

Chaîne des Puys – Limagne Fault
Nomination to the World Heritage List
Report of the Independent Technical Mission
4-8 October 2015

Executive Summary

The “Tectono-Volcanic Ensemble of the Chaîne des Puys and the Limagne Fault, France” has been nominated by the French State for the inscription in the World Heritage List. The IUCN technical evaluation was negative to this request, and recommended not to inscribe the proposed property on the World Heritage List. With decision 38 COM 8B.11 the World Heritage Committee then referred the nomination back to the State Party requesting an upstream mission to help clarify the proposal. On behalf of the French State, an “Independent Technical Mission” (ITM) read the dossiers, and additional new information, visited the proposed property, and held in-depth discussions with the on-site scientific and managerial community, and with IUCN.

The ITM has read the dossiers and additional new information such as international publications and 27 supporting letters from the international scientific community. The new publications and the supporting letters claim the outstanding importance of the Chaîne des Puys for understanding volcano-tectonic processes and morphologies in monogenetic volcanic fields. This heralds the return of the outstanding scientific position of Chaîne des Puys held in the 18th and 19th centuries.

The ITM has clearly seen the following aspects in the field: a) Parallel alignment of the main fault scarp of the Limagne graben with the chain of the Chaîne des Puys volcanoes; b) Diversity of volcanic types such as tuff-rings, scoria and cinder cones, lava domes, spines, lava flows, and dykes.

The ITM has highly appreciated the geoeducational and geotouristic facilities at Vulcania and Lemptegy open-air volcano. The University Blaise Pascal in Clermont-Ferrand with its “Laboratory of Magmas and Volcanoes” underlines the outstanding geoeducational and scientific importance of the property.

The ITC has also noted that public accessibility to prominent volcanic and tectonic features is given and that trails have signage, panels, and infrastructure necessary for sustainable geotouristic activities. It is also stated that the “Chaîne des Puys-Limagne Fault” proposal is unconditionally supported by the top politicians (e.g. Jean-Yves Gouttebel, President; Gregoire Michau, Director) as well as by the actual nature protection regulations, and management and inhabitants of the proposed property.

In total, and in comparison with other monogenetic volcanic fields and related tectonic environments, the ITM comes to the conclusion that the “Tectono-Volcanic Ensemble of the Chaîne des Puys and Limagne Fault, France” is a scale model for clearly displaying the interdependence of “lifting, rifting, and subsequent volcanism” as advocated ever since Desmarest, von Buch, Cloos, and Nakamura. It is the ensemble of volcanoes and tectonic structures and landscapes that make it such a scale model and unique in its clearness and completeness on our planet Earth.

Acknowledgments

All three ITM members wish to express their sincerest thanks to the organizers for the perfect organization as of October 4th to 8th. The general organization, hospitality, level of information, field trips and sites, lodging and catering were excellent.

In particular, we thank Tim Badman (IUCN) for providing us all the necessary insights to the IUCN evaluation mechanisms and arguments. Benjamin van Wyk de Vries explained the volcanological aspects of the Chaîne des Puys, and Olivier Merle gave a detailed explanation on the tectonic features and evolution of the Limagne Fault system. Finally, we gratefully acknowledge Cecile Olive-Garcia for not only manage the logistics of the mission but also for coordinate very efficiently the whole application dossier.

Technical details

The Independent Technical Mission (ITM) was composed of Peter Bitschene (Germany), José Brilha (Portugal), and Setsuya Nakada (Japan) and has arrived at Paris/France on October, 4th. On October 5th in the morning, the ITM met at the UNESCO Headquarters in Paris with Tim Badman, Director of the IUCN World Heritage Program, with representatives of the French State Nathalie Brat (Second Counsellor, French Ministry of Foreign Affairs), Perrine Laon (French Ministry of Ecology), Wolfgang Brost (French Ministry of Ecology), Cécile Olive-Garcia (Council of Puy des Dome.), and with Mechthild Rösler (Director of the Division for Heritage and World Heritage Centre, Culture Sector). Tim Badman briefed the ITM about the IUCN's tasks and decisions with regard to the World Heritage Site evaluation processes in general, and the results of the evaluation of the Chaîne des Puys-Limagne Fault nomination to the World Heritage List specifically. In the afternoon, the ITM proceeded to Clermont Ferrand by train, and was saluted upon arrival by Mr. Jean Yves Gouttebel (President of the Council of Puy de Dome) and by Benjamin van Wyk de Vries (Magmas and Volcanoes Laboratory of the Université Blaise Pascal at Clermont-Ferrand); the ITM then was transferred by car to Volcalodges near Saint-Pierre-Le-Chastel.

