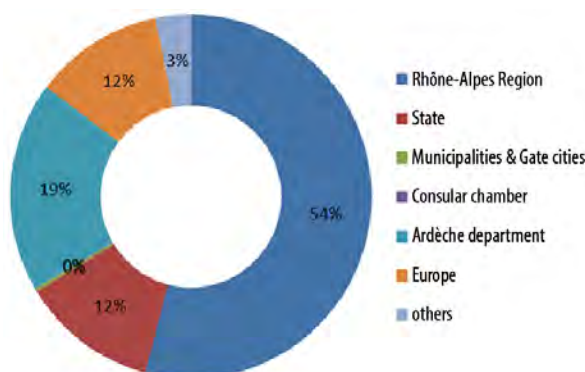


Figure 25. Members financial repartition by programs.

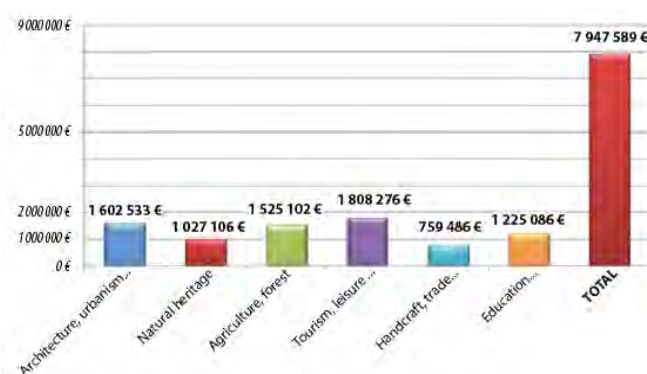


Figure 27. Budget repartition by allocation [€].

A.5 Enclosures

The enclosures are of two types. The first one is a series of digital files that can be downloaded together with the present application dossier.

- Appendix 1 - Official application letter
- Appendix 2 - Letters supporting the application
- Appendix 3 - Fully completed self-evaluation document and appendix
- Appendix 4 - Existing geo-institutions and geo-activities in the region
- Appendix 5 - Complementary maps and tables
- Appendix 6 - Extensive bibliography
- Appendix 7 - Review of the press : papers, radio, TV

The second one is a sampling of recent and representative publications which illustrate the territory and its application to become a Geopark.

- Enclosure A – Charter of the RNP of Monts d'Ardèche 2013-2025

B. Scientific description of the European Geopark territory

B.1 Definition of the geographic region

The territory of the Mots d'Ardèche is located on the eastern border of Massif Central (fig. 28). This also marks the eastern boundaries of the Park. From a geographical point of view, the Mots d'Ardèche are a transitional territory belonging to the Massif Central, the largest French massif, with an area of 85 000 km², i.e. 15 % of the French territory. It is also the fourth highest massif of the country with the Puy de Sancy (1 885 m).

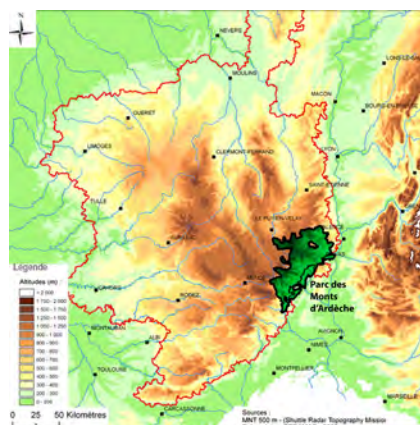


Figure 28. Location of the RNPMA and its regional context.

B.1.1. Lithology and domains

From a geological point of view the area is composed by successive lithology's and different domains : various crystalline and volcanic terrains in the middle of the massif, and an easterly sedimentary terrain in the eastern border. All geological periods are represented in the Park covering a span of nearly 550 million years, from the Palaeozoic until present times : the ancient basement, the mesozoic sedimentary rocks, the Cenozoic then Neogene volcanic rocks. The Quaternary volcanic rocks are contemporary with the most recent glaciations and first human settlements.

Tectonic history

The massif is mainly composed by Paleozoic rocks (Variscan orogeny), principally gneiss, granites and schists. During the Tertiary because of the Alpine and Pyrenean orogenies this crystalline basement has undergone many fractures and dislocations. This has led to the opening of grabens (Limagne and Alès), the rising of magma, as well as lava flows during Neogene and Quaternary. They explain the formation of the volcanoes, one of the features for which the massif is well renowned.

Vertical movements linked to the same orogenies caused the uplift of the southern and eastern borders of the Massif Central, the area of the Mots d'Ardèche. These areas were the focus of subsequent activity ; evidenced through the development of scree over a steep gradient well away from the Rhone Valley. The River Rhone flows at about 90 m altitude at Pouzin (just outside the boundaries of the Park).

This transitional morphology between two morphostructural domains characterizes the foothills of Mots d'Ardèche as far as the "mountain" of Cévennes following an east – west line. The highest point of Mots d'Ardèche is the Mont Mézenc volcano at 1 753 m.

Geology of the six landscapes units

The crystalline units are the basement of the area. Close to the Rhone Valley, they are often covered by Mesozoic and Cenozoic (Neogene) sediments, but outcrop widely in the territory of RNPMA. The Neogene and Quaternary volcanism cuts the other layers. The six landscape units composing the RNPMA are grouped in two main geological domains which are spatially distinguished, with a third scattered one whose distribution is linked to lava flows.

The north-western part lies on crystalline rock. It is characterized by steep slopes and the terraces on which chestnuts trees are cultivated due to the lithologically controlled acid soils. The western Haute Cévenne is drained by valleys that meet at Vals-les-Bains. The Fontaulière, Besorgues, Volane and Sandron Rivers meet up with River Ardèche which carries water eastward to the River Rhone. The southern Cévenne is dominated by the Grand Tanargue (1 511 m) and the Serre de Barre (900 m). It is drained by the River Beaume and its tributary the Drobie, and further south by the River Chassezac and its tributaries the Thines and Borne. All of them are tributaries of the River Ardèche drainage basin.

The south-eastern part lies on sedimentary rocks aged Triassic to Late Jurassic. Deep canyons cut the sedimentary layers as far as the granite and schist basement, such as in the Beaume gorges upstream from Joyeuse. This sedimentary cover is continuous until Privas. To the west the basement reappears.

The volcanic formations stretch from the eastern Velay to the middle of the RNPMA and continue in the Les Boutières. The five phonolitic Sucs (a massif in its own right, not to be confused with "Les Sucs" geosite) are the distinctive landscape feature of the area, with the famous Mont Mézenc (1 752 m) and Gerbier de Jonc (1 551 m). There are also other remarkable structures such the ring complex of the Sara Suc (1 521 m). The density and the powerful beauty of these landforms makes it a unique European site.

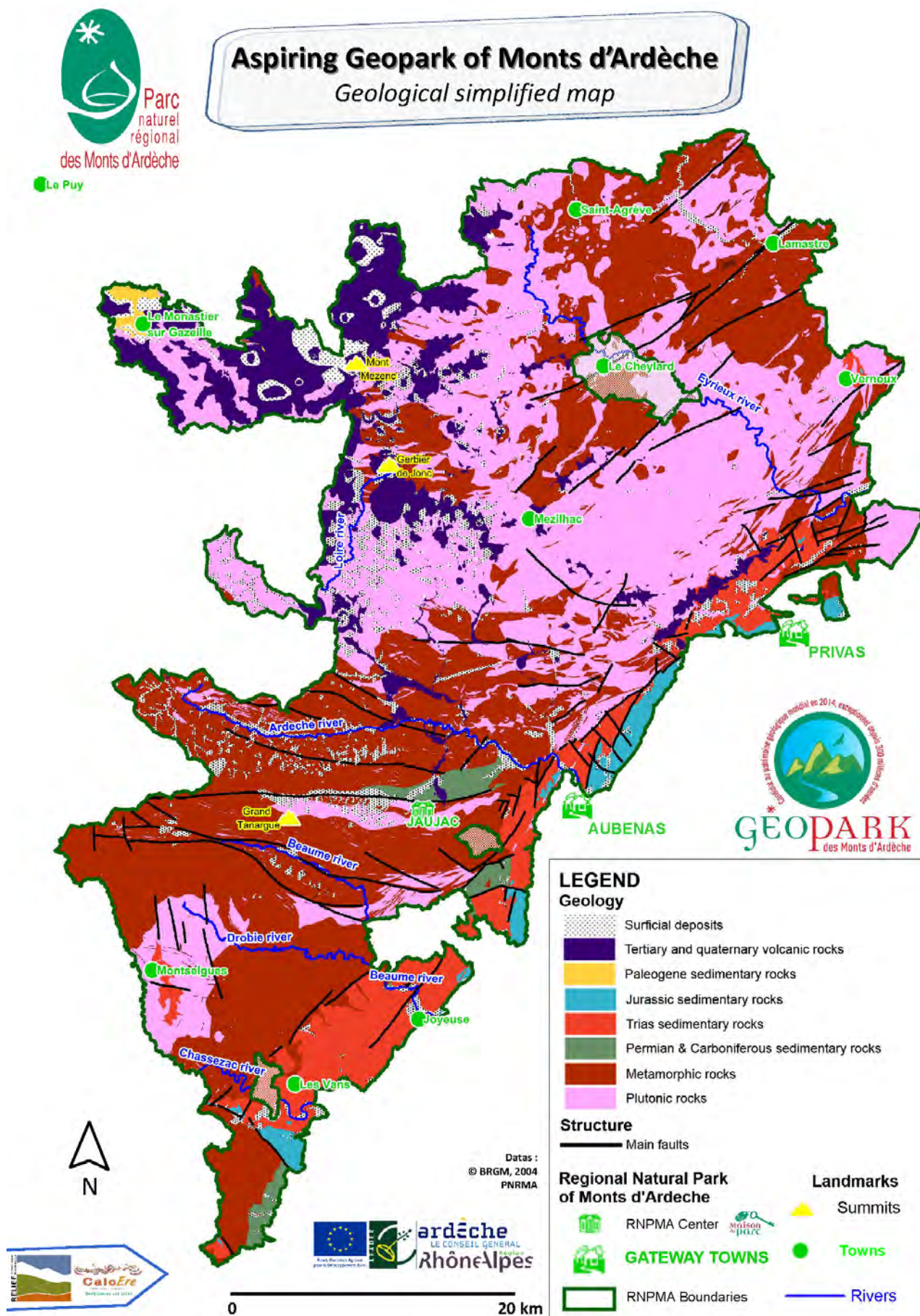


Figure 29. Simplified geological map of the territory.

B.1.2. Hydrography

The River Ardèche is the main water course which has given its name to the department and the RNP of Monts d'Ardèche. It drains the department from west to east and then flows into the River Rhone. Its tributaries are the Chassezac, Beaume (in the South) and Volane rivers. The River Eyrieux flows directly into the River Rhone. Their hydrological regime is called "pluvio-cénvenol" (fig. 13 part A) in French because it is strongly specific to the Cévennes region. It is characterized by heavy periods of rainfall at the beginning of Autumn which led to sudden floods. In general the regime has its maximum during winter and more or less marked lower flow level (fig. 30).

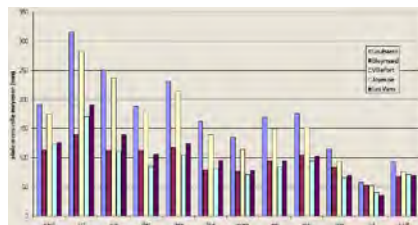


Figure 30. Distribution of the monthly rain-falls in the Chassezac watershed.

The major part of the water system of RNPMA is drained by the catchment of the River Rhone and a small part in the North-West by the River Loire catchment area.

B.2 General geological description and remarkable features

The Monts d'Ardèche Geopark showcases an extraordinary slice of the geological history of a large part of Europe since 550 Ma, namely from Paleozoic to the present times, including two orogenies: the Variscan (or Hercynian) orogeny and the Alpine orogeny (fig. 29).

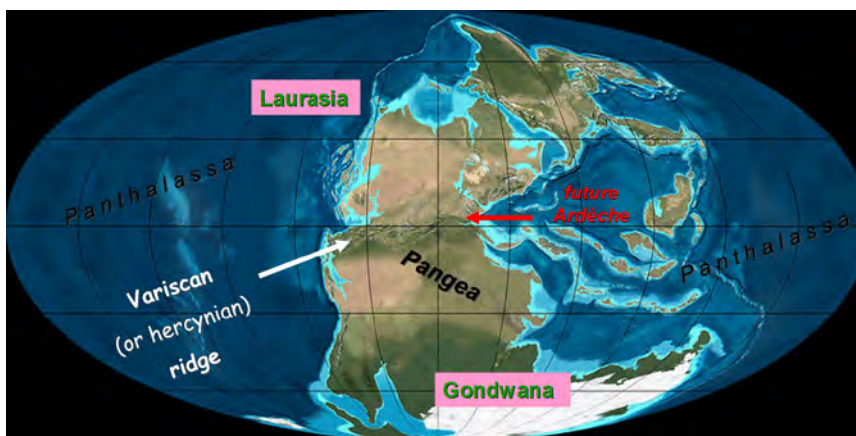


Figure 31. Map of the world at the end of the Permian (~250 Ma). All continents are assembled, forming the Pangea. The variscan ridge divides this block. The Ardèche, like the whole Massif Central, are the deep roots of the mountain range.

B.2.1. The metamorphic and plutonic rocks

The metamorphic and plutonic rocks (fig. 31) are the major geological outcrops within the Geopark (fig. 29). They are the deep roots of the Variscan Mountains, a grand mountain range culminating at more than 4000 m altitude and crossing Pangea from the Urals to Labrador in the Upper Paleozoic.

The schists of the Cévennes ("schistes cévenols"), in southern part of the Geopark, are Cambrian-Ordovician sediments deposited on the northern margin of Gondwana. They were structured during the Carboniferous (340 Ma) when this external unit was overthrust from North to South. They were also subject to an intense metamorphism with the same orientation (epizone and mesozone, but also polyphase metamorphism).

The metamorphic and granitic rocks of Vivarais and Velay, in the centre and north of the Geopark, are the deep roots of the Variscan Mountains. They were formed from stacked thrusts during the major phase of continental collision in the Devonian (360 Ma) with a moderate temperature – moderate pressure metamorphism reaching the catazone. After this collision, the region was affected by rifting during Middle Carboniferous (320-200 Ma). The associated doming, as well as the melting of the deepest part of the crust, led to the formation of the "dôme du

Velay". These are a vast group anatectic granites and migmatites over which a suite of metamorphic rocks remain (mainly paragneiss and orthogneiss and some amphibolite). A low pressure – high temperature metamorphic phase, contemporaneous with the granitization, affected those rocks and masked the paragenesis and structures linked to the former moderate pressure – moderate temperature phase. These crystalline rocks melted at a depth of several kilometres before being pushed back to the surface. They form the southerly border of the largest domed structure of the Variscan Chain in France.

B.2.2. The sedimentary cover

The sedimentary cover (fig. 32) of the Variscan basement outcrops along the southern border of the aspiring Geopark (fig. 29). Two different contexts and generations of sediments can be distinguished :

The detrital sediments coming from the erosion of the Variscan ridge can be observed in basins and intra-continental grabens of Carboniferous and Permian ages (Stephanian Basin of Jaujac and Largentière Basin respectively). During the Triassic the general



Figure 32. Map of the world in the middle of Jurassic (~115 Ma). During Jurassic, the Pangea breaks apart and the Tethys cover a part of the future Europe. Marine sediments are deposited on the margins of the islands which are the remains of the Variscan ridge.

transformation of the basement to a peneplain lead to the deposition of sandstones in deltas and lagoons along the margins of the Tethys. These sandstones constitute the main part of the outcrops in the south-eastern piedmont of RNPMA. Characteristic structures of the depositional environment can be observed (cross-bedding, ripple marks, pseudomorphosis of salt crystals) as well as some spectacular reptile tracks.

The **marine Jurassic sediments** overlie the Triassic sandstones and come from the collapse of the passive continental margin due to synsedimentary tectonics of rotating fault blocks. The marine invasion of the continental margin is marked by carbonate sedimentation and marine fossils (ammonites and belemnites of Naves for instance). Later following the compressive phases (North-South Pyrenean and Provencal and East-West Alpine compressions) and Oligocene distension linked to Alpine orogeny, the sedimentary margin was deformed and sliced into collapsed blocks.

B.2.3. The volcanic flows

The spectacular volcanic outpourings (fig. 33) of the aspiring Geopark are partially caused by the melting of the upper mantle, but are also linked to the formation of the Alps during the Cenozoic. This has uplifted and then fractured the basement of Massif Central. The ancient faults of the Variscan basement have been reactivated causing the diverse volcanism of Ardèche.

