Invitation

natur musée
25 rue Münster
Luxembourg-Grund

Parking Saint-Esprit
Ascenseur vers le Grund

à la conférence de
l'Association Géologique du Luxembourg:

European volcanism:
Alpine geological processes, or heat from Earth's core?

Prof. Gillian R. Foulger University of Durham, U.K.

lundi, 12 novembre 2007 à 18h00

conférence en langue anglaise,
en collaboration avec le natur musée et la Société des Naturalistes Luxembourgeois

La conférence sera précédée d'une visite guidée de l'exposition «Nature sans frontières»
R.V. au hall du natur musée à 17h00

pour les informations thématiques consultez le site www.mantleplumes.org

www.MantlePlumes.org

ASSOCIATION GEOLOGIQUE DU LUXEMBOURG

CONFERENCE

European volcanism: Alpine geological processes, or heat from Earth's core?

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University of Durham, U.K.

The surface of Earth behaves like a few large plates that move relative to one another – Plate Tectonics. Most volcanoes lie on plate boundaries and are attributed to processes associated with the plates pulling apart or moving together. However, some volcanic regions do not fit this pattern. The most spectacular example is Hawaii, a huge volcanic complex in the centre of the vast Pacific plate. Remarkably, an almost straight chain of extinct volcanoes extends away from Hawaii, and they become progressively older the further they are from Hawaii. To explain this region, a second, independent theory was proposed – that a hot region lies in Earth's mantle and the Pacific plate moves overhead. The plate progressively carries volcanoes away with it, enabling new ones to form as new oceanic crust moves over the "hot spot".

But where does the heat come from, and how is it continually replenished, for many tens of millions of years? It was proposed that Earth's 3,000-km-thick mantle is heated by the core beneath, like a pot of water on a stove. Hot, mushroom-shaped plumes of mantle then upwell and rise to the surface causing volcanism that may be in the middle of tectonic plates. The plates move independently overhead, carrying the lavas away to form linear chains of extinct volcanoes that become older with increasing distance from the presently active "hot spot". That model is known as the Plume Hypothesis.

After its proposal, the Plume Hypothesis was applied to many volcanic regions on Earth, such as Iceland, Réunion and the Azores. However, as its popularity increased it was applied to ever smaller, ever less plausible volcanoes, many of them not fitting the original hypothesis at all. This scientific embarrassment was hidden from view by adapting the hypothesis specially for each individual volcanic region – designer plumes.

A good example is the Eifel volcanic field. Eifel is part of the European Cenozoic Volcanic Province, which has also been attributed to a plume. It is hardly necessary to point out that neither Eifel, nor any other European volcanic field, bears any resemblance to Hawaii whatsoever. The volume of lava at Eifel and other European volcanic fields is only a tiny fraction of that of Hawaii. There are no time-progressive volcanic chains, seismic imaging shows no plume-like structures extending down to Earth's core, and there is no geological evidence for high temperatures. On the other hand, there are correlations between the volcanism, rift valleys, zones where crustal blocks collided (sutures), and geological structures associated with the Alpine mountain chain. It is much more plausible that European volcanism is associated with local extensions of the European crust, caused by processes related to Alpine mountain building, than with quasi-random hot plumes from near Earth's core.

The attribution of European volcanism to plumes has done a good service to the quest to understand the causes of volcanism. This is because it is such an implausible suggestion that it brings into sharp focus that the Plume Hypothesis has been vastly over-applied the world over. Scientists are even beginning to question whether Hawaii, the original type locality, is due to a mantle plume. Such a question would have been virtually unthinkable in the past. Today scientists are sharply divided, and answers are demanded to a whole new suite of scientific questions that we did not know existed five years ago.

Please visit http://www.mantleplumes.org/