On October 6th an indoor meeting was held at Volcalodges with presentations by the Chaîne des Puys-Limagne Fault scientific committee academicians Olivier Merle (Tectonics and Heritage, Université Clermont-Ferrand) and Benjamin van Wyk de Fries (Volcanism and Heritage, Université Clermont-Ferrand), with subsequent in-depth discussion; during the afternoon a first field excursion was held across the Chaîne de Puys and Plateau of Gergovie.

On October 7th a new indoor meeting was held during the morning at Volcalodges with a presentation of Karoly Nemeth (Comparative analysis of monogenetic volcanism, Massey University/New Zealand) and subsequent in-depth discussion; an excursion to the Puy de Dome with a guided walk across and along the Chaîne des Puys volcanic field was performed in the afternoon. A stop was also made at the Lemptegy Volcano, a former quarry turned into an actual open-air volcano laboratory and tourist site. Over night lodging was at the Ecolodge Bois Basalte near Sauterre, Manzat.

On the morning of October 8th a final discussion was held with Tim Badman and the local committee (K. Nemeth, O. Merle, B. van Wyk de Fries, C. Olive-Garcia) at Bois Basalte on the volcano-tectonic ensemble of the Chaîne des Puys-Limagne Fault with special emphasis on pros and cons concerning the nomination to the World Heritage List.

The Independent Technical Mission formally closed at about 13:00h. Peter Bitschene went

to Lyon airport and José Brilha and Setsuya Nakada made a quick visit to Vulcania in the afternoon before leaving to Clermont-Ferrand airport.

1. Introduction

The “Tectono-Volcanic Ensemble of the Chaîne des Puys and the Limagne Fault, France” has been nominated by the French State for the inscription in the World Heritage List. The IUCN technical evaluation was negative to this request, and recommended not to inscribe the proposed property on the World Heritage List. With decision 38 COM 8B.11 the World Heritage Committee then referred the nomination back to the State Party requesting an upstream mission to help clarify the proposal, and finally prepare a required additional information dossier. On behalf of the French State, an “Independent Technical Mission” (ITM) was constituted by Peter Bitschene (Germany), José Brilha (Portugal), and Setsuya Nakada (Japan). The aim of this mission was to help to resolve scientific and technical divergences between the nomination application and IUCN’s evaluation, namely to:

- Clarify the characteristics of the site proposed for nomination, considering the whole set of geological features that make up the nomination, including the “tectonic and structural elements interacting with monogenetic volcanism in this geological scale model”.
- Re-examine on a global basis the comparative analysis provided by the State Party, and
- Review the divergence of analysis that appears in the various reference documents, and providing an opinion on how that divergence might be resolved.

The mission including visiting the proposed sites was carried out during October 5 to 8, 2015. This report expresses the final opinion of ITM, obtained by consensus of the three members.

2. The background

The IUCN report concluded that this property did not meet criterion (viii), and that the nominated property does not compare favourably with other properties on the World Heritage List nor with several other areas, which are not inscribed. However, there were huge diversities between the application and the evaluation by the IUCN, as claimed in all supporting letters submitted to the director of UNESCO World Heritage Centre in May and June 2015. That is; (1) the IUCN evaluation basing only on volcanological aspects of the proposed property, without paying sufficient attention to the ensemble of the tectonics and volcanism in the application dossier. The IUCN report itself mentioned that “the comparative analysis in the nomination is focused almost exclusively on the volcanic features of the site”. (2) Scientific papers written in French may have been under-evaluated as supporting the international importance in the report. (3) References on monogenetic volcanic fields largely rely too much on the monograph not inclusively summarized by the IAVCEI new commission in the report. Rather, not effective comparison of this nomination with other volcanoes may have not been done by the IUCN report to diminish the characteristics of the nominated property. (4) Furthermore, substantial results from the educational activity using the volcano quarries in the nominated property were not considered important in the IUCN report.

Review works in the IUCN team seems to have failed understanding the scientific significance of the dossier prepared by the proponent. This ITM should try filling these

gaps for better understanding of the both sides.