The “**sucs country**” of the Velay has the largest phonolitic group in Europe. The landscape, made from these amazing “rocks that ring” is unique with domes, pitons and a large variety of other landforms. This vast and strongly coherent area also contains the most beautiful group of sublacustrine volcanoes in France. These explosive volcanoes formed characteristic shallow craters called maars, either ancient ones such as the Cirque des Boutières (A6), or recent ones such as Saint-Martial (A11,

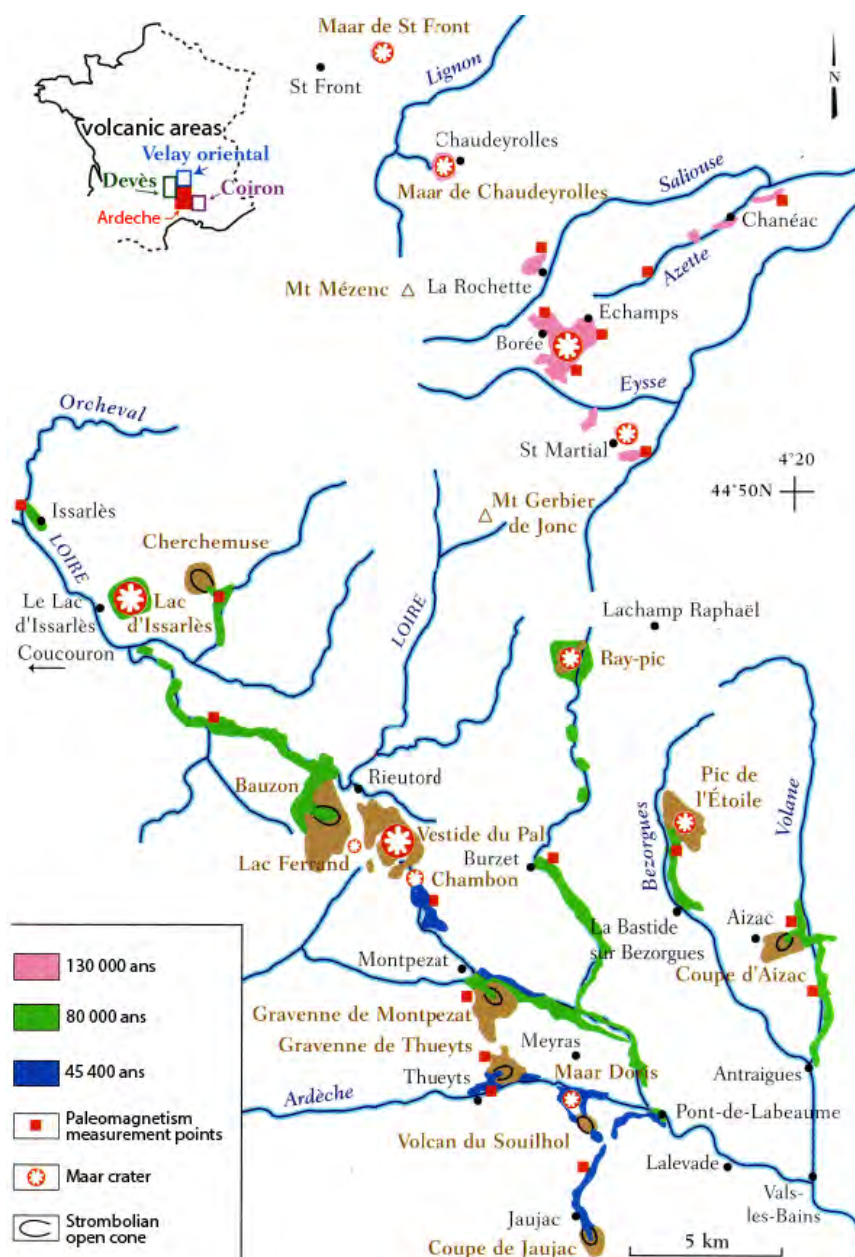


Figure 33. Map of recent volcanism.

fig. 50) or the Vestide du Pal (A16).

The “**young volcanoes country**” of the Vivarais comprise very long lava flows (up to 21 km) which entertain by now and then flowing upstream (Thueyts), sometimes playing leapfrog (Pont de la Beaume) and by building imposing basaltic stacks and colonnades. The volcanoes have also carried precious geological wonders to the surface: fragments of peridotite brought up from the mantle. No human drilling has ever gone so deep in the continents and so these fragments can be thought of as a kind of natural drilling which allows us to study the sub-continental mantle. Through these ancient and reactivated faults flow mineral waters (often gaseous) and thermal springs, exploited for their health qualities (St-Laurent-les-Bains, Neyrac-les-Bains, Vals-les-Bains).

B.2.4. Quaternary

The glaciations and the humans put the finishing touch to the picture.

The formation of valleys during the Pliocene and Quaternary has been influenced by :

1. the uplift of Cévennes border,
2. the Messinian crisis which lowered the Mediterranean sea-level caused over deepening of valleys (those in which the Neogene lava had once flowed),
3. the progressive climate cooling followed by alternating glacial and interglacial periods of Quaternary, and
4. the volcanism which has sometimes perturbed the entrenchment of the streams and caused local changes in hydrography.

Because of the lithological contrasts, the erosion has exposed the original relief and numerous volcanic structures that were buried in the younger sediments. The cold climate of the Quaternary has put the finishing touch to the picture by forming scree slope around the sucs or the surprising “rivers of stones” in the Mont Mézenc massif.

During the last glacial and interglacial periods, the first human beings slowly began to shape the natural landscapes of the aspiring Geopark : rock shelter (“baumes”) or caves, dry stone wall terraces, phonolite flagstones quarries, irrigation, forest clearing or afforestation, etc.

B.3 Description of the geosites

B.3.1. Geosites by type

The territory of Monts d'Ardèche includes many geologic points of interest. Out of a hundred of interesting and well-known sites, 51 geosites were selected for their educational, tourist and scientific value (fig. 38 ; refer to the list, appendix 4). They can be classified according to categories of geotypes or geological periods.

6 Sedimentological geosites

On its southerly border the RNPMA contains sedimentary rocks (fig. 29). Some of these rocks are witnesses to a past marine environment recognizable thanks to the presence of fossils (belemnites, corals, gastropods, cri-



Figure 34. Quartz vein in a Carboniferous outcrop (A41 Prades-Jaujac).



Figure 35. Permian sandstone outcrop (A42 Les Fourniols).



Figure 36. Formation of cavities in the Triassic sandstones (A40 Bois du Four).

noids). The oldest sediments were worked as coal seams (Carboniferous) and silver lead was mined within the fractures at the collapsed edges of the Massif Central which had been mineralized during Triassic hydrothermal circulations.

3 Hydrogeological geosites

Thermal spa waters are one of the characteristics of Monts d'Ardèche region. Three sets of springs are exploited for their curative properties (Neyrac-les-Bains, St-Laurent-les-Bains et Vals-les-Bains). The link between water and geology is present in other sites, for example, the many mineral springs (la Reine des Basaltes) or sources (those of the Loire), whose location is linked to the volcanic activity of the sector. The spa towns have an important cultural value.



Figure 37. The “véritable” Loire spring at the foot of Gerbier de Jonc (A2).

3 Petrographical geosites

The geological history of Ardèche is linked to the Variscan orogeny whose rocks have been cut by volcanic formations. The result of these meta-

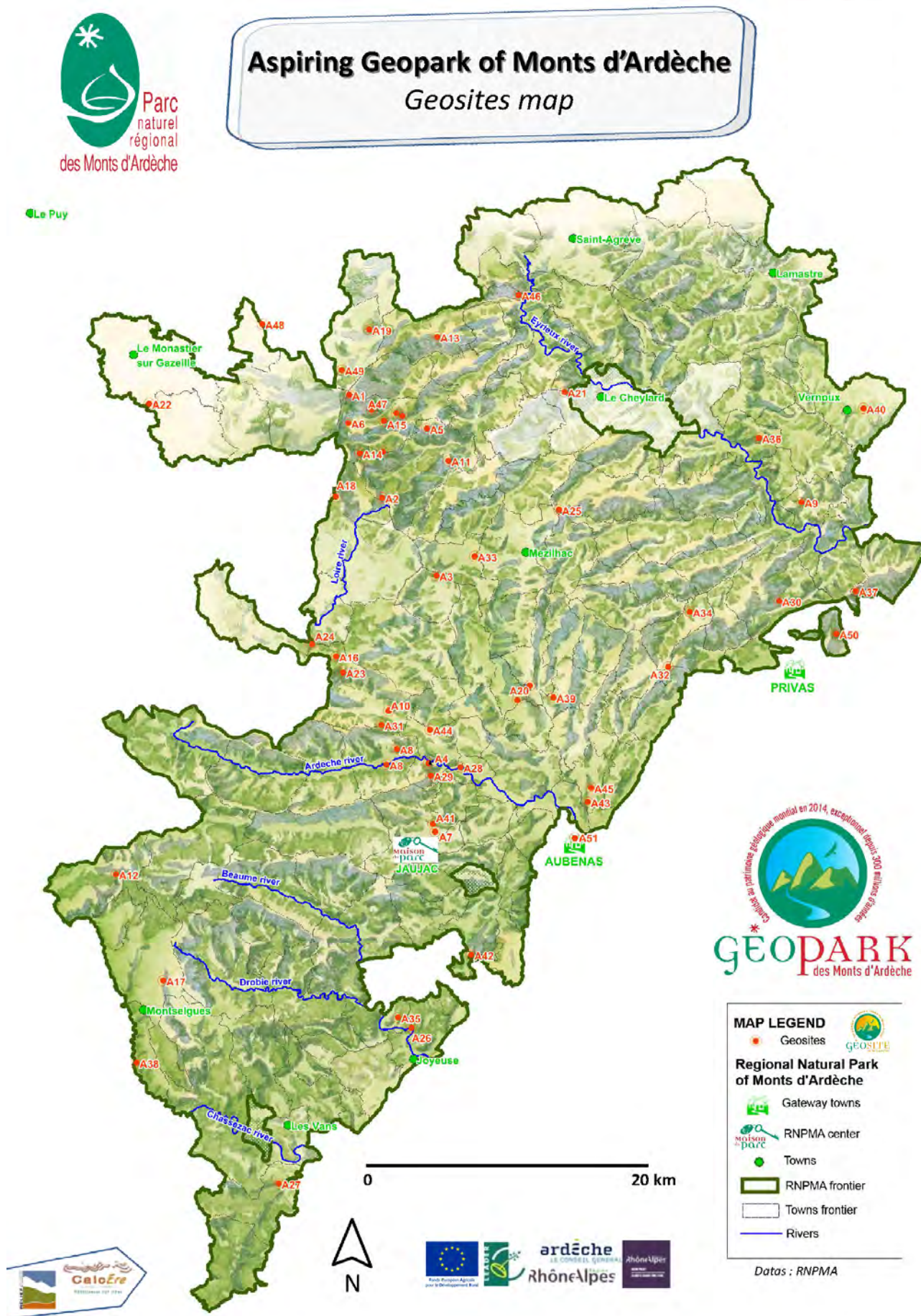


Figure 38. Map of the RNPMA geosites.

morphic and volcanic episodes is a great variety of rocks and mineralogies (cordierite, leptonite, tourmaline, garnet, rhyolite with biotite, vaugn-erite, etc.), often rare at RNPMA scale.



Figure 39. Peridotite in scoria (A16 Vestide du Pal).

7 Geomorphological geosites

The history of the Ardèche relief is revealed through the erosion of rivers which have cut through the bedrock, the sedimentary cover and volcanic formations offering insights into the structure and providing outcrops.

32 Volcanic geosites

Two main volcanic episodes have marked the territory, constructing relief or craters and covering large areas with basaltic flows. The young volcanoes of Ardèche are contemporary with the human activities of Chauvet Cave (–32 000 years) (and –45 400 years for the most recent volcanism).



Figure 40. Miocene phonolitic intrusions (Roches de Borée A15).



Figure 41. Basaltic lava flow and waterfall (Antraigues A20).



Figure 42. Phonolitic protrusion at the summit of Mont Mézenc (A1).



Figure 43. Le Don volcano (A25).

One of the characteristics of Monts d'Ardèche is that covers a particularly **long geological time span**. The selected geosites reflect the geological history and offer the possibility to reconstruct events, starting with the formation of the rocks during Variscan orogeny (Palaeozoic), the deposition of sediments throughout the Mesozoic, the incision of the valleys during the Messinian crisis, as well as the intense volcanism during Miocene (volcanism of Mézenc, Gerbier ; Saint-Clément, Neogene) and then again in the Pleistocene (young volcanoes of Ardèche, Quaternary)

B.3.2. Palaeozoic : rocks of the Variscan orogeny, metamorphism and continental sedimentation

300 million years ago the Variscan orogeny took place following the collision of two supercontinents ; Gondwana and Laurussia. Metamorphic rocks such as gneiss, granite and migmatite were the main components of the Variscan belt in this region. Today this impressive mountain chain has been levelled and is often covered by sediments or volcanic flows. Nevertheless, the ancient basement outcrops in numerous places. At the Belvedere of St-Michel de Chabrilanoux

(A9) on the north-west border of the RNPMA, the crystalline basement is profoundly incised by the River Eyrieux. Two particularly aesthetic geosites were formed by erosion of the granite basement at the south west of RNPMA. The Boulder field of Montselgues (A17), an emblematic site for the Park, was formed from granite with potassium feldspar phenocrysts (locally called "horse tooth granite" or granite of the Borne of Mont Lozère) where the erosion led to arena-like landforms.

In Sainte-Marguerite-Lafigère (A38) huge blocks of the same type of



Figure 44. Granite boulder field of Montselgues (A17).

granite and carried by the river can be found. The metamorphism of the basement led to a particular mineralization that enriches the geodiversity of Ardèche. In the quarry of Chalencon (A36) there is a beautiful outcrop of banded leptonite with cordierite and garnets. The vallée de la Beaume near Joyeuse (A26) shows outcrops that help to reconstruct great parts of Variscan metamorphism.

The Variscan belt has been eroded since it formed. The sediments were transported to nearby subsiding basins. During the warm Carboniferous period with its lush vegetation, the sediments were rich in the organic material which, millions of years later will be transformed into coal. The Prades-Jaujac Basin is a witness of this period. The coal seams of this basin

were exploited by locals, providing them fuel until the midst of the 20th Century.

During the Permian Period, the erosion continues but the climate gets drier. The sedimentation changes: clay, sandstones and conglomerates are deposited and can be observed at the site of Fourniols (A42).

B.3.3. The Mesozoic : marine sedimentation, fauna, flora and habitat

The old Variscan belt is nearly completely eroded and almost reduced to a plain by the end of the Permian period. From 250 million years ago in the Triassic, the Ardèche is a vast plain on which deltaic and shallow water deposits are accumulated in the form of sandstones.

The most important geosites with their origins in this period are Baumi-cou Waterfall (A35), the Reptile prints of St-Julien-du-Serre (A43) and Serre de Gruas (A37). All are formed in Triassic sandstones with specific characteristics. At Baumi-cou (A35) the erosion of the sandstones is very unusual and led to the local name of "nipple" (nipple-erosion). The sandstone slab of St-Julien-du-Serre (A43) show a series of reptile prints from 3 to 4 different animals and is one of the most important witnesses of local fauna at a departmental level. Gruas (A37) is unusual for its discordance, outcrops showing ripple marks and for its position : it offers a 360° view over the Rhone Valley, Prealps, Volcanic Plateau of Coiron and the crystalline basement of Boutières.



Figure 45. Fossil of Jurassic gastropode (Naves Cirque A27).

During the Jurassic, 200 Ma the thinning of the Earth's crust causes the creation of subsiding basins and the surface is cut into horsts and grabens : this structure of tilted blocks becomes more and more developed. A shallow and changing sea covers large parts of Ardèche. According to the environment, the sedimentation is marine (pelagic zones), detrital (neretic zones) or discontinuous (emergent zones). The horsts, grabens and the changing sea level form different sedimentary environments that can be observed on the eastern border of RNPMA.

Three geosites permit to investigate the fauna and flora of the Jurassic period. Near Aubenas, not far from the reptile prints of St-Julien-du-Serre, an outcrop shows a nice submarine landslide (A45) and informs about the instabilities of the sea floor during this period. It is also possible to observe corals in the Hettangian level. Northwards near Privas, the Jaubernie Caves (A50) are interesting for archaeological reasons but also because they show evidences of a submarine delta and numerous belemnites. Further north the sandstone and limestone outcrops of Bois du Four (A40) contain many fossils (bivalves, gastropods and crinoids). At the southern end of RNPMA the Naves Cirque (A27) shows a complete sequence of Jurassic sedimentary rocks. It's one of the important sites of the RNPMA because it's located on a fault that brings into contact the crystalline basement and the Jurassic sediments. This contact zone is at the origin of a highly variable landscape concentrated in a relatively small part of the territory.

During the Cretaceous sedimentation continues and thick layers of limestone are deposited. Nevertheless, this period is poorly preserved within the Park. The geosites linked to the Cretaceous, such as at Berrias (Berriasien stratotype), at Bois de Païolive (Megalapiaz in Kimmeridgian limestone) and in the Ardèche Canyon (meanders in the Urgonian, Pont d'Arc), and caves (Chauvet Cave, etc.) are located in the south of Ardèche.

B.3.4. Tertiary : uplift, fluvial erosion and volcanism of Velay

During the Oligocene and Miocene, due to the Alpine orogeny the region was subject to extension. The most important consequence of this tectonic movement to the relief of the Ardèche is the uplift of the eastern border of Massif Central. The crystalline basement is heavily incised during this time, accentuated by the Messinian Crisis (~6 Ma) during which the Mediterranean dries out and Rhône tributaries carve out the relief. The Eyrieux Valley that can be seen from the Belvedere of St-Michel de Chabrillanoux (A9) (cf. B.3.1) is exemplary of this period.

The volcanism of the Massif Central and the Ardèche is linked to the Alpine orogeny. A first period of volcanic activity affects the region of Haute Loire and Boutières between 10-6 Ma. During this a very high concentration

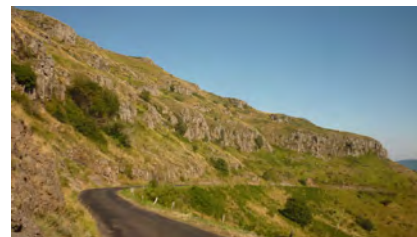


Figure 46. The St Clément flows (A13).

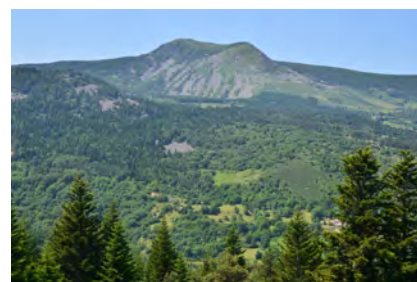


Figure 47. Characteristic "saddle" profile of the Mont Mézenc (A1).



Figure 48. Le Gouleyou, a phonolitic protrusion (Roches de Borée A15).

and great variety of volcanic activity occurred in these regions. The first episodes can be seen in very large outpourings of lava. Thanks to fluvial erosion, 12 levels of basaltic flows can be observed at Saint-Clément (A 13). The basaltic flow of Rocher de Brion (A21) is isolated and in high position due to relief inversion. It is contemporary to the Saint-Clément flows. The Boutières Cirque (A6) is a complex site where the polyphase volcanism is revealed by fluvial and glacial erosion. The phonolitic protrusions and domes in the landscape of Boutières are only little younger (8-7Ma). They are locally named "Sucs": Les cinq sucs (A18), le Suc de Chabrière (A47), le Mont Mezenc (A1), le Gerbier de Jonc (A2), les Roches Borées (A15), Suc de Montivernoux (A33). On all these sites viscous lava forms domes.

Other types of lava intrude through the crystalline basement, and sometimes into the Triassic sandstones. Today they are today visible as dikes and necks: le Rocher d'Ajoux (A34) and Neck of Craux (A39). While the lava flows must be revealed by erosion in order to be visible in the landscape, such as the volcan de Don (A25) and volcan de Chirouze (A30).

B.3.5. Quaternary : the young volcanoes of the Ardèche and periglacial influence

A second phase of volcanism is responsible for the creation of many maars, Strombolian volcanoes and generally medium sized basaltic flows oriented in a NW-SE axis. Thermoluminescence dating gives this volcanism an age between 166 000 and 45 400 years ago. The volcanic forms of this period are called "The young volcanoes of Ardèche". During this time, many volcanic deposits accumulated. A series of outstanding maars were selected as geosites of the RNPMA :

Chaudreyrolles Maar (A19) and its peat bog, Borée Maar (A5) filled with lava, Vestide du Pal (A16) the biggest Maar in Europe, St Martial Lake (A11) reconverted to a pleasure lake, the maar crossed by the Ray Pic waterfalls



Figure 49. Basaltic flow (Pont du Diable A8).



Figure 50. Maar of St Martial (A11).



Figure 51. Drawing (1827) of the town and volcano of Jaujac (A7).

(A3) which is an excellent geotourism site and the Chambon Maar (A23) with its lahar deposits.

The strombolian volcanoes of this period are often well preserved and show a nice form of breached crater: Jaujac volcano (A7), Aizac volcano (A20), locally called "coupes" are exemplary. The phonolitic plug of Bauzon (A24), despite his local name "suc" is a breached strombolian cone, Volcan de Souilhol (A29) is known for its impressive volcanic bombs and Mont Breyse (A22) has two cones. Gravenne de Thueyts (A8) and Gravenne de Montpezat (A31) were mined for their locally useful "pouzzolane" material. Finally some geosites are juxtaposed and superposed basaltic flows whose positions permit relative dating and show columnar jointing (basalt columns). These flows are often revealed by fluvial erosion and are common in

the pre-existing valleys. Examples are Amarnier (A44), Pourcheyrolles (A10), and Pont-de-Labeaume (A28).

B.3.6. Thermal Spas and Springs

Two gesosites represent a particular aspect of the RNPMA and its link to regional volcanism. Doris Maar is associated with a bubbling spring (Moffette)(A4). The two sites probably share the fracture in the earth's crust through which carbon dioxide leaks. The spring "Doris" is used in the thermal spa baths and other springs are bottled in this commune. The Hot Spring of Saint-Laurent-les-Bains (A12) is a thermo-mineral spring known since the Middle Ages and has a temperature of 53°C. The Eaux de Vals, identified as of public interest in 2012 is bottled and used in thermal spa care. Other geosites are strongly linked to springs, as for example Aizac (A20) where mineral water is taken and Mont Gerbier de Jonc (A2) at whose feet is the source of the Loire.

B.4 Details on the interest of the sites

B.4.1. Geosites studied for more than 200 years : scientific value

Research in geosciences has a long tradition (236 years) in this region. **Barthélémy Faujas de Saint-Fond** (1741-1819) was the first to edit "Recherche sur les volcans éteints du Vivarais et du Velay" in 1778.

At the same time as Faujas, the abbot **Jean-Louis Giraud Soulavie** (1752-1813) published the first geological map of the Ardèche and the first representation of the altitudinal zonation of vegetation. With his work

"Histoire naturelle de la France méridionale (1780-1783)", he is considered the father of the paleontological stratigraphy.

Since then the interest for geology has continued and other publications such as the "Journal des Mines" are edited (first issue in 1749). Subsequently geologists from France and

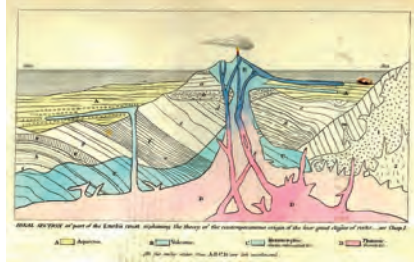


Figure 52. Representation of volcanism attributed to Charles Lyell.

abroad came to Ardèche, in particular **Charles Lyell** (1797-1875, fig. 52) a British geologist who named the geological eras (Tertiary) and corresponding series (for the Tertiary, Palaeocene, Eocene, Oligocene, Miocene and Pliocene). The geology of Ardèche is part of this long tradition.

B.4.2. An important geocultural imprint

More than two-thirds of the Park's geosites have a cultural value. Most of them were exploited for their natural resources. In fact volcanic materials were largely used in the construction industry, as for example "lauze" was used for stone roofs (Mont Signon A19) and columnar basalt for house walls and dry stone constructions (Rocher de Brion A21). Pozzolana, a material from magmatic explosions, is an excellent material with many uses (gardening, construction, natural filter, etc.) (Gravenne de Thuyets A8), the lahar deposits are easy to shape (Chambon A23). Other than the technical properties of the volcanic material, the great variety of colours were exploited for aesthetic reasons, as for example the construction of churches (Eglise de Borée, fig. 53 and 75).

Other non-volcanic geological layers were exploited : grindstones (Bois du four A40, Triassic sandstones at Montselgues A17), coal (Prades-Jaujac Car-

boniferous Basin A41), lignite (Vallée de l'Aubépin near Moudeyres A48), peat (Chaudefrolles Maar A19) and vaugnerites (Church of Meyras). The Ardèche is a territory in which mining history dates back to the Middle Ages and has strongly influenced the landscape (for example, an ancient railroad transformed in hiking trail).

Another type of link joining geosites with human settlement are the habitats they offer. Due to their elevated and isolated position the Rocher de Brion (A21), Roche de Gourdon (A32), Volcan du Don (A 252) and Dents du Mézenc (A49) show remains of

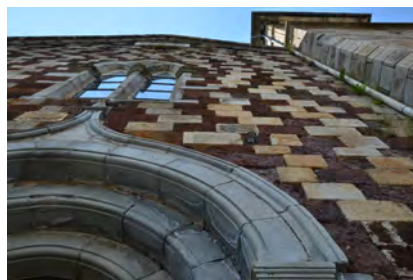


Figure 53. The church of Borée, built with five different local volcanic rocks (A15).



Figure 54. Lauze quarry on Mont Signon (A19).



Figure 55. Wall with faces sculpted in scoria (Antraigues A20)

gallo-roman or later settlements. At Baumaticou (A35), Jaubernie (50) and at Volcan de Chirouze (A30), natural hollows served as rock shelters during the Neolithic Era, as well as during the European wars of religion in the 16th century.

B.4.3. Attractive and educational sites, early geotourism

The Monts d'Ardèche have been visited for 200 years especially due to their young and well preserved volcanic features. Some geosites have an important aesthetic value and are considered landmarks (Mont Gerbier de Jonc A2, Jaujac Section A7, Pont du Diable A8). Strombolian volcanoes, maars and dikes are naturally delimited sites, easy to distinguish in the landscape even if the forest cover in Ardèche is among the densest of France. This trait has encouraged local authorities and stakeholders (municipalities, associations, unions and RNPMA) to equip numerous sites with information panels, interpretation tables and other facilities.

B.5 Current pressure on the sites

The development of the territory is not uniform and some regions are more impacted by demographic changes than others. The south-east border of RNPMA shows a significant periurban and tourist development which results in a decrease of agricultural land and an increase in built areas. There is a high risk of landscape degradation in that part of the territory. In the mountainous part of the Park where there are no important transport routes and no large urban centres, the situation is different.

Nevertheless, another danger concerns the centre of RNPMA ; rural depopulation and the loss of socio-economic and cultural activity may significantly change the landscape that is no longer maintained. Yet, some sites suffer from reforestation which covers landforms and outcrops. A balance has to be found in the management of steep terrains and their multiple uses : agriculture, forest management, protected areas and leisure. The RNPMA Charter (2013-2025) takes into account these



Figure 56. Interpretation table (Roches de Borée A15).



Figure 57. Interpretation table of the Croix du Branlet (Mt Mézenc A1, Boutières Cirque A6).



Figure 58. Interpretation table (Pont du Diable A8).



Figure 59. Interpretation table (Pont de la Beaume flows A28).



Figure 60. Interpretation table (Mont Signon A19).

different interests.

As far as the geosites are concerned, two main dangers have been identified : firstly the overcrowding of some of the outstanding sites that attract many visitors during the high season and may damage the sites.

At the Ray Pic Waterfall a visitor management plan was implemented to better absorb the 150 000 visitors per year. Another outstanding site of the Park, Mont Mézenc and surroundings (Gerbier de Jonc included) became an "Espace Naturel Sensible" (ENS) in order provide integrated management in this zone of high ecological value, where geology and wild life come together to create a landscape of particular beauty. A LIFE programme helped to diminish impacts due to overcrowding.

Other sites were deforested to restore the landscape value to certain summits, as for example at Lauzière.

Another sensitive point to the aspiring Geopark is the risk of plundering at the fossil and mineralogical sites. Known only by a few specialists, these sites have to be carefully managed by the RNPMA (with regard to the owners) to permit both, the public access and conservation.

In front of this different kind of pressures, the RNPMA positions itself as coordinator of a sustainable local development. The new charter takes the management of geology and linked resources explicitly into account (materials, architecture, tourism, agriculture). At a regional level the Direction Régionale de L'Environnement and the Commission Régionale du Patrimoine Géologique direct the National Inventory of Geological Heritage for this region. 15 sites of this inventory are within the RNPMA borders. These sites are considered of national (in some case even of international) value by independent experts.

Sites within the RNPMA borders :

- A1 Mont Mézenc (n°07038)
- A2 Gerbier de Jonc and Loire

spring (n°07041)

- A3 Ray-Pic Waterfall and flows (n°07042)
- A4 Doris Maar and Mofette (n°07117)
- A5 Borée Maar and Echamps plateau (n°07221)
- A6 Boutières Cirque (n°07194)
- A7 Coupe de Jaujac volcano and flows (n°07064)
- A8 Le Pont du Diable and Gravenne de Thueys (n°07043)
- A13 Saint-Clément flows (n°07039)
- A15 Roches de Borée (Gouleyou) (n°07566)
- A15 Petite Roche (n°07566)
- A15 Grande Roche (n°07566)
- A16 Vestide du Pal (n°07119)
- A17 Montselgues boulder field (n°07071)
- A23 Le Chambon (n°07120)
- A29 Volcan du Souilhol (n°07118)
- A31 Gravenne de Montpezat (n°07197)

B.6 Current status in terms of protection of the sites

As in other parts of France, the sites rarely benefit from legal protection for geological or geomorphological reasons alone. Within the boundaries of the Park, nine geological sites are legally protected. These sites are classified for their geological or landscape value and their quality as "natural monument".

The following five sites are listed :

- The basalt flows of Pont du Diable de Thueys (échelle du roi,

Code	Name of the geosite	Commune	Geosite	Equipment and/or interpretation	Level of interest	Science	Education	Tourism	Protection	Ecology	Culture	Era	Period	Age
Sedimentological Sites														
A41	Prades-Jaujac-La Souche Carboniferous Basin	Prades, St-Cirqs de Prades, Jaujac, ...	outcrop		*	**	**	*		✓		1	Carboniferous	300 ma
A42	Les Fourniols	Largentièrre	outcrop		*	*	*	*		✓		1	Permian	250-290 ma
A43	Reptile prints in Triassic sandstone	St-Julien-du-Serre	outcrop; reptile prints		*	**	**	*	✓			2	Triassic	
A40	Le Bois du Four	Vernoux-en-Vivaraïs	outcrop		*	*	*	*		✓		2	Triassic/ Jurassic	
A50	La Jaubernie Caves	Coux	outcrop; sandstone slab		*	**	**	***	✓	✓		2	Jurassic	190 ma
A45	Submarine landslide	St-Julien-du-Serre	outcrop; slump	✓	*	*	*	*				2	Jurassic	
Geomorphological Sites														
A27	Naves Cirque	Les Vans	viewpoint; contact zone	✓	*	**	**	**	✓	✓		1/2	Jurassic	
A17	Boulder field of Montselgues	Montselgues	example of granite erosion	✓	*	*	***	**		✓		1/2	Triassic	
A38	Granite Boulders of la Borne	Ste-Marguerite-Lafigère	example of granite erosion		*	*	**	*	✓			1	Cambrian	500 ma
A9	Belvedere and formation of the Eyrieux Valley	St-Michel-de-Chabrilanoux	viewpoint; outcrop	✓	*	*	***	***				1	Messinian	7-5 ma
A37	Serre de Gruas	St-Vincent-de-Durfort	viewpoint; outcrop		*	*	**	**		✓		2	Triassic	
A35	Baumicou Waterfall	Vernon	example of sandstone erosion		*	*	**	**		✓		2	Triassic	
A48	Aubépin Valley near Moudeyres	Moudeyres	fluvial incision		*	***	*	*		✓		3	Neogene	
Petrographical Sites														
A26	Metamorphism of the Labeaume Valley	Ribes, St-André-Lachamp, Beaumont	outcrop		*	***	**	**	✓	✓		1		
A36	Chalencon - Pont de Chervil Quarry	Chalencon, Beauvène	outcrop		*	*	**	**	✓			1	Carboniferous	300 ma
A49	Dents du Mézenc	Chadeyrolles	outcrop		*	*	*	*		✓		3	Neogene	8.8 ma
Hydrogeological Sites														
A4	Doris and Mofette Maar	Meyras	hydrothermal vent; maar	✓	***	***	**	***					Up. Pleistocene	47 ka
A12	Hot water fountain	St-Laurent-les-Bains	hot spring	✓	*	*	*	***		✓			Up. Pleistocene	17 ka
Volcanic Sites														
A6	Boutières Cirque	Borée	polyphase volcano	✓	**	**	*	***		✓		3	Neogene	10-8 ma
A13	Saint Clément flows	Saint-Clément	basalt flows	✓	**	***	**	**	✓			3	Neogene	10 ma
A21	Rocher de Brion	Jaunac, Accons	dyke	✓	*	*	**	**	✓	✓		3	Neogene	10-7 ma
A18	Les 5 succs	Ste-Eulalie, le Béage, Cros-de-Géorand	dome-flow; stone river	✓	*	*	***	**	✓			3	Neogene	
A47	Phonolitic plug of Chabrières	Borée	phonolitic protrusion		*	***	*	*				3	Neogene	8.5 ma
A1	Mont Mézenc	Borée, les Estables, la Rochette, Chadeyrolle	phonolitic dome	✓	**	**	*	***	✓	✓		3	Neogene	8 ma
A2	Gerbier de Jonc and Loire Source	Ste Eulalie, St-Martial	phonolitic protrusion	✓	**	*	***	***	✓	✓		3	Neogene	7 ma
A14	Ring structure of Pradoux et Sara	Borée	ring dyke		**	***	**	**	✓	✓		3	Neogene	6.5 ma
A15	Roches de Borée	Borée	phonolitic protrusion	✓	**	**	**	**	✓	✓		3	Neogene	7-8 ma
A25	Volcano du Don	Marcols-les-Eaux	flow; neck	✓	*	*	*	**		✓		3	Neogene	
A30	Volcano de Chirouze	Pranles	maar; lava lake	✓	*	*	*	**		✓		3	Neogene	7 ma
A33	Suc de Montvernoux	Lachamp-Raphaël	phonolitic dome		*	*	*	**	✓			3	Neogene	
A34	Rocher d'Ajoux	Ajoux	dyke		*	*	**	**	✓	✓		3	Neogene	
A39	Volcanic Neck of Crau	Genestelle	neck		*	*	*	**		✓		3	Neogene	
A32	Roche de Gourdon	Gourdon	basalt flow		*	*	*	**	✓	✓		3	Neogene	
A46	Basalte Quarry of St Julien Boutières	St-Julien-Boutières	neck; dyke		*	*	**	*	✓	✓		3	Neogene	
A19	Chadeyrolles Maar and Mont Signon	Chadeyrolles	phonolitic dome; maar	✓	*	*	***	***	✓	✓		3/4	Neogene	
A23	Le Chambon	Montpezat-sous-Bauzon	maar; flow; lahar	✓	**	***	*	*	✓			4	Pleistocene	
A22	Monts Breyse	Alleyrac, Presailles, le Monastier-sur-Gazelle	strombolian volcano; basalt flow		*	**	**	**	✓	✓		4	Mid. Pleistocene	375 ka
A11	Saint Martial Lake	St-Martial	maar		*	**	*	***	✓			4	Mid. Pleistocene	130 ka
A5	Borée Maar and Echamps Plateau	Borée, Saint Martial	maar		***	***	***	**	✓	✓		4	Mid. Pleistocene	120 ka
A3	Ray-Pic Waterfall and flows	Lachamp-Raphaël	maar; lava lake; flow	✓	**	**	*	***				4	Up. Pleistocene	80 ka
A24	Phonolitic plug of Bauzon	St-Cirqs-en-Montagne, Cros de Géorand,...	strombolian volcano; basalt flow	✓	*	**	**	**				4	Up. Pleistocene	80 ka
A44	Amarnier	Meyras	overlapping of flows		*	**	**	*		✓		4	Up. Pleistocene	80 ka
A31	Gravenne de Montpezat	Montpezat, Thueyts	strombolian volcano	✓	*	*	***	*		✓		4	Up. Pleistocene	80 ka
A20	Coupe d'Aizac Volcano	Aizac	strombolian volcano	✓	*	*	***	*				4	Up. Pleistocene	80 ka
A10	Château de Pourcheyrolles	Montpezat-sous-Bauzon	basalt flow		*	*	*	**	✓			4	Up. Pleistocene	80 ka
A28	Pont-de-Labeaume basalt flows	Pont-de-Labeaume	juxtapositional flows	✓	*	*	**	**		✓		4	Up. Pleistocene	80-47 ka
A7	Coupe de Jaujac volcano and flows	Jaujac, Fabras	strombolian volcano; basalt flow	✓	*	***	***	***				4	Up. Pleistocene	40 ka
A8	Pont du Diable	Thueyts	basalt flow	✓	*	*	**	***	✓	✓		4	Up. Pleistocene	47 ka
A29	Volcano du Souilhoh	Meyras	strombolian volcano; quarry	✓	*	**	*	**				4	Up. Pleistocene	47 ka
A16	Vestide du Pal	Montpezat, Burzet	strombolian volcano	✓	**	**	**	**	✓	✓		4	Up. Pleistocene	49 ka