3. WH Criteria

As the objective of our mission was not to explore the arguments to justify criterion (vii), our report will only be concerned with criterion (viii). The IUCN report denied the values of the criterion (viii) due to non-uniqueness of monogenetic volcanic fields, the property's references mainly published in the national journals and university papers, no listing of this nomination in the literatures of general monogenetic volcanoes, and poor exposure and smaller distribution of volcanoes.

However, considering the combination of the monogenetic volcanic field with the normal fault system and landscape evolution, the proposed property shows major stages of Earth history such as the interdependence of "lifting, rifting, and volcanism". These interdependencies can be easily seen in the proposed property, beside the extensive vegetation cover. Direct exposure and the extensive distribution are not key issues of the universal outstanding value in this nomination.

Fulfilling the criterion (viii) in the proposed property needs more work on the comparative analysis to clarify the outstanding universal values. The scientist team should prepare further comparative analysis characterizing this nomination as combination of the alignment of volcanoes with the normal fault system and the geomorphological features.

4. Unexplored arguments and comparative analysis

This mission was focused on the need to better clarify how the nominated property complies with criterion (viii), and which additional unexplored arguments can be found. In order to achieve a solid justification, the proponents must clearly demonstrate the geological scientific value of the property and how this value is comparable with worldwide occurrences located in similar geological settings, whether they are already in the WHL or not. As stated by the proponents, the property constitutes the best example of complex processes related with continental rifting and associated processes/products. Therefore, this has to be clearly demonstrated by the proponents, which justifies a refinement of the previous comparative analysis (CA). An improvement of the CA will certainly contribute to supply strong arguments about the real scientific value of the proposed property. In order to detail the CA, we recommend the following points:

- i) Identification of areas with similar geological settings (continental rifts) that should be used in the CA; the examples refereed in the IUCN evaluation report that fit in this setting should also be included in the CA.
- ii) Identification of the attributes that will be assessed in the CA, taking into account the geological setting, including the structural features related with the tectonic setting, volcanic features and geomorphological features. Each one of these three groups of features should be assessed independently using a semi-quantitative approach.
- iii) A discussion should be presented in order to conclude if the proposed property has, in fact, a higher scientific value when compared without other classical locations under the same setting.
- iv) This new CA should be reviewed by top international experts and should be endorsed by scientific bodies widely recognised by the international geological community.

4.1. Monogenetic volcanic fields

Monogenetic volcanism or monogenetic volcanic fields are related to nearly all tectonic regimes on Planet Earth. Their common characteristic is that monogenetic volcanoes only erupted once to build up their volcanic edifice, independently of being a maar crater, a tuff ring, an ash-and-cinder cone, a lava lake or a lava flow. Monogenetic volcanoes compose monogenetic volcanic fields (MVF). Here at Chaîne des Puys, we are thus dealing with a monogenetic volcanic field (MVF). On a global scale, most MVFs are composed of just one composition, which is basalt (e.g. West Eifel MVF/Germany; Lanzarote/Spain; Wudalianchi/China). Some monogenetic volcanic fields, however, are chemically more heterogeneous (East Eifel MVF/Germany; Asunción MVF/Paraguay; Azores/Portugal; Harat al Madinah MVF/Saudi Arabia). In addition, a few MVF are chemically heterogeneous and formed by explosive, extrusive and intrusive processes (e. g. La Gomera/Spain). The Chaîne des Puys does show all the above mentioned criteria i.e. diversity of volcanic processes (hydroclastic-explosive - with the formation of “pepperite”, a term that has been coined in the Chaîne des Puys MVF - pyroclastic-explosive, effusive, intrusive, when going back to the Variscan granitic basement rocks) leading to a diversity of volcanic landforms such as maars and tuffrings, scoria cones, lava dikes and lava flows, spines and domes; in addition there are volcanic to subvolcanic (fine grained) edifices (domes – also a term that has been coined in the Chaîne des Puys MVF); and last but not least there is a chemically diverse suite of compositions ranging from alkaline basalts to trachybasalts and trachyandesites to trachytes. Other MVF do have a wider chemical variety (East African Rift Valley Volcanism), or just more volcanic edifices (just look at the MVFs that formed during back arc rifting processes on the American continents related to Pacific Plates’ subductions and associated monogenetic volcanism). However, on a global scale, the Chaîne des Puys MVF does stand out as showing a diversity of volcanic processes and products leading to a variety of volcanic edifices, chemical compositions, and landscapes.

4.2. Rifting processes

Monogenetic volcanism is always related to tectonic processes, notably to rifting processes, involving crustal uplift and crustal thinning, with mantle upwelling, plumes and hot spots as underlying activity. On a worldwide scale there are magnificent rifts that can easily be recognised in the field, e.g. Rhinegraben-Rift; East African Rift, Baikal Rift. Clearly, tectonic features such as faults, grabens and horsts can be seen on seismic profiles of the Limagne Graben, the underlying processes are circumscribed with rifting. Geological mapping also makes evident that there is the elevated Chaîne des Puys horst with its Variscan granitic basement, and the down-faulted Limagne graben with its sedimentary infill of Cenozoic sediments. However, on an outcrop scale the faults are not easily visible, although we saw one fine example with slickensides in the Variscan granite. However, photo interpretation and landscape evaluation do clearly show the major fault zones and tectonic patterns. In addition, the large-scale rifting processes are repeated on a smaller scale e.g. in the Lemptegy quarry, where horst and graben structures, faults and thrusts can be seen in this geoeducational facility.

On a global scale, there are many rift systems, which do better show their tectonic inventory, notably without vegetation. Nevertheless, if we come down to strikingly show the relation and interdependence of “initial lifting – follow-up rifting – subsequent volcanism”, as e.g. emphasized ever since Cloos and Nakamura, the Chaîne des Puys-Limagne Fault ensemble is a true scale model. The Rhinegraben Rift is better visible but

has scarce and only small-scale volcanism on its shoulders. The East African Rift has abundant volcanism, which overflows everything and hides the underlying basement. The Baikal Rift is limited in its extension and lacks clear alignment of associated monogenetic volcanoes, a fate that most rifts with associated monogenetic volcanism suffer from. In consequence, the Chaîne des Puys-Limagne Fault has a remarkable value when it comes to show and explain the interdependence of “lifting-rifting-volcanism”.

4.3. Geomorphological processes

The geomorphological features of the proposed property are well related with the structural and volcanological processes that constitute the geological backbone of the area. These geomorphological features are major assets that reinforce the scientific value of the nominated property and therefore they should be stressed by the proponents. In spite of the fact that the area reveals the effects of being used by humans for the last millennia, the major features of landforms are still easily recognised (cones, maars, craters, lava flows, columnar jointing, inverted relief, fault scar, etc.). The importance of these geomorphological values should be strengthened in the additional information that will be provided by the proponents because they are deeply associated with the main geological setting of the property.

In summary, as mentioned before, the proposed property can only be considered as an example of major stages of earth's history when considering the ensemble of i) Aligned volcanic chain with wide variety of volcanic and subvolcanic edifices and wide range of compositions; ii). Deep faults related to intracontinental rifting in the back of the Alpine orogenic belt forming prominent graben-and-horst structures; iii) Clearly visible geomorphological features associated with volcanism and faulting.

5. International scientific community

The 27 letters of support written by the international scientific community have not been available to the IUCN evaluation. They represent a significant contribution to recognise the scientific relevance of the combination of volcanological and tectonic features in the proposed property.

An examination of the 27 support letters states the following with regard to the Chaîne des Puys-Limagne Fault nomination: superb universal value because of landforms including domes and intrusions; outstanding universal value linking volcanoes and tectonics with landforms and geoeducation; new and internationally acknowledged publications in the past 3 years in addition to geoeducational value; tectono-volcanic scale model; integrated model with volcanism, tectonics and landscape, especially well suited for geoeducation; globally significant with geologically outstanding universal value; outstanding universal value with educational and scientific outreach.

The scientific community clearly expresses in favour of the Chaîne des Puys-Limagne Fault as a world heritage property. Furthermore, all support letters unmistakable look at the ensemble of volcanology, tectonics, landscape, and geoeducation. This holistic view resolves one of the deep controversies between the IUCN evaluation and the Chaîne des Puys-Limagne Fault proposal: it is the ensemble of volcanism plus tectonics plus landscape that makes the proposal unique and outstanding and a scale model for the interdependence of lifting – rifting – volcanism.

It is to be stated that most of the letters do not specifically highlight an “outstanding universal value” of the proposed property, probably because some of these scientists are not aware of criterion (viii). In addition, many letters do criticize the considerations made in the IUCN technical evaluation report.