Figure 61. List of the geosites. Level of interest : * low interest ; ** medium-strong interest ; *** very strong interest.

- chaussée de géants, gueule du Diable et pont du Diable) / geosite (A8) Pont du Diable and Gravenne de Thueyts
- Mézenc Massif / geosite (A1) Mont Mézenc
 - Le Mont Gerbier de Jonc / geosite (A2) Mont Gerbier de Jonc
 - Le rocher du Fromage d'Antraigues / geosite (A20) Aizac Section and Antraigues
 - Ray Pic Waterfalls / geosite (A3) Ray-Pic Waterfall and flows

Four sites are registered :

- Les grottes de la Jaubernie / geo-

- site (A50) La Jaubernie Caves
- Le château de Poucheyrolle / geosite (A10) Pourcheyrolles
 - Les coulées basaltiques d'Antraigues / geosite (A20) Aizac volcano and Antraigues
 - Le Rocher de Gourdon / geosite (A32) le Rocher de Gourdon

Numerous other geosites are indirectly protected because they form the substrata of ecological sites of national or regional importance. Other designations as Les Zones Naturelles d'Intérêt Ecologique Faunistique et Floristique (ZNIEFF), Natura 2000 network and ENS sites offer protection

status to sites like the ring structures of Pradoux and Sara (A14) (scree), Chadeyrolle Maar (A19) (peat bog) or Naves Cirque (A27) (Landes and forests).

Finally, the regional inventory of geological heritage can be considered a tool for the protection of the 15 sites of RNPMA.

B.7 Data on the management of the sites

The management of the geosites of the Monts d'Ardèche Geopark is essentially on the behalf of the commune and private landowners (private sites). For this reason the RNPMA tries to coordinate the improvement and communication of the geosites to ensure better integration of conservation issues, as well as standardization of the interpretive supports. Conventions have been signed with concerned communes for the maintenance of trails and infrastructure.

The RNPMA raises awareness of inhabitants and tourists to adopt a respectful behaviour towards the sites, whether they are equipped or not.

Other institutional services of the state are concerned with the management of natural sites, as EN-RA (Conservatoire des Espaces Naturels-Rhône Alpes) for Natura 2000 network sites, or the Office National des Forêts (ONF LIFE program, actions supported by the RNPMA). It's worth mentioning that the Conseil Général of Ardèche department is responsible for the management of the Gerbier de Jonc site.

Typical of the RNPMA, visits to the majority of geosites is free of charge. A few sites un- or poorly- visited because they are private properties.

The RNPMA's geosite inventory was established with the help of the Société Géologique d'Ardèche (SGA) (refer to geosite list, appendix 4). Its initial aim is to enable better planning for the improvement and presentation of the geosites.

It comprises a complete database assembling information on the physical, scientific, educational and geotourism characteristics of the geosites.

B.8 The geocultural sites and their integration into the geopark framework

Strong links exist between the geology and the human activities in the RNPMA (refer to B4). Numerous cultural, agricultural, hydrological and mining sites reinforce the presentation and communication of the geology. These sites show a strong interaction between the rocks, landscapes, water and daily life of the Ardéchoise.

Seven categories of geocultural sites have been identified, they group 36 sites (refer to list, appendix 4).

Religious heritage and geology are connected through building material often used for decorative reasons (Church "Borée" SNG7). Another connection can be made with the localization of some religious symbols at elevated altitudes (Croix de Fay-sur-Lignon SNG36).

The **historical heritage** relates to geology in the same way: building materials, location (Château de Rochebonne SNG9).

The **built and vernacular heritage** is closely related to the religious and cultural heritage and illustrates the great geodiversity of Ardèche.

The variety of **objects coming from the quarries**, and the use of the properties of the rocks can be explored in the schist terraces of Drobie (SNG12), the old grindstone quarry d'Ucel (SNG14), as well as the recent land art monument Tchier de Borée (SNG17).

Two agricultural products are important for the local identity: chestnuts and wine. **Gastronomy and wine heritage** are presented to the public in interpretation facilities, for example the cooperative wine cellar Cévenole at Rosières (SNG18) or Chestnut Museum at Joyeuse (SNG19). The Cévenol presents the ingenious way to use sandstone terraces for wine

production. The Chestnut Museum is an Interpretation Centre revealing the relations between geology and this emblematic local resource. It explains how the silica rich soil suits chestnut growing. Finally, the Maison du Fin Gras (SNG36) presents the CDO "Fin gras du Mézenc", beef with finely-chopped parsley obtained by traditional hay fattening.

The **hydrogeological heritage** concerns mineral and thermal water (Mineral water plant SNG20) and the long traditions of the mining activities within the territory are explored in the mining heritage category (ancient quarry of Sainte Marguerite Lafigère SNG31).

Last but not least, some **tourist sites** mention geology as related to archaeology or locally produced goods "terroir" (Musée des Vans SNG25, Bourlatier Farm SNG27, etc.). These are sites designed to attract tourists and who offer discovery experiences in line with a regional sustainable development.

This non exhaustive list of geocultural sites and objects is going to evolve with time and will include new partners, interested in the aspiring Geopark.



Code	Name of the site	Commune	Description	Interest	Tourist site	Equipment
Religious Heritage						
SNG 1	Church «Saint-Julien-du-Serre»	St-Julien-du-Serre	Roman Church built of standstones	Architectural	✓	✓
SNG 2	Church «Saint-Clément»	St-Clément	Church made of different local volcanic materials: trachyte, basalt (flow, scoria) and phonolite	Materials	✓	
SNG 3	Church «Notre Dame de La Pervenchère»	Montpezat-sous-Bauzon	Church designated «Monument Historique», made of granite	Architectural	✓	✓
SNG 4	Church «Meyras»	Meyras	The flamboyant portal of this roman church is made of vaugnerite	Materials	✓	
SNG 5	Church «Niègles»	Pont-de-Labeaume	Roman Church in the hamlet of Niègles	Architectural	✓	✓
SNG 6	Church «Thines»	Malarce sur la Thines	Roman Church with outstanding polychromatic facade (trachyte, red and black scoria, granite)	Architectural	✓	
SNG 7	Church «Borée»	Borée	Church with atypical facade, made of yellow tufa, granite, trachyte and red scoria	Architectural	✓	✓
SNG 8	Fival Temple	St-Etienne de Serre	Temple built between 1837 and 1841 to serve as place of worship for the protestant parish of St-Etienne-de-Serres	Cultural	✓	✓
SNG 36	Fay-sur-Lignon Crosses	Fay sur Lignon	Dyke topped with 3 crosses near the Church	Cultural	✓	
Historical Heritage						
SNG 9	Rochebonne Castle	St-Martin-de-Valamas	Castle with nice view of orthogneiss outcrops and offering a view point of the Eyrieux Valley	Landscape	✓	
SNG 10	Ventadour Castle	Meyras	Castle in front of the site of Pont de Labeaume	Historical	✓	
SNG 11	Crau Castle	Genestelle	Castle built on the Crau volcano	Historical	✓	
Built and vernacular Heritage						
SNG 12	Schists terraces of Drobie - Lauzes trail	Vallée de la Drobie	Walking circuit showing the work of different artists highlighting elements of the rural heritage: terrasses, bridges, mills, ...	Artistic	✓	✓
SNG 13	Lime Kiln of Pas de Brès	Payzac, Fauçères	Lime kiln alongside the trail from Pas à Bres to Gratte, the kiln used the dolomitic levels of the Middle Triassic	Materials		✓
SNG 14	Quarry of Fromenterol	St-Julien du Serre	Millstones extraction site	Archaeological		
SNG 15	Wine making vats carved out of rock	Chassiers	Outstanding archaeological heritage, wine making vats carved into sandstone	Archaeological		
SNG 16	Mill at Laval d'Aurelle	Laval d'Aurelle	Small grinding mill with horizontal wheel	Cultural	✓	
SNG 17	Tchier de Borée	Borée	Monumental contemporary art installation in «cromlech» style made of phonolites, on each stone texts or pictures are inscribed	Artistic	✓	✓
Gastronomy and Wine Heritage						
SNG 18	Cooperative wine cellar La Cevenole	Rosière	The wine cellar explores the nature of the soil in their wine promotion. On sandstones: wine terrasses of Balbiac	Gastronomical	✓	✓
SNG 19	Chestnut Grove Museum	Joyeuse	Exhibition about the growing techniques and the civilisation of chestnut trees	Gastronomical	✓	✓
SNG 38	Maison du Fin Gras	Chaudeyrolles	Exhibition about the breeding of «fin gras» (hay fattened beef with finely-chopped parsley) and about the Mézenc terroir	Gastronomical	✓	✓
Hydrological Heritage						
SNG 20	Mineral water plant	Asperjoc, Meyras	Spring and mineral water plant of Reine des Basaltes and Pestrin	Hydrogeological	✓	
SNG 21	Intermittent fountain and springs of Vals	Vals-les-Bains	Fountain located in the Parc de Vals, producing a geyser	Hydrogeological	✓	✓
SNG 22	Odysée des eaux, thermal baths and fluorine extraction	St Laurent-les-Bains	Eco-museum, geological approach to the history of the hot springs	Hydrogeological	✓	✓
SNG 23	Exhibition about mineral water	Marcols-les-eaux	History of the springs of Morcols, discovery of the Janvier spring	Hydrogeological	✓	✓
SNG 35	Peat bog of Montselgues	Montselgues	Natural site on the plateau of Montselgues presenting peat bogs and a particular fauna and flora	Hydrological	✓	✓
Sites to visit						
SNG 24	Ecole du vent	Saint-Clément	Visits, animations and exhibitions about wind power, including a section about the formation of the Mézenc Massif	Cultural	✓	✓
SNG 25	Musée des Vans	Les Vans	Museum about archeology, geology and local handicraft	Cultural	✓	✓
SNG 26	Village with thatched cottages	Moudeyres	Tourist village with thatched cottages and museum	Cultural	✓	✓
SNG 27	Boulatier Farm	St-Andéol-de-Fourchades	Farm «Monument historique», phonolite roof, basalt prisme pillars. Example of traditional vernacular architecture	Architectural	✓	✓
SNG 28	Ecomuseum «des terrasses»	St-Michel-de-Chabrilanoux	Educational trail and visit to discover the heritage of dry stone	Cultural	✓	✓
SNG 29	Mandy Mill	Pranles	Mill built in 1891, animations, visits and regional products	Gastronomical	✓	✓
SNG 30	Raoul Mill	St-Joseph-des-bancs	Exploration of flour production, in particular chestnut flour	Gastronomical	✓	✓
Mining heritage						
SNG 31	Ancient quarry of Ste Marguerite Lafigères	Ste-Marguerite Lafigères	Discovery trail of the ancient quarry, nice view on the principal buildings from the road	Ressources	✓	✓
SNG 32	Ancient quarry of calamine	St-André-Lachamp	Ancient quarry of calamine (Zn)	Ressources		
SNG 33	Remains of mines at the Bois de Vouge	Fons	Remains of the iron mines of Aihlon	Ressources		
Astronomical sites						
SNG 34	Juvinas Meteorite	Juvinas	In 1821 a meteorite of 91 kg hit the ground at this place. Annual scientific events	Astronomical		
SNG 37	Planet Mars	Mars	Observatory with large telescope	Astronomical		✓

Figure 62. List of the cultural sites.

C. Arguments for nominating the territory as a European Geopark

C.1 Comprehensive analysis of the potential for the development of geotourism

The RNPMA is a preserved territory with numerous and exceptional geological resources. It is located between the Chaîne des Puys (North) and the Chauvet Cave (South), two sites of outstanding geological value. France applied for an inscription of these two sites in the World Heritage List of UNESCO in 2014.

C.1.1. An attractive geological heritage

The heritage of Monts d'Ardèche, rich in natural geological sites of great value, is an important asset for the territory. Among the emblematic sites that reflect the attractiveness of the region one must mention Mont Gerbier de Jonc (450 000 visitors per year) and the spa towns of Neyracles-Bains, Saint-Laurent-les-Bains and Vals-les-Bains. These have been known for their curative properties since the 17th century, as well as for

their internationally known mineral water. The first hotel accommodation was developed in Vals-les-Bains and today, there are around fifteen hotels as well as campsites, self-catered accommodation, B&B's, etc.

But the geological heritage is not limited to the above mentioned sites. It also includes :

- the volcanoes and lava flows ; the youngest of which were certainly observed by a population contemporary with the people who painted Grotte Chauvet ;
- the dry stone terraces built by humans to live and farm in the steep terrain. They are significant for the art of adaptation to geologically shaped landscapes drawing on the resources of the environment ;
- the omnipresence of water in the territory (nearly 3 000 km of waterways) has shaped the landscape and represents an important resource. Thermal baths and mineral water production is strongly linked to the local geological characteristics ;
- a remarkable built heritage whose forms and materials reflect an adaptation to the terrain, climate and unique geology.

This diversity of geological resources is a strong characteristic that the RNPMA wishes to develop in order to enhance the attractiveness of its territory to a wide audience.



Figure 64. Poster from the Tourist Office of Vivarais (archive).

C.1.2. A wide geotourism offer

This geological heritage has long been identified and communicated as evidenced by interpretive supports that already, at the beginning of the 20th century, featured geological sites : volcanoes, canyons, caves, etc.

Conscious of the wealth and the tourist potential of these geological sites, early on the Monts d'Ardèche protected their principal sites :

- Ray-Pay waterfall, protected in 1931 ;
- Mont Gerbier de Jonc, protected in 1933 ;



Figure 63. Gerbier de Jonc (A2).

- Le Rocher du Fromage, protected in 1933 ;
- L'Échelle du Roi, at Thueyts, protected in 1935 ;
- La Chaussée des Géants et la Gueule d'Enfer de Thueyts, protected in 1936 ;
- Mézenc Massif, protected in 1997 ;
- Pont du Diable basalt flows, protected in 2007.

At the same time numerous initiatives and improvements were undertaken by the RNPMA, SITHÈRE, CPIE, and different authorities which have permitted the development of the geotourism offering (refer to C2).

To list a sample of these actions and facilities :

- Interpretive trail of Aizac volcano ;
- Ray-Pic waterfall (belvedere and interpretation facilities) ;
- The via ferrata, belvedere and information panels of Pont du Diable at Thueyts ;
- Rocher de Brion at Jaunac ;
- Mont Gerbier de Jonc (Information Centre : work in progress) ;
- Sites described in the leaflet "volcans des deux mondes" (Saint-Clément flows, Saint-Martial lake, Boutière Cirque, etc.).

Similarly, many discovery guides have been published by various actors for this area, among which we can mention :

- Guidebook "Discovery to the Volcanoes of the Ardèche" (SITHÈRE 2002, reviewed 2013) ;
- Topoguide of Aizac volcano (RNPMA, 2006) ;
- Geological guide "10 itineraries, Ardèche" (Editions Omnisciences, 2012, to be reprinted in 2014 with RNPMA as partner) ;
- Guidebook "Volcans des deux mondes" (RNPMA, 2007) ;
- Travel guide "Aux sources du Chaos, Promenades géologiques et conversation autour de Montselgues".



Figure 65. The "Carnets de voyage" collection.

Many societies or professional organizations offer activities linked to geology for students as well as tourists. These activities are complementary to the already important geotourism offering : guided tours, educational visits, public talks, exhibitions, etc.



Figure 66. Musée des Vans.



Figure 67. Ecole du Vent.

Finally, the 20 information points within the RNPMA (19 thematic centres and the Park Centre) all promote the geotourism offering. Among these information points, the museum of Les Vans has a room dedicated to geology and the Ecole du Vent offers opportunities to discover how geology structures the landscapes.

C.1.3. A dynamic management organization, a powerful local involvement

The RNPMA is supported by its technical staff and many partners to help in the preservation of the cultural and natural heritage. Together they also implement local sustainable development projects.

With this spirit the whole territory supports the Geopark project : through the mayors of 145 municipalities, the local stakeholders and the Park staff. Considered territorial resources, the development of a Geopark is deemed to be the most suitable method for enabling the far reaching, sustainable preservation and promotion of local geoheritage.

For the initiatives aimed at developing geotourism, the RNPMA can draw the Société Géologique d'Ardèche (SGA) and on its scientific committee which is composed of relevant actors who know the territory and its geology well : University of Clermont-Ferrand, Ecole Nationale Supérieure Lyon I, University Lyon 2, University of Savoie, University of Nice Sophia Antipolis, CPIE of Velay, SITHÈRE and Clapas Association (refer to Part C.2).

Similarly all the organisations for tourism development in the territory are closely associated with this project : Agence Départementale du Tourisme de l'Ardèche, Conseil Général de l'Ardèche, Syndicat Mixte de la Montagne Ardéchoise, Pays, Communautés de Communes, as well as the networked tourist offices, etc.

All stakeholders whether political, scientific, technical, economic or institutional are represented and involved in the development of geotourism throughout the Geopark project.

C.1.4. Local products and geological heritage

Through the partnerships with the territorial economic stakeholders, the RNPMA is working to promote a geological theme in the products it is offering. For example in summer 2013 the exhibition "Fusion", a theme evoking the local volcanism. This exhibition was organized at the Park Centre in collaboration with the association "Trajectoires". This partnership has been created to stimulate artistic work linked to geological themes and has encouraged for example the creation of souvenirs linked to geosites.

The RNPMA is also working to develop heritage of the mineral water companies in its territory : among the five mineral waters companies, three are beneficiaries of the brand “Produit du Parc” (Park Product) (Reine des Bassetes, Ventadour and Vernet).

The park is also a partner of the co-operative wine producers at Rosières which highlights the Chatus historic grape whose production area is located in the Triassic sandstones. The Park organizes guided visits to present this special story. Other emblematic products (chestnuts, Fin-Gras beef of Designated Controlled Origin) are shared with visitors during the “rendez-vous terroir”, special moments of gastronomic discovery amongst passionate local producers.



Figure 69. Landscape reading with an Park-labelled interpreter in the Borne valley.



Figure 68. Poster of the “Fusion” exhibition at the Park Center.

Artisans, artists and visual artists live and work in the villages, valleys and the slopes of the Monts d'Ardèche and welcome residents and visitors in their workshops nearly all year round in the context of the “chemins de la création”. Among these 142 craftsmen around fifty work with metal and other materials from the earth : ceramists, sculptors, potters, blacksmiths, glassmakers, enamel workers on lava. They participate in the creative process that links the inhabitants to the geological heritage of their territory.

Finally, the jewellery making tradition that stems back more than 150 years

in the Boutières was the first established jewellery making industry in France. This sector employs 800 persons in the Eyrieux Valley. The promotion of this production has given rise to many initiatives that, in February 2010, led to the creation of “Valley of Jewels” which now allows visitors to combine outdoor activities, the discovery of natural and cultural heritage, tasting of local products with workshop visits and jewellery shops.

Such examples show how local businesses can profit from their involvement in the development of geotourism.

C.1.5. A strategy plan for the development of sustainable tourism

With the implementation of the new charter (refer to Enclosure A), the RNPMA developed an action plan for the area to become a reference territory for sustainable tourism.

This is to be done through the development of a heritage discovery offering which draws inhabitants and visitors to explore the whole territory. The RNPMA signed, the European Charter for Sustainable Tourism in September 2011, which confirms both the Park's actions in promoting sustainable tourism and its five-year action plan.

One of the objectives of this plan is to combine outdoor activities (sports and leisure) with the issues of the protection of agriculture production and natural areas, as well as the development of “off season” tourism, in particular by relying on the well-known Mézenc-Gerbier area. Other actions will be undertaken to improve the quality of services through the training and support of professionals (hoteliers, restaurant owners, mountain guides) and to protect the most sensitive areas.

Thus the tourist offering for heritage discovery, including geotourism, plays a central role in the implementation of the strategic plan for the development of sustainable tourism.

C.1.6. Outdoor activities

From Mont Mézenc (1753 m) to the Mediterranean vegetation zone of Les Vans (170 m) , the Monts d'Ardèche have an exceptional variety of landscapes making this territory an excellent place for hiking and outdoor activities. The short distances



between the varied landscapes and natural sites offer the possibility of a range of outdoor activities : paragliding, canyoning, climbing, kayaking, snowshoeing, walking, mountain biking, horseback riding, mule roaming, swimming, fishing, etc. 4000 km of marked paths cover the territory and provide numerous possibilities for different circuits. The RNPMA promotes holiday tours through its map-guides : "Horse Trails" and "Following the Steps of the Mule" which allow you to travel through the area. A new mountain bike map-guide will be published soon, adding further variety to the discovery possibilities of the geological heritage of the Monts d'Ardèche.



Figure 70. Mountain biking in Ardèche.

In terms of pedestrian itineraries RNPMA created two hiking trails : the "Tour de la Haute-Cévenne" that reveals the young volcanoes of Ardèche (Vestide du Pal Circuit, Eaux-Vives Circuit, columnar basalt Circuit) and the "Tour du Massif Mézenc-Gerbier" who leads the hiker to discover the distinctive volcanism of the "Pays des Sucs".

Geological heritage provides an extra dimension to those engaging in sporting activities (paragliding from the phonolitic protrusions and Tanargue, canyoning in the valleys of the Cevennes ...) it may be highlighted by the sporting professionals, but principally it is explained by the mountain guides. Respect of habitats and species is controlled by the Park, especially through its brand "Marque Parc", allocated to professionals who meet the criteria of environmental compliance.

C.1.7. Catchment areas and access

The territory of the Monts d'Ardèche is a preserved natural environment surrounded by economically dynamic urban centres. Above all the area represents a recreational space for nearby urban populations coming to find nature. Thus 86% of the clients are French coming from nearby territories or urban centres : Rhône-Alpes, Provence-Alpes Côte d'Azur and Ile de France.

Although the heart of the territory is not accessible by railway, this possible disadvantage may be offset by the sense of isolation the Park offers, which is increasingly sought by tourists looking for serenity and authenticity.

The location of the territory of the RNPMA, between the Chauvet Cave and the Chaîne des Puys, two natural and geological candidate sites for UNESCO world heritage status is an incontestable asset that will help to attract customers, including foreign visitors.

We believe that the recognition of the RNPMA as Geopark will also attract the new customers visiting the two exceptional sites, those visitors who are seeking a sustainable way to optimise their travel by making an overnight visit to the Monts d'Ardèche.

C.1.8. Catering and accomodation

The park has a large capacity to accommodate visitors with all types of tourist facilities : 131 campsites, 112 hotels, 1513 self-catering properties, 330 Bed and Breakfast, 74 municipally owned establishments and

18 360 second homes making a total of 128 527 beds. The different types of accommodation facilitate all types of holidays.

The RNPMA developed the label "Marque Accueil du Parc" ("Park Welcome" label) which identifies the accommodation that meet the criteria for the development of a more ethical and environmental friendly tourism. In 2013 this label was held by 82 hoteliers. 17 hoteliers are also certified by the European Charter for Sustainable Tourism.

With 346 traditional restaurants, the gastronomy is very rich. Nearly 60% of the municipalities have at least one restaurant. Most of them serve meals showcasing local products such as Fin-Gras for the "Pays des Sucs" or chestnuts (in all parts of the Park). In the Autumn during the period of the "Castagnades" (<http://www.castagnades.fr>), restaurants offer the "menu castagnades" that highlight the Ardèche chestnut. In 2013, 28 restaurants participated in this event.

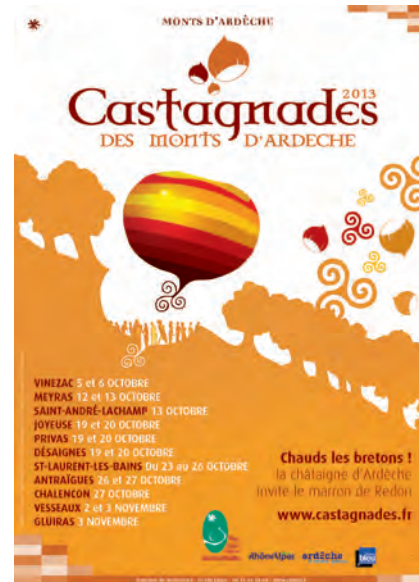


Figure 72. Poster of the 2013 Castagnades.



Figure 71. Hotelier receiving the plate of the "Park Welcome" label.

The good coverage of accommodation and gastronomy is an important asset for the development of geotourism in the Monts d'Ardèche and for the economic returns linked to being awarded Geopark status.

C.2 Overview of the geo-institution and geo-activities in the region

Many geo-institutions work within and are based in the Geopark territory and its surroundings. Most of them collaborate with the RNPMA either by participating directly in common projects or through conventions. A wide range of geo-interpretive and geotourism activities are therefore proposed: from the general “all audience” activities, to specialized activities aimed at amateur geologists, but also educative activities for pupils of all levels. This chapter gives a short overview of the representative geo-institutions and their activities.

C.2.1. Multiple actors ensure a rich offering of geo-activities

Clapas

Clapas is an association of professional geological and natural science mediators that was created in 1991. The association works on different themes such as rocks, nature and landscapes, volcanism, karst and water, natural environments, soil, landscape appreciation (including changing vegetation and human impact) and major risks (in particular flood risk using an innovative learning tool called RIVERMED).



Figure 73. Landscape reading during a “volcano class” in the Sucs area, at the foot of Gerbier de Jonc.

Drawing on these subjects Clapas gives illustrated public talks, as well as field excursions and educational events for students from primary school to university level, and also training days. More than 25 geosites in the territory of Monts d'Ardèche are used by Clapas for their educational activities.

Clapas also collaborates in the preparation of teaching documents. It has for example developed the educational leaflet “L'espace forestier pédagogique de la Gravenne de Montpezat” with the RNPMA and the ONF of Aubenas (<http://ardecol.inforoutes.fr/gravenne>).



Figure 74. Maryse Aymes and her Guide Géologique Ardèche.

Maryse Aymes president of the association is also the co-author of the geological guide to the Ardèche which offers the discovery of 10 emblematic regional geological sites.

Clapas is member of the “Education Monts d'Ardèche” network of the RNPMA, the national network GEOLE of the French Geological Society (SGF) and collaborates on publications with the Ardèche Geological Society (SGA).

Ardèche Geological Society (SGA)

The SGA is an association (in the sense of the law 1901) created in 1976 (<http://societegeolardeche.com.pagesperso-orange.fr>). It undertakes several different activities linked to geology for different audiences. The structure contributes to the discovery of Ardèche geology by its members, especially through an annual program of different field trips



Figure 75. Geological excursion of the SGA. Presentation of the rocks of Borée area from the ones used to build the church.

(see <http://societegeolardeche.com.pagesperso-orange.fr/Comptes%20rendus.htm>). The SGA also publishes an annual review and a newsletter.

The association also organizes public talks and exhibitions in order to reach a wider audience. In 2011 for example the SGA participated, with SITHERE and the mineral water producers, in the organization of the 4th Scientific Adventure Festival on the subject “Water in the Ardèche”. This free festival was open to all and included 5 talks, 3 exhibitions (in 3 different places) and 4 field excursions offering the possibility to discover the whole geological diversity of the Monts d'Ardèche.

The SGA also provides expertise by participating in excavations, research and identification of rock samples. The association also supports local authority led projects: it gives advice to projects concerning the conservation and promotion of geoheritage sites. It also provides scientific reference point and logistical support to other entities leading projects linked with geology. In this manner the SGA is actively collaborating in the development phase of the Geopark project through a convention with the RNPMA.

The SGA has led the study concerning the reference of the Berriasian stratotype in 2008. Among its most recent works, it has participated to the cre-



ation of protected areas in 2011 and 2012, and has conducted the geological sites inventory of the RNP for its application for the Geopark label in 2012-2013.

CPIE of the Velay

The “permanent initiative centre for environment” (CPIE) of Velay is a team of naturalists, teachers and project workers who are very active on the ground (<http://www.cpieduvelay.fr>). Its detailed knowledge of the territory and the issues in the Haute-Loire reinforce the activities it has been conducting for over 25 years, notably concerning biodiversity.



Figure 76. Pupils studying scoria in the framework of “Volcans en liberté” project.

Together with the Conseil Général of Haute-Loire it has initiated “Volcans en liberté” a program that promotes a network of sites used by recognized professionals for educational activities linked to volcanism, a wide range of cultural offers and multiple wilderness activities at designated “Volcans en liberté” sites.

Since 1990, the CPIE in particular guides sustainable development processes in the Mézenc massif and initiated the classification of this site. It also manages the Natura 2000 site of Les sucs de Breysse in collaboration with the ONF. The CPIE gives animations in the Natura 2000 site of Mont Mézenc and builds an ecot-

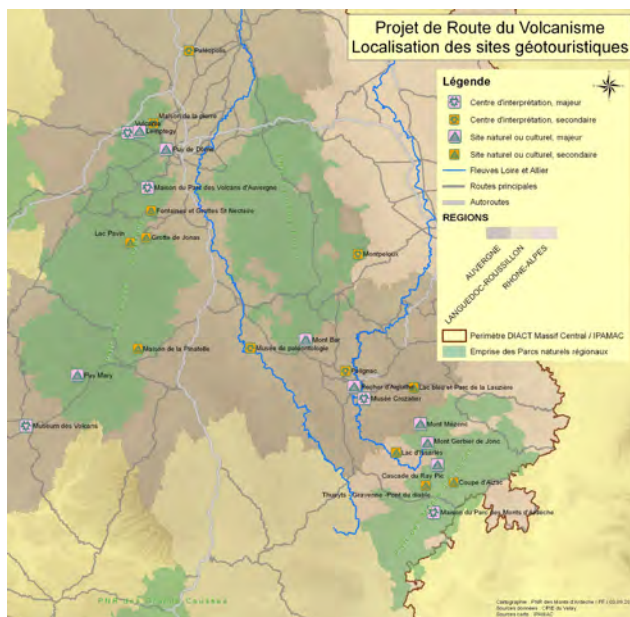


Figure 77. Map of the “Volcanism Road”.

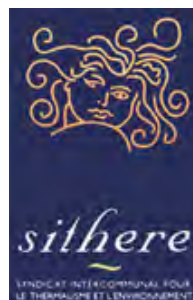
ourist project with the local tourism office on the interpreted natural sites. Between 2009 and 2012 more than 2 300 persons have been made conscious about geology and volcanism.

Since 2008, the CPIE of Velay founded a partnership which has included Vulcania (an amusement park themed on volcanism) and the Regional Natural Parks of the Volcans d'Auvergne, the Livradois Forez and the Monts d'Ardèche. This group aims to develop a geotourism project known as the “Volcanism Road” (fig. 77) at the scale of the Massif Central. The RNP-MA has signed a partnership convention with these parties.

The Geopark project led by the RNP-MA is in line with this initiative involving the surrounding territories and again proves the importance of geology in the whole region.

SITHERE

The Inter-municipal Syndicate for Thermal Spas and the Environment (SITHERE) was created in 1979. It is active in the fields of balneology, environment and the economic development and promotion of regional heritage. Working since 1996 within the framework of



the “Pôle d'Economie du Patrimoine” and through partnerships with the Ecole des Mines of Paris and the professor E.T. Berger, and today with the Blaise Pascal University of Clermont-Ferrand, the SITHERE has established educational and tourist initiatives based on geological and volcanic features of the Monts d'Ardèche territory :

- Many volcanic sites has been set up with thematic paths or information panels ;
- Training in geology and volcanism has been offered to tourism professionals in the territory ;
- A traveling exhibition with 13 panels about the young volcanoes of Ardèche has been created ;
- A SEMEAU project, inside the European LIFE program, for the modelling of bodies of groundwater and surface water, in collaboration with the ONF.