6. Scientific and educational values

It is unquestionable that the scientific value of geological sites should be recognised by the international scientific community, which is expressed essentially by published works and communications in congresses. The international relevance of Chaîne des Puys-Limagne Fault proposal in another scientific domain should be stressed: the history of volcanology. In fact, this area was the subject of many research works that have contributed for the international advancement of the volcanological knowledge in the last two centuries. Obviously that much of this scientific literature was written in French, which should not be considered a constrain, as French language was the standard in those times. The increase of recent works published in international top-level scientific journals concerning several aspects of Chaîne des Puys-Limagne Fault geology should be noted. This is a demonstration of the scientific relevance of the area, also attested by the existence of international research projects and post-graduation programmes.

An added value is provided by excellent geoeducational facilities at Lemptegy open-air volcano and Vulkania, together with excellent research facilities in the nearby University of Clermont-Ferrand (Magmas and Volcanoes Laboratory).

7. Boundaries and buffer zones

These issues were not explored during the technical mission. However, the general impression is that the proposed property could be smaller in area and the buffer zone adjusted in order to facilitate better management.

8. Proposed management

These issues were not explored during the technical mission. Nevertheless, the discussions with the managers have clearly shown that the top to bottom management is good and that the management team is well organised and informed. We want to stress that the general infrastructure (accessibility trails, signage, panels, interpretative facilities) is already setup and is well kept. We have also observed that a functioning network (university, restaurants and hotels, museums, open quarries, etc.) is already been setup.

9. Final recommendations

This mission underlines the general high quality of Chaîne des Puys-Limagne Fault application and the strong commitment shown by the national, regional and local administrations. The professionalism of the team that is coordinating this application was also highly appreciated, as well as the strong involvement of geological experts lead by academics of the University of Clermont-Ferrand.

Strong efforts are visible in the Chaîne des Puys-Limagne Fault proposal, which is definitely relevant to involve the local community, stakeholders and general population with this endeavour.

Independently of the final result of the present application, we believe that the comprehensive work that has been implemented in the property and that is already included in the management plans of all involved stakeholders will continue in the future, contributing for the protection and sustainable education and tourism uses of the main geological features that have top-class worldwide relevance. We also note that the proposal complies completely with the requirements needed for a UNESCO Global Geopark, according with the programme approved by the 38th General Conference of UNESCO (3-18 November 2015).

The Independent Technical Mission suggest the following aspects to be further elaborated by the proponents and delivered in a complementary information package:

1. State clearly that Chaîne des Puys-Limagne Fault is an ensemble of a) aligned volcanoes with a wide variety of volcanic edifices, products and chemical compositions; b) large scale and small scale tectonic features composed of faults leading to the prominent graben-horst structure and related to intracontinental rifting in the backyard of the Alpine orogeny; c) inverted landscapes with prominent lava plateaus and volcanic domes.
2. Justify the property as a scale model for “lifting – rifting – volcanism”, a global, holistic concept starting in Central Europe in the Chaîne des Puys in the 19th Century, and further developed by Cloos (1939: *Hebung – Spaltung – Vulkanismus. Geol. Rdschau*, 30/4: 401 – 527), and Fuchs et al. (eds. 1983: *Plateau Uplift – The Rhenish Shield – A Case History*; see also Nakamura, 1978). The relevance of being a scale model for this holistic approach is explained, but not clearly stated in the application. Note: The aspect of lifting is not yet explored enough. Further scientific work such as fission-track dating in order to elucidate the timing and temperature realm of the Chaîne des Puys basement uplifting should be done in the future (not on the scope of this complementary information package).
3. State clearly the importance of the scientific and geo-educational facilities such as Lemptegy, Vulcania, and the Laboratory for Magmas and Volcanoes.
4. Describe the geotouristic assets such as the railway to the Puy de Dome and trails back, eco-lodging with regional food and wine. In addition, give relevant visitor numbers (three years, as for 2012–2014) of the landmark facilities such as Puy de Dome, Vulkania, and Lemptegy. It makes a difference if 100.000 visitors or more go and see the property or if only a few thousands may eventually come!
5. Describe the top-down management plan and the bottom up discussion processes before decisions are made.
6. Emphasize the short-comings of the IUCN evaluation, i.e. restricted scope of comparative analysis valid only to volcanism.

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Peter Bitschene
José Brilha
Setsuya Nakada