In 2013, in coordination with the RNP-MA and in support of the Geopark project, two geotourism initiatives have been implemented :

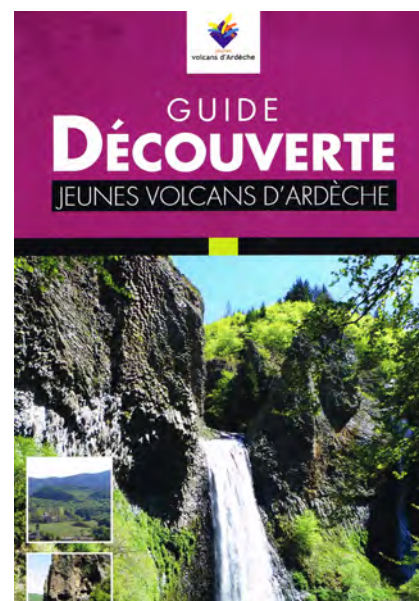


Figure 78. “Jeunes volcans d'Ardèche” guide.

- a new edition of the guide "Découverte des jeunes volcans d'Ardèche". This educative guide facilitate the discovery of 9 volcanic sites by following marked footpaths ;
- training for tourist office staff in geological heritage, in collaboration with the University of Clermont-Ferrand.

Paléodécouvertes association

The Paléodécouvertes association of the Ardèche was founded by Bernard Riou. It proposes activities throughout the territory which allow everybody to learn about geology in a playful and attractive way.

It organizes temporary exhibitions and workshops presenting geological careers to children and adults. The association works in primary and secondary school classrooms. In parallel it offers geological excursions and different events to its members throughout the year.

Among its activities Paléodécouvertes offers animations within territory, a resource centre and a virtual museum with collections and publications :

- A temporary exhibition in 2013 about the fossils of Ardèche and elsewhere ;
- Traveling activities like public talks, exhibitions, shows, workshops or geological excursions ;
- Online collections, directly available for consultation on the association website (www.paleodecouvertes.org/musee-virtuel/collections-en-ligne).



Figure 79. Flyer for the temporary exhibition about the fossils of Ardèche and elsewhere.

Haroun Tazieff Centre

The Haroun Tazieff Centre (CHT) is an association created by the friends of Haroun Tazieff and his son, Frédéric Lavanchy. It aims to study and make public the work of the famous volcanologist in all its dimensions (scientific, ethical, aesthetic, social and historic) in order to contribute to the development and promotion of the Earth Sciences. The CHT is located in Chaudeyrolles, a commune within the RNPMA since 2013, and where two geotourism paths can be found. The centre draws from the work and actions of the team members working with Haroun Tazieff, favouring educational initiatives.



In this context, the main axis for the work of CHT is notably :

- to make available the documentation gathered by the expeditions of Haroun Tazieff for the scientific and cultural interpreters, the



Figure 80. Examples of exhibition and educational animation proposed by the CHT.

teachers, the field workers and all the institutions (professional or volunteer) which are involved in general education for the preservation of natural balance.

- to propose an interpretation of the landscape as an heritage and to promote it.

This is translated in practice by exhibitions, training, events, public talks, thematic days and scientific workshops for pupils.

Other actors in the territory

The Geological group of the Haute-Loire (<http://geol-43.asso-web.com>) lead many activities both in the Haute-Loire and the Ardèche sides of the Mont Mézenc area. It often guides school classes of different levels and also offers geological field trips, talks and exhibitions.



One of the functions of the Scientific Technical and Industrial culture center (CCSTI) of Ardèche, called "l'Arche des métiers", is to spread initiatives related to scientific, technical and industrial culture and to link scientists and the general public (<http://www.arche-des-metiers.com>). Through its exhibitions, talks and the coordination of the Science Festival, the Arche des métiers is a major actor for the transmission of scientific knowledge in the territory.



Through talks and exhibitions the European Cultural Space of Monastier-sur-Gazeille (<http://espace-culturel-europeen-le-monastier.org>)



highlights the culture and wider riches of the Mézenc-Gerbier massif: an impressive monastic and cultural heritage and an unique natural diversity.

Other geo-activities are led in the territory of the RNPMA by institutions which cannot be all described here in detail, such as :

- the School of Wind (Ecole du Vent) in Saint-Clément (<http://www.ecole-du-vent.com>) ;
- the Réseau Passerelle Patrimoine (<http://passerelles-patrimoines-ardeche.com>).

C.2.2. Geo-actors network of the RNPMA

Territory education network

The geo-actors network is structured inside the RNPMA firstly around the territory education, one of the priorities of the Park's territory project. Because it doesn't want to carry itself this mission, the RNPMA has in the very beginning contacted the local educational structures, those who are specialized in the geo-activities (cf. C.2.1) but also other institutions which can propose geological interpretations. The network of the educative partners groups 15 professional, fixed (thematic pole) or travelling, structures (<http://education.parc-monts-ardeche.fr/-Les-acteurs-de-l-education-au-.htm>).

A internal specialist dedicated to education is responsible to animate this network. The RNPMA funds the pedagogical actions asked by schools, helps to the elaboration of projects and provides educative material, like pedagogical documents, multimedia tools, travelling exhibitions or games.

Outdoor discovering activities network

This network is also organized through the discovery platform of the RNPMA which promote the outdoor activities as a mean to discover the territory. The guides, educated to geology and volcanism by the Park and other geo-institutions (C.2.1), can therefore propose their own discovery programs on the natural and cultural her-

itage of the area through a dedicated website. The RNPMA manages this web platform in collaboration with 7 guides structures (<http://www.decouverte-monts-ardeche.fr>).

C.3 Policies for geoheritage conservation and promotion

The conservation of this remarkable natural heritage and the promotion of its distinctive territorial products are the objectives put in place by the RNPMA when it was created, and reaffirmed as central missions of the Park in the new charter 2013-2025. Geoheritage does not escape this engagement ; in fact the situation is quite to the contrary.

C.3.1. Multiple methods of conservation

Natura 2000 sites

The territory of the RNPMA is an active part to the Natura 2000 network. Its area includes 10 Natura 2000 sites of which 2 are entirely or partially managed by the Park. These sites contain many geosites like the boulder field of Montselgues, the sucs area or the Mont Mézenc. The Natura 2000 network aims to maintain and restore the natural habitats in order to reach a favorable conservation level ; the geoheritage is also preserved.

Biological Reserves

Biological reserves are also to be found in the area of the RNPMA :

- the Managed Biological Reserve of Mézenc ;
- the Complete National Biological Reserve of the Ardèche springs ;
- the National Biological Reserve of Grand Tanargue.

These biological reserves are created in order to improve the knowledge on natural environments by providing special study sites for scientists, as well as for educational and awareness rising for the public.

The Managed Biological Reserve aims to protect and manage the conservation of natural habitats which are particularly interesting or rare, of rare or threatened animal and plant species as well as other natural resources such as mineral deposits. The Complete National Biological Reserve allows habitats to freely develop in order to study and understand the related processes and to conserve or develop the associated biodiversity.

Sensible Natural Spaces (ENS) of the Ardèche department

Through its ENS policy the Ardèche department participates in the conservation, the knowledge of and the promotion of the geoheritage in its territory. 6 ENS sites have been identified in the Park: the Gerbier-de-Jonc and Mont Mézenc massifs with the Sucs plateau, the Serres of the Boutières and Glueyre, Orsanne, and Auzène Valleys, the Borne Gorges and the Tanargue massif, the Montselgues plateau with the Thines Valley, the Drobie and Beaume Valleys, and finally the Chasserac Gorges with the woods of Païolive and Abeau. These sites are intended to conserve and promote the local natural heritage, including geology. Each site is subject to a planning document covering several years. Awareness rising actions take place at each ENS site, in particular through public events arranged though the framework of an annual ENS call for proposals in the Ardèche.

One of the main tools of this policy is the creation of pre-emption zones. This in turn permits management of relevant land parcels thus preserving the geological and natural heritage over the very long term. For instance the Gerbier-de-Jonc is currently rented through a contract of 30 years. In order to achieve this policy, a part-time position of ENS animator has been created in the Park's administration, and is funded by the department.

Geoheritage inventory

At a national level the value of geoheritage is officially recognised in the 1995 and 2002 laws stemming from the Conférence Permanente du Patrimoine Géologique (CPPG) and the



Figure 81. The Ray-Pic waterfall, a Listed Site since 1931.

National Geoheritage Inventory started in 2007. In the Rhône-Alpes Region the National Geoheritage Inventory is lead by the Direction Régionale de l'Environnement, de l'Aménagement et du Logement (DREAL). This inventory contains 23 sites from the RNPMA territory. Once validated at national level, this inventory will be published online with public access in an "open consultation" process, such as during the development of town planning projects.

Classified and Listed Sites

The local awareness of the value of geoheritage has led the public authorities to protect many geosites and which are now presented in this Geopark application. In this way 7 geosites are classified sites, 5 of them have been since 1930 (see part C1) and 5 others are listed sites in the sense of article L. 341-1 to 22 in the Environmental Code.

This classification confirms the historical, artistic, scientific, legendary or picturesque quality of these sites. The surroundings of the sites are protected against all actions which could modify the aspect or alter the sites and are under the control of the Minister in charge of the sites, or the

Departmental Prefect. The law of the 2 May 1930 allows the conservation of the sites (maintenance and restoration, promotion) and the preservation against all serious degradation (destruction, alteration, loss of character).

Perspectives for the Improvement of the Current Protection Status.

The new charter of the RNPMA intends to reinforce the protection through law by the classification of 1200 ha as biological reserves and to develop conservation and management programs for the remarkable spaces and species of the territory.

In addition, this new charter confirms the determination to provide the territory with landscape protection tools, notably through the planning regulations (SCOT, PLU, PLUI). This planning action will be complemented by the application of inter-municipal landscape strategies, technically and financially supported by the RNPMA.



Figure 82. Logo for the RNPMA geosites.

All these natural areas (Natura 2000, ENS, National Reserves, classified sites, etc.) recognized because of their natural quality and their scientific interest, are a unique opportunity to demonstrate that the conservation of natural heritage can be compatible with economic activity, especially through the development of geotourism.

C.3.2. Existing Actions of Communication and Promotion

The new charter of the RNPMA recently approved by 145 municipalities for the 2013-2025 period, clearly highlight the will to support and

develop geotourism initiatives. This desire will be concretely realised through actions which are soon to be applied thanks to the very active local dynamic generated by the Geopark project.

Investments for Geotourism

As part of the application process for the Geopark label 77 geosites have been inventoried, of which 51 have been selected for the Geopark application (see part B3). The RNPMA along with the communes and other institutional local stakeholders is leading a development policy which aims transform these geosites in the near term, into places for the understanding of Earth history and therefore human history. The project developed by the RNPMA plans in a first phase (by 2015) to install interpretive panels at 51 geosites as well as "geo-totems" using a uniform graphic identity. The second phase (2014-2015), building on the foundations in place will implement a geotourism discovery throughout the Monts d'Ardèche territory. This will provide an annual geosites animation program, the development of innovative tourism, and educational products in order to promote the geoheritage of the Ardèche.

In parallel the RNPMA wishes to trigger a dynamic with the local stakeholders so that all the 77 geosites are promoted. The RNPMA will fund the entire cost of the information content, and half the cost of physical supports, through an public tender in the 2014-2015 period. It has to be noted that the first projects have already started, in particular by Les Vans municipality, responsible of Les Vans museum. It wishes to renew its museography to take into account the Geopark initiative and integrate a central theme of the links between Man and Earth.



A Label for the Local Geotourism Actors

The RNPMA intends to set up a label recognizing the actors of the territory which have developed a specific geotourism products as "geo-partner". For example, a restaurant owner proposing a geo-menu, an artist whose creations are inspired by local geo-heritage, specialist mediators, etc. The Park's administration is currently thinking about the criteria needed for such a label. New actions are planned for 2014 such as (see also part D5) :

- events : a program of talks and excursions for all audiences, in collaboration with territory's stakeholders ;
- tourism products : development of new tourist products such as a Geopark and geosite map, posters, a dedicated website (www.geopark-monts-ardeche.fr) ;
- training : for the tourist offices, hoteliers, guides, tourist sites, etc. ;
- cooperation : international partnership and transnational actions (currently under discussion with Italy) ;
- editing : partnership for the new edition of the geological guide to the "Ardèche" ;
- education : creation of two projects to go to tender, targeted at a school audience.

C.4 The Territory's Interest in Joining the European Geopark Network

Over and above the prestige that the Geopark label would bring to its reputation, or the geotourism development potential, the territory of Monts d'Ardèche wishes to implement a global strategy drawing on varied and active partnerships, to sustainably reinforce its tourist appeal.

C.4.1. A Global Strategy Beyond Geological Themes

The geotourism development strategy of the RNPMA is incorporated in a

wider policy for the promotion of its territory, and particularly of its landscapes, through international recognition. Concurrently to geotourism development, the RNPMA is leading a project called "Parcours Artistique" which invites internationally known artists to create in-situ contemporary, monumental and perennial works within the landscapes of the area. These works will trace a discovery path for all audiences, art lovers, hikers and inhabitants.



Figure 83. Chasing lions in the Chauvet cave.

The territory of Ardèche is a territory of creation, as shown by the artists who have painted the walls of the Chauvet cave. Since its foundation in 2001 the RNPMA has supported and encouraged artistic works which draw from the geoheritage (footpath of the Lauzes, paths of creation, and industrial landscapes). All these elements are part of the today's diversity of the offering in the area. In a similar way, the promotion of the geosites allows links between granitic heritage of the aspiring Geopark with the limestone heritage of the Chauvet Cave, and the Parcours Artistique will link prehistoric and contemporary artistic creation. Because modern artists choose materials for their works by favoring the local geological resources, like the Chauvet cave artists have already done by choosing ochres they found on site, but also through the choice of subjects, the Parcours Artistique and the Geopark both highlight the link between Man and Earth and contribute to a new impetus for the geotourism in the territory.

C.4.2. A Project Inscribed in a Network

The projects of "Parcours Artistique" and for the Geopark label are in synergy with the complete replica cave of the Chauvet Cave, candidate as a UNESCO World Heritage site (<http://www.lagrottechauvetpontdarc.org>).

The RNP of Monts d'Ardèche is indeed developing a perfectly complementary offering from both a geological and an artistic point of view. The Chauvet Cave is a recent site in the context of to the geological time scale and it will complete the discovery of the older geosites of the Park's territory. In parallel, the modern artistic creations that will be shown in the RNPMA will echo back to the prehistoric works visible in the Chauvet Cave.

Therefore the visitors of one of these two geotourist and cultural sites will naturally be able to add to their discovering by visiting the neighbouring site. They could even continue their visit by discovering nearby the Puy massif and the Limagne fault area, which follow the same process of international geoheritage recognition through its candidature as a UNESCO World Heritage site (www.chained-espuys-failledelimagne.com). The process of obtaining the Geopark label is therefore not a discrete project for the RNPMA, but a true collaborative process aiming to create and integrate a network of geotourism oriented territories. This network extends beyond the neighbouring territories of Monts d'Ardèche. The Bauges massif RNP is also a Geopark and an active partner of the RNPMA. It has been able to confirm its involvement in geotourism to the local stakeholders of Monts d'Ardèche territory and therefore helped to ensure a better support for the project.

In conclusion the major assets of the RNPMA are the strong potential for geotourism development, the numerous geotourism stakeholders with whom it is collaborating, in and outside of its boundaries, and the many actions it is leading in order to develop a sustainable tourism based on its regional geoheritage.

Thanks to all these assets, the RNPMA can benefit from the economic activity created by the Geopark label and become an key contributor in the Geoparks network which will undoubtedly contribute to the growing reputation of the network in the next few years.

D. General information on the territory

D.1 Economic activities

D.1.1. The general context of the branches of industry

The regional economy was traditionally based on agriculture, manufacturing industries and since the 20th century, tourism.

Nowadays, the territory's economy is evolving, and changing: traditional and niche production is affected by globalization and the economic crisis in the same way as other territories. However trading activities, aimed to sell and not only to produce, tend to fare well: those are local activities which serve the local population. Moreover emerging sectors, with potential for the future and based on local resources and environmental quality, are adding to the traditional activities that have been established for decades: eco-construction and eco-rehabilitation, arts, agriculture, timber industry, food-processing industry, nature-based tourism and ecotourism...

D.1.2. Agriculture

The RNPMA territory is above all an agricultural territory, with a third of its companies belonging to this sector.

The strength of RNPMA lies in particular produce that takes advantage of their links with the territory: traditional varieties of chestnuts and associated goods produced under the "AOC" label (Designated Controlled Origin) Châtaigne d'Ardèche, wild blueberries, a large variety of fruits and vegetables, the meat industry (for example the AOC Picodon and AOC Fin Gras du Mézenc), delicatessens, beekeeping, olive growing in

the Piémont Cévenol, Chatus and other labelled "IGP" (Geographical Indication of Origin) wines from Ardèche...

The various industries try to best develop their respective AOC and "AOP" (Designated Protected Origin) production. Since 2005, the brand "Produit du Parc" has also been granted to honey producers, chestnut-based products, Chatus and wild blueberries.



Figure 84. Pasture under the chestnut trees.

A priority of the RNPMA is to promote quality agriculture with multiple functions that is productive and respectful of the resources. It aims to do this by structuring the industries and promoting specific agricultural produce. Among the main goals of the RNPMA, there is an important and ambitious program of developing chestnut groves.

Growing 5 000 tons of chestnuts, the Ardèche is the principal department in France by production. However chestnut production (AOC and/or biological agriculture) is not sufficient for the increasing demand of consumers and processors. Thus it is necessary to produce more chestnuts outside of the traditional varieties. The development program aims to fill the production deficit that amounts to an estimated 2 000 tons in the Ardèche, according to the sector's manufacturers.

The economic potential of the nut is interesting, but the timber industry must not to be neglected. The chest-

nut tree, traditionally used in the territory gives a high-quality timber for cabinetmaking and joinery. It can also be used as fire wood or for making fenceposts. Naturally self-seeding and fast-growing, the chestnut tree produces fine timber.

At the agricultural level, two main financial tools are in progress, a "PSADER" (Strategic Program for Agriculture and Rural Development) with a budget of 558 306€ for 2012/2013 and a PPT (Territorial Pastoral Plan) with a budget of 1 040 272€ for 2011/2016.

D.1.3. Tourism

Given the diversity of the landscapes and the exceptional characteristics of the natural and cultural heritage, activities directly or indirectly linked with tourism and leisure are major economic levers for the RNPMA territory. It benefits from a very strong image of the Ardèche as tourist destination and the impact of the name "regional natural park".

In 2007, the number of nights was estimated between 7,5 and 8 million, corresponding to an average of 1 million stays. These numbers confirm that the RNPMA is a popular tourist destination. However the tourist frequentation is very concentrated in July and August, despite the tourist season running from Easter to early November. French visitors represent 85% of tourists in the RNPMA. The remaining 15% are represented by foreign visitors and consist mainly of Belgians (54% of the foreign tourists), Dutch (11%), Germans (10%), Swiss (7%), Italians (4%) and British (3%).

Tourism consumption, though hard to estimate, is about 175 million euros for the RNPMA territory (408 million for the Ardèche department). Tourism is an essential line of development for local economy and plays a large part in the development of commercial activities on the territory. The tourists' high demand for services and facilities plays a part in improving the quality of life of the residents, who would not benefit from the present facilities because of their low population. In the Ardèche, the average budget for the stay of 3 to 4 people is 580 euros.

Activities and housing are substantial. The RNPMA territory is made for hiking and outdoor sports and benefits from very varied landscapes and natural sites, thus allowing several outdoor activities (paragliding, canyoning, climbing, kayak, snow sports, walking, fishing, and so on). 4000 km of marked hiking trails cover the territory.

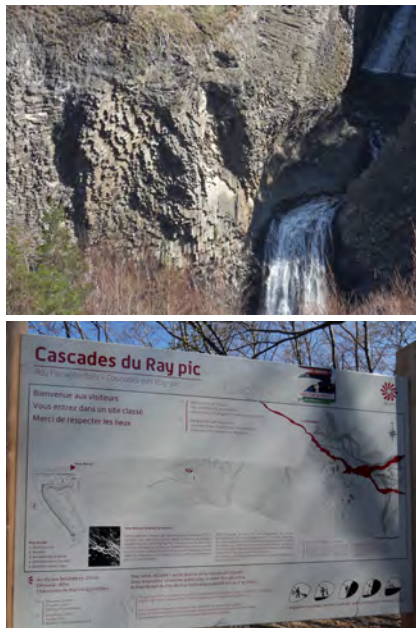


Figure 85. The Ray-Pic waterfall, early geotourism.

A cultured as well as natural territory, the RNPMA hosts 19 tourist sites which are grouped in a network of Museums and Centres. They welcome on average between 85 000 and 100 000 visitors a year. The RNPMA territory hosts all types of events : sporting, cultural, traditional, popular or specialised, which constitute more and more to strong and attractive

highlights for the RNPMA territory (ex : the blueberry market in Summer, the Castagnades in Fall). Events such as the "Chemins de la creation" or the "Haltes de Bourlatier" play a part in constituting an offer of pre-season cultural entertainments for tourists and local residents. The Castagnades (22 000 visitors a year), the Ardéchoise (15 000 visitors), and the "rencontre des cinémas d'Europe" (14 500 visitors) show the diversity of the events.

The three spas (Neyrac-les-Bains, Saint-Laurent-les-Bains and Vals-les-Bains) which record a total of more than 160 000 days of Spa cures, close to 9 000 Spa residents and 50 000 wellness packages, enrich the territory's tourist offer. With 20 520 lodgings and 128 527 beds, the Park is well able to meet the demand for tourist accommodation.

In order to raise the quality of the tourist professionals, the park has created the brand "Accueil du Parc" ("Park Welcome" label). In order to obtain it this label it is necessary to meet criteria demonstrating high quality. The three key values "scored" by the RNPMA are :

- the link with the territory ;
- the promotion of local products ;
- the preservation of the environment and the integration into the landscape.

More than 100 professionals (individuals or companies) have been granted the Park's label in 2013 for offers ranging from farm visits to accommodation, as well as nature activities.

In 2011 the RNPMA was granted the label "Charte Européenne du Tourisme Durable" (CETD : European Charter for Sustainable Tourism) for a 5 year period. It collaborates with 18 service providers, in line with part 2 of the CETD, supporting tourist industries. It aims to achieve part 3 of the charter (partnership with tour operators) in the Parks of the Massif Central for the first time in Europe.

The development of the tourist offer also implicates the development of

itineraries through the territory. Several touring itineraries are proposed in guidebooks and in the marked in the countryside, whether general or specific themes.

In the Mézenc-Gerbier area, the eponymous association supported by the RNPMA was awarded the national label "Grande Randonnée de Pays" (Great Walks of the Country) with the local Hiking Federation. The opening, maintenance, sign posting dense network of paths through this area, allows free walking or guided hikes. A similar project took place in the Antraigues district, similarly labelled "Grande Randonnée de Pays". These initiatives are added to the existing network.

More specifically is this geological guidebook by Maryse Aymes and Jean-Pierre Esteban, published in 2012, and due be re-published in 2014 in partnership with the Park.

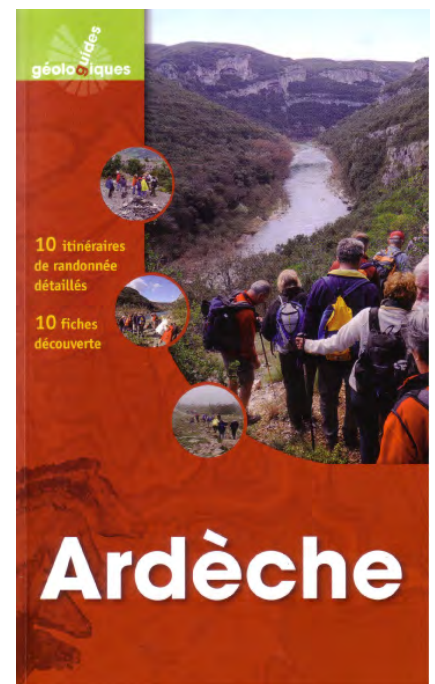


Figure 86. The geological guidebook of Ardèche by Omnisciences collection and BRGM.

The authors present a geological discovery of Ardèche through 10 carefully described and commented itineraries as well as 10 double-pages spreads "geology and the heritage". This offer is based on geotourism and this guidebook specifically addresses the main theme of a geopark.

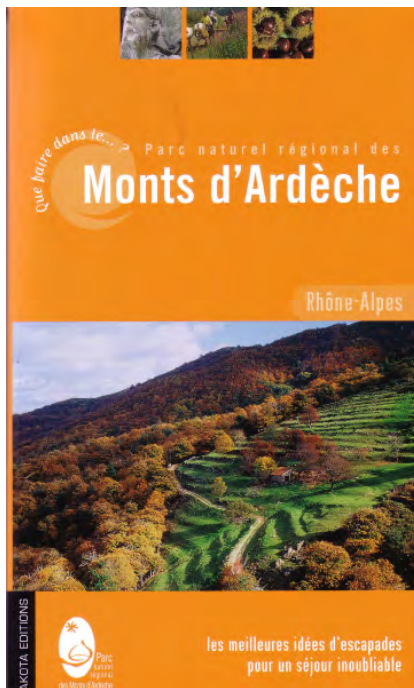


Figure 87. The DAKOTA guidebook about the RNPMA, for all readers.

Finally, more general but corresponding to the RNPMA territory, a guidebook covering all tourist activities titled “Que faire dans le... ? Parc naturel régional des Monts d'Ardèche” was published in 2006. It provides wide choices and helps organise the tourist offers for all types of holiday.

These tourist products are in addition to those which are already proposed by the various Tourist Offices or the individual providers.

D.1.4. Crafts, trade and industry

Arts and crafts are an integral part of a territory's tourist structure. In order to support and promote these many skills, the RNPMA decided to create a network of these often disparate and fragile trades. Once it was in place and having been connected with the district authorities, the partnership united the craftsmen and artists so they may more easily attract audiences, present their workshops and techniques (open days). This programme was set up in 2003 and is called “les Chemins de la création” (the Paths of Creation). 142 artists and craftsmen and 40 different trades benefit from and through connections with 14 district authorities.

In addition, the building sector, the territory's second job supplier, makes good use of the local mineral resources. Granite, basalt, phonolite, sandstone, limestone, schist... all are used in construction and represent real territorial markers and testimony of the mineral diversity.

The dry stone wall terraces and the “lauze” stone roofs, often described as architectural and cultural heritage of the RNPMA area, also support the economy, especially in a territory where the residential economy represents between 40 to 45 % of the territory's income.

To build in dry stones or to create lauze roofs is part of specific professional trades connected with local stones. The Co-operative Actions Pierre Sèche (CAPS) has been created to act in favour of the promotion and the professional development of the dry stone industry. For example the guidebook “Construire des terrasses en pierre sèche” (“Building dry stone terraces”) and the call for projects « Rénovez vos terrasses en pierre sèche » (“Renovate your dry stone terraces”) shows that the RNPMA acts in order to boost the dry stone industry.

The dry stone terraces are also ideal for quality agricultural goods such as the Eyrieux field potatoes, or the Chatus, one of the oldest grapes in France. The RNPMA contributed to the promotion of these products by highlighting that not only their quality, but also the unique terraces on which they are cultivated.

D.2 The perspectives for the protection of the territory

The new charter of the RNPMA defines three goals for the management of its territory for the next twelve years. First of all, the conservation of this rich territory and its natural, cultural and landscape heritage. The RNPMA is marked out in particular by its

protected or inventoried spaces that represent more than 50% of its surface (fig. 88), its unique and remarkable terrace landscapes, its exceptional geological sites and its built heritage.

In order to maintain this remarkable state of conservation, the RNPMA, with the help of the districts, the Rhône Alpes region and the State, and through its development services (in particular the Direction Régionale de l'Environnement, de l'Aménagement et du Logement, DREAL : the Regional Directorate for Environment, Development and Housing), makes sure that the preservation of the heritage is systematically part of the policies and the development plans. This rule applies to the “exceptional” sites as much as to the “ordinary” spaces, in order to ensure a good functioning of ecosystems. The park's motto in this regard would be “developing while protecting the territory”. In the context of sustainable development, protecting it does not mean preserving it in a shrine, but developing it in a conscious, thoughtful and environmentally friendly way.

Several projects of site management are under discussion in the RNPMA, in order to ensure a more strict protection of some areas whose natural (flora, fauna and geology) and cultural heritage is particularly valuable. A lot of tourists visit those sites in Summer, which threatens their integrity. That is why the Regional Council of Ardèche is establishing Sensitive Natural Spaces (ENS), especially in the region of Mont Mézenc – Gerbier de Jonc. This particular status allows visitors to come to the sites while preserving their natural characteristics. In total, 9 ENS zones have been selected for the Ardèche department, 5 of them being on the RNPMA territory.



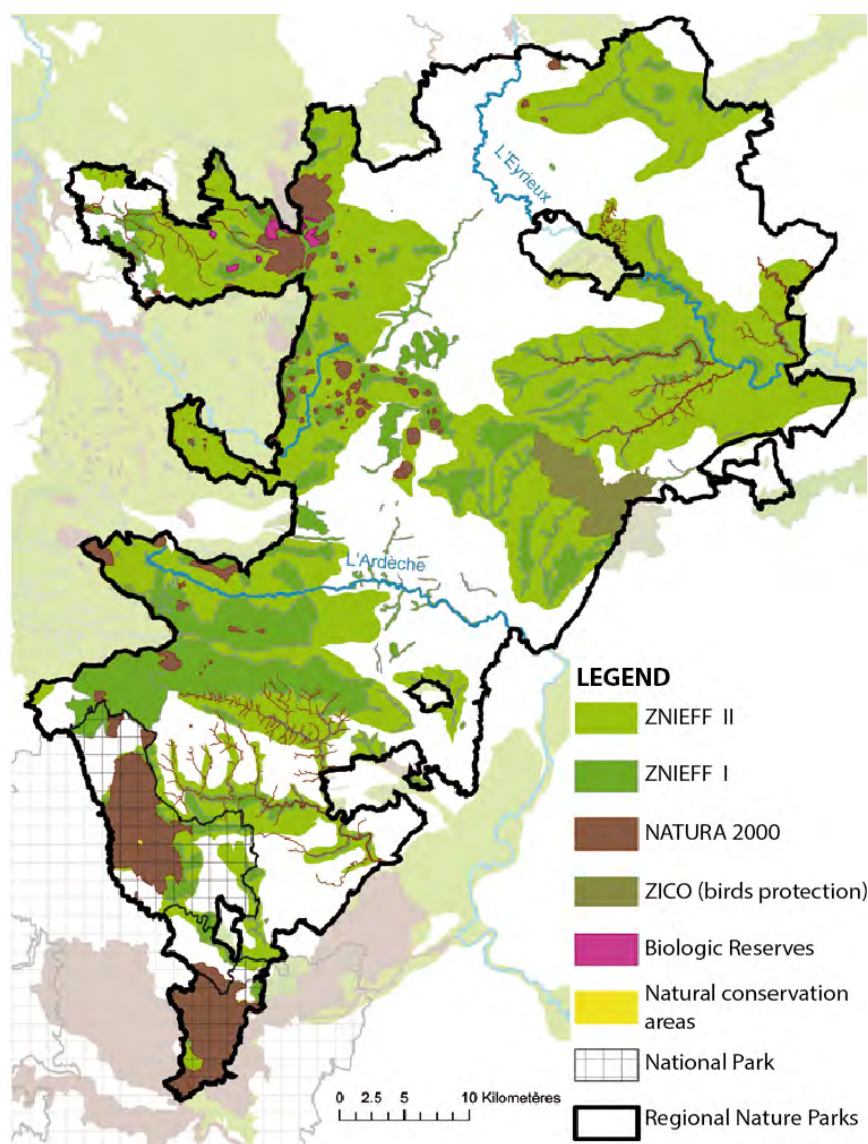


Figure 88. Map of the protected and inventoried natural spaces of the RNPMA.

D.3 A Brief Analysis of the Current Status of the Protection of the Territory

The perimeter of the aspiring Geopark of Monts d'Ardèche, candidate to EGN, is the same as the perimeter of the RNPMA. This national recognition as a Regional Natural Park is meant for to conserve and communicate inhabited rural spaces but does not imply a strict protection, as in the case of the National Parks. However, a regional natural park is organized around a project of sustainable development that encompasses objectives of environmental conservation

(cf. D.2), like in the RNPMA that just renewed its charter, valid for the next twelve years.

The totality of the aspiring Geopark of Monts d'Ardèche does not benefit from specific protective measures. However, more than 50% of its territory is covered by :

1. a category of protected space ;
2. a feature worth of inventory as natural heritage.

Moreover, the territory has several sites and features registered and listed at national level. At the present time the on-going inventory of the national geological heritage lists 15 sites of geological interest in the RNPMA, whose options for legal protection are yet to be defined.

D.3.1. Legal Protection

Biological Reserves – Le Mézenc, the springs of the River Ardèche and the Grand Tanargue

A biological reserve is a protected space in forest or forest-associated areas (moors, ponds, peat bogs, dunes). This status applies to forests managed by the National Forestry Office (Office National des Forêts, ONF) and aims to protect remarkable or representative habitats. Depending on the habitats or the management style, two types of biological reserves can be distinguished : Managed Biological Reserves where precautionary management is set up, and Complete National Biological Reserves, where the forest's evolution is left to freely develop. The Biological Reserve "Le Mézenc" (FR2300167) is a Managed Reserve that was created in 1999 and covers 410 ha. It is spread over 6 municipalities (Borée, Rochette, Chaudeyrolles, Estables, Freycenet-la-Cuche, Saint-Front) and is divided into 7 zones (source : INPN). Two more reserves have been created in 2012 : the Complete National Biological Reserve of the River Ardèche springs (442 ha.) and the National Biological Reserve of Grand Tanargue.

D.3.2. Contractual Protection

The Natura 2000 Sites

From the Eyrieux Valley in the north to the Bois de Bartres area in the south, the territory of the RNPMA contains 8 Natura 2000 sites, whose natural heritage represents the territory's geological and climatic diversity. In order to ensure the conservation of these sites, the Syndicat mixte (joint association) of the RNPMA was designated as the coordinating structure for the Natura 2000 sites of Tanargue (B26) and Plateau de Montselgues (B8). These sites are important reservoirs of biodiversity and are under scrutiny by the sensitive area policy (Espaces Naturels Sensibles, ENS) of the Ardèche department. Some contractual environmental policies (MAEt or Natura 2000 forest contracts) have been managed in past years and others

still persist ; they have contributed to the preservation of agricultural and pastoral environments or ancient afforestations.

The other Natura 2000 sites :

- Le Mézenc (FR8301076) is a 2742 ha. site entirely situated in the Haute-Loire department. It is totally within the perimeter of the RNPMA and is managed by the Pays de Mézenc district council ;
- the Sucs area (B18, FR8201664) is a very fragmented site almost entirely situated in the park's territory. As the coordinating body, the RNPMA is the contact for this site, which is an important element for the aspiring Geopark of Monts d'Ardèche, situated in the middle of the Sucs area ;
- the Eyrieux Valley and its tributaries (B6, FR8201658), whose activities are managed by the river association "Eyrieux clair" ;
- the Loire River and its tributaries are only partly situated in the park's territory. Their surface area is 1 315 ha. and runs through 15 municipalities of the Ardèche ;
- the moors and forests of the Bois des Bartres (B9, FR8201661) are only partly situated on the park's territory ;
- the Cévennes National Park and its biosphere reserve.

The south west limit of the RNPMA is touched by the Cévennes National Park's and the Cévennes biosphere reserve's transition area.

D.3.3. The Inventory Areas of the Natural Heritage (ZNIEFF)

Almost half of the RNPMA is covered by a Natural Zone of Faunistic, Floristic and Ecological Interest (Zone Naturelle d'Intérêt Ecologique, Faunistique et Floristique, ZNIEFF, fig. 88). These categories are selected as part as a national inventory whose goal is to identify and describe areas with important biological potential and that are in a good state of conservation. Type 2 ZNIEFF zones are large natural areas, rich and almost intact,

offering important biological potential. 13 of these zones are located within the perimeter of the RNPMA. Type 1 ZNIEFF are areas of important biological or ecological interest. 54 of them are located within the perimeter of the RNPMA. This inventory must be taken into account in the use of the territory, or in development programmes.

D.3.4. Natural Sites Listed as Remarkable

In France, a number of natural and cultural sites are either listed or classified according to criteria stated by the law (laws of 21 April 1906 and 2 May 1930). The classification offers a reinforced protection compared to listing, because it forbids any works likely to modify the appearance of the site (except in cases of special authorisation). This protection tool concerns 10 sites of the RNPMA with strong geological components (cf. B.6). The Ardèche department has about 30 sites in the two categories.

D.4 Existing Facilities

A number of sites with facilities (museums, sites open to the public, marked trails, etc.), brochures and maps are available for visitors interested in any kind of heritage during their visits in the RNPMA. Below are some examples of these offers.

D.4.1. The "Maison du Parc", a Showcase for the Territory

The "Maison du Parc" (Park Center) is located in the Rochemure castle in the Jaujac district, in the middle of the park. It is an old 18th century farm renovated in the 19th century. It is the headquarters of the RNPMA and the workplace of the technical team.

Free access is granted to the outer estate in all seasons, for a stroll or a hike along the interpretive trail "La coulée vive" (the Living Flow) inviting the visitor to meander up to the Jaujac

crater (fig. 89). In summer, the Park Centre is open to visitors in the week and at weekends. It hosts exhibitions, a tourist information space and a bookstore. Guided hikes are also organized from Rochemure.



Figure 89. Brochure presenting the Park Center and map of the "Coulée vive" trail.

D.4.2. Interpretive Trails

Many trails introduce the public to regional geology, in particular the young volcanoes of Ardèche and the "sucs" (emblematic geological formations) :

- the travel guide "Volcans des deux mondes" (Volcanoes of Both Worlds) offers 10 richly illustrated walks, to help the visitor discover the many volcanic riches of the Sucs area (edited by the RNPMA). Some of the described sites are equipped with interpretive panels ;
- the guidebook "Autour du volcan", cheminement de l'eau du carbone et des laves de la coupe d'Aizac (All About the Volcano). A trail equipped with signs and with an accompanying brochure offers a short accessible stroll (edited by the RNPMA) ;
- the travel guide "Aux sources du



Figure 90. Mont Mézenc interpretation table.

- chaos”, promenade géologique et conversation autour de Montselgues (Back to the Origin of Chaos), is a geological walk providing the discovery of Montselgues, (edited by the RNPMA), encourages the visitor to explore the jumbled Montselgues granite ;
- the “Guide découverte des jeunes volcans d’Ardèche” (Discovery Guide to the young volcanoes of the Ardèche) proposes 9 enhanced sites : among those, most notably, the Ray Pic waterfalls, the overlapping flows in Pont-de-Labeaume or the “Giant’s Path” in Thueyts (edited by Sithere) ;
 - the “sentier du Rocher de Brion” (Brion Rock Trail) allows you to discover this geological and archaeological site emblematic of Ardèche volcanism. The Brion site has information to help you discover flora, history and built heritage. For more information, the visitor can read the book “Le Rocher de Brion”(edited by RNPMA).

It goes without saying that other themes are addressed by the interpretive trails, such as locally-grown products, history, fauna and flora. For example :

- “Ages et usages de la châtaigne” (The chestnut’s ages and usages, Lamastre area) : Discover the secrets of the chestnut (a nut emblematic of the RNPMA area)

with a life size game, at a chestnut producer in the Doux Valley ;

- the “sentier des Lauzes” (Lauzes trail, in the Drobie Valley) is an original cultural trail punctuated by art works offering a reflection on the landscapes.

In parallel with the interpretive trails, there is a selection of 40 emblematic trails, available on the park’s website : Tétines trail, Druids trail, the Sources of the Loire River trail, Five Senses trail, etc.

D.4.3. Geotourism Tours

Two major hiking tours allows you to discover and understand Ardèche volcanism by following GRP trails (“Grande Randonnée de Pays”, Great Walks of the Country).

The GRP “Tour du Massif Mézenc Gerbier-de-Jonc, où le fleuve naît du volcan”

The Tour of the Mézenc Gerbier-de-Jonc Massif, where the river emerges from the volcano, republished in 2013, leads the hiker to discover the Sucs area (edited by the French Hiking Federation in partnership with RNPMA and the Mézenc municipality) ;

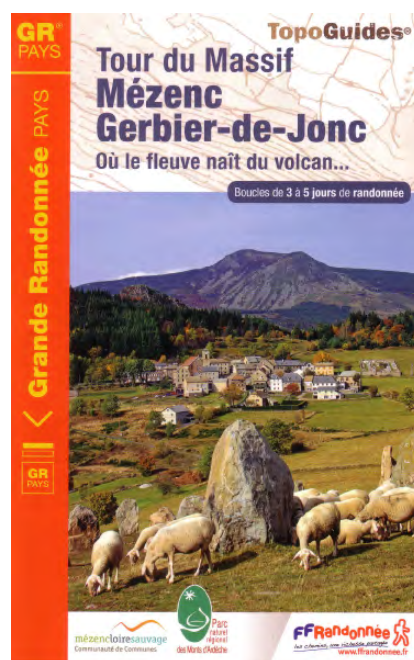


Figure 91. The French Hiking Federation guidebook of the GRP Mézenc-Gerbier de Jonc trail.

The GRP “Au cœur des Monts d’Ardèche”

The GRP At the heart of Monts d’Ardèche offers 5 circuits around the young volcanoes of Ardèche and in particular the Vestide du Pal circuit, the Eaux-Vives circuit and the circuit of the columnar basalt.

D.4.4. Belvederes and Viewpoints

Between isolated promontories and deep gorges, viewpoints and belvederes with interpretative facilities teach visitors about the landscape and nearby summits. They offer multiple vantage points over the territory and breath-taking views. Among the sites prepared by the park and its partners are : the Belvédère de l’Eyrieux, the Rocher de Brion, the Champ de mars, etc. The two most important volcanic sites of the young volcanoes of Ardèche have had belvederes improved and equipped allowing a better understanding of the whole sites.



Figure 92. View from the St-Michel belvedere.



Figure 93. View from the St-Clément belvedere.

In order to best understand the landscapes of Monts d’Ardèche area, the Park set up a “Route des Paysages” (Road of Landscapes) that links the Roche de Gourbon to the Gerbier de Jonc and now consists of 3 belvederes encouraging the interpretation of the landscapes.

D.4.5. Museums and Centres

Museums and Centres offer discovery spaces about different themes such as mills, milling industry, local gastronomy (wine, meat, chestnut, blueberry, honey), history... United by the Park's theme the network of centres and museums offer new discoveries for whoever wishes to increase their knowledge of the territory. Furthermore, the Pass'Parc provides discounts from one site to the another.

Among the Centres and Museums, some in particular communicate and promote the territory's geological heritage :

- the "Ecole du Vent" (School of the Wind) in Saint-Clément presents, among others, the formation of the Mézenc massif through entertaining equipment (fig. 66) ;
- the Musée des Vans has a substantial section about geology aimed at the well-informed or amateur geologists (fig. 65) ;
- the Odyssée des Eaux ("Odyssey of the Waters") at the Tower of Saint-Laurent-les-Bains explores the links between water and land through an original and poetic displays : it offers a multidisciplinary exploration conceived as an ascent through geological strata.

D.4.6. Spas

Three spas offer thermal activities and cures : Vals-les-Bains, Neyrac-les-Bains and Saint-Laurent-les-Bains. They are areas of relaxation and conviviality. Tourist destinations par excellence, the spas offer a wide range of sporting and cultural activities in their area.



Figure 94. An impression of the planned facilities for the Maison de site du Gerbier de Jonc.

D.5 Planned facilities

D.5.1. "Maison de site du Gerbier de Jonc"

The General Council of Ardèche has for many years undertaken measures aiming to protect the Gerbier de Jonc site (Geosite A2), which is listed as exceptional. In this context, an ambitious project will be carried out in 2014 with the creation of a "Maison de site" whose goals will be :

- to preserve and promote the richness of the nature, landscapes, history and identity of the area ;
- to offer to visitors a developed and diversified discovery of the landscape, through an adapted presentation ;
- to improve the welcome and information provision in order to raise the visitor's awareness of the area and encourage him or her to discover the territory.

The project objective is to avoid creating new buildings and to refurbish the departmental road, and restructure its surroundings in order to improve visitor reception.

Two specific spaces in the Maison de site will be dedicated to the exhibition and presentation of the Mont Gerbier de Jonc site. The museology itself is incorporated into the architecture of the project through the creation of a covered courtyard whose back wall will incline with the slopes of the Mont Gerbier de Jonc, drawing the gaze towards the summit and showing the hikers climbing Mont Gerbier. Rocks will penetrate right into the courtyard, introducing nature into the building through this characteristic element of the site.

The building of the Maison de site du Gerbier de Jonc and its surroundings, whose opening is planned for the end of 2014, will require an investment of 4 millions of euros.

D.5.2. Musée des Vans (Museum of Les Vans)

In the context of the project of the Geopark of Monts d'Ardèche, the Musée des Vans (geocultural site SNG25) will soon refurbish its room dedicated to geology. As manager of the site, the town council of Les Vans intends to completely transform its museum space dedicated to geology in direct connection with the Geopark project. As main thread of its new displays it will explore the link between Man and Earth.

D.5.3. Artistic Path

In the context of the Geopark project, the RNPMA formed a partnership with art professionals in order to create a particularly original artistic path, in linked with contemporary creation.

When considered in relation to a site, a work of art possesses an extraordinary power of revelation. This artistic path is under development with the intention to invite world-renowned artists to create works in situ all across the Park's territory. As a whole, they would form an open-air permanent collection.

The diversity of the landscape of the Monts d'Ardèche territory requires a particularly powerful general artistic concept.

A historic stopping-off place between the Massif Central and the Mediterranean Sea, the watershed is one possible theme for this artistic path. Located on the crests at the west borders of the Park, the path will run from north to south. Its geographical characteristics endow the park with a powerful symbolic and poetic dimension, an inspiration to the invited artists : it is the watershed that narrates the direction of flow, on the one hand



moving towards the Atlantic Ocean and on the other hand towards the Mediterranean Sea. It is both a testimony and a guide to the territory's geological history. Thus, it is by linking themselves to the watershed that the works of art will, like water, irrigate the territory in order to show its riches.

Drawing from a choice of great artists who use a wide range of different and impacting methods, the works will be capable of moving both an enlightened public as well a local population less familiar with artistic events of this type.

It is the park's ambition to organize a popular attraction capable of making its mark on the international artistic stage using strong programming.

This is an artistic project with a strong territorial dimension; besides providing answers in terms of the ownership of a territory by its inhabitants, its main objective is to reveal these

sites and a to make a natural, human, economic and historical environment known to the public, building on the local economic fabric.

Thus it is closely tied to the application of the RNPMA for the Geopark label, promoting the territory's geological richness, raising public awareness of landscape and environment, and developing an international strategy in order to generate tourism and economic returns.

D.5.4. Geototems

All of the 51 Geosites identified as being of primary importance in the Monts d'Ardèche territory will be equipped with totems in 2014. These totems will present the Geopark along with a map of the geosites, thus allowing a networking of sites and aiding in their identification as geotourism points of interest.

These totems will be financed by the RNPMA and installed by the municipalities.

D.5.5. Call tenders for the project Promote a geosite

In order to provide a strong boost to the development of geotourism on its territory, the RNPMA wished to set up a funding programme so that the stakeholders on its territory may set up interpretation tools: thematic trails, booklets, new technology interpretation...

Any project sponsors who reply to this call for tenders which will take place in 2014-2015 will benefit from significant financial support from the RNPMA, in order to develop contents and interpretive tools.

This call for tenders apply to the whole of the Geopark to ensure territorial consistency of the facilities, in particular through the use of a common graphic charter.



Figure 95. Geototem.

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F. Credits for the Figures

Part A

- Figure 1. RNPMA
- Figure 2. Fench RNP Federation
- Figure 3. RNPMA
- Figure 4. RNPMA
- Figure 5. RNPMA
- Figure 6. RNPMA
- Figure 7. RNPMA
- Figure 8. www.meteo-mc.fr
- Figure 9. www.meteo-mc.fr
- Figure 10. www.meteo-mc.fr
- Figure 11. www.meteo-mc.fr
- Figure 12. RNPMA
- Figure 13. www.pluiesextremes.meteo.fr
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- Figure 15. RNPMA
- Figure 16. RNPMA
- Figure 17. RNPMA
- Figure 18. RNPMA
- Figure 19. INSEE
- Figure 20. RNPMA
- Figure 21. RNPMA
- Figure 22. RNPMA
- Figure 23. RNPMA
- Figure 24. RNPMA
- Figure 25. RNPMA
- Figure 26. RNPMA
- Figure 27. RNPMA

Part B

- Figure 28. RNPMA
- Figure 29. RNPMA
- Figure 30. Préfecture de l'Ardèche, prévention des risques
- Figure 31. L. Stieljes
- Figure 32. L. Stieljes
- Figure 33. E. T. Berger
- Figure 34. A. Ramet, N. Teil | RNPMA
- Figure 35. A. Perret | Relief
- Figure 36. A. Ramet, N. Teil | RNPMA
- Figure 37. S. Martin | Relief
- Figure 38. RNPMA
- Figure 39. A. Perret | Relief
- Figure 40. A. Perret | Relief
- Figure 41. S. Martin | Relief
- Figure 42. A. Perret | Relief
- Figure 43. A. Ramet, N. Teil | RNPMA
- Figure 44. A. Perret | Relief
- Figure 45. A. Ramet, N. Teil | RNPMA
- Figure 46. RNPMA
- Figure 47. S. Martin | Relief
- Figure 48. S. Martin | Relief
- Figure 49. RNPMA
- Figure 50. S. Martin | Relief

Figure 51. from Charles Lyell, Principles of Geology (second American edition, 1857)

Figure 52. from Poulett Scrope, Memoir on the Geology of Central France (first edition, 1827)

Figure 53. S. Martin | Relief

Figure 54. A. Perret | Relief

Figure 55. A. Perret | Relief

Figure 56. A. Perret | Relief

Figure 57. RNPMA

Figure 58. A. Perret | Relief

Figure 59. A. Perret | Relief

Figure 60. S. Martin | Relief

Figure 61. RNPMA

Figure 62. RNPMA

Part C

Figure 63. transport-grange.com

Figure 64. Archives départementales de l'Ardèche

Figure 65. RNPMA

Figure 66. RNPMA, Musée des Vans

Figure 67. RNPMA, Ecole du Vent

Figure 68. RNPMA, Musée des Vans

Figure 69. La Fage

Figure 70. RNPMA

Figure 71. RNPMA

Figure 72. RNPMA

Figure 73. Association Clapas

Figure 74. Dauphiné Libéré

Figure 75. SGA

Figure 76. Les chalets du Mézenc

Figure 77. RNPMA

Figure 78. SITHERE

Figure 79. Association Paléodécouvertes

Figure 80. Centre Haroun Tazieff

Figure 81. RNPMA

Figure 82. RNPMA

Figure 83. DRAC Rhône-Alpes

Part D

Figure 84. RNPMA

Figure 85. A. Ramet, N. Teil | RNPMA

Figure 86. Omnisciences / BRGM

Figure 87. DAKOTA

Figure 88. RNPMA

Figure 89. RNPMA

Figure 90. S. Martin | Relief

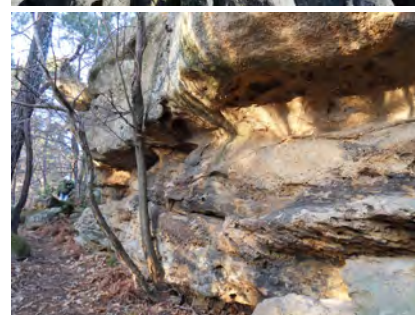
Figure 91. FFRP / RNPMA

Figure 92. RNPMA

Figure 93. RNPMA

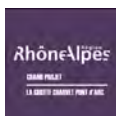
Figure 94. X. Depaule

Figure 95. RNPMA





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