



## **Inverted Relief in volcanic landscapes, an old idea with new observations in the Chaîne des Puys**

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The concept of volcanic inverted relief is almost as old as geology. It was identified by Desmarest (1870) in Central France, and by Whitney (1879) in California, and quickly began to be used as a tool in the uniformitarianism / catastrophism argument. In the 20th century inverted relief was identified and described in many volcanic fields by Cotton, later explored in Australia by Ollier, and most of the known examples presented in their textbooks are from Australia. Study continued in Central France, in the 19th and 20th centuries, notably on the Montagne de la Serre at the southern end of the Chaîne des Puys. This latter site has the advantage of having multiple ages of inverted relief stacked closely together over a rift margin fault. This creates especially clear and intricate inverted relief types. However, apart from these studies inverted relief has received little attention, yet is acknowledged to be present in most volcanic environments to some degree. The advent of planetary geology has partly brought inverted relief back to the fore, as it is clearly present on Mars. We review the characteristics of inverted relief and discuss their use as a tracer of long-term landscape evolution. At a broad scale it can be used for determining differential erosion rates. In turn, these can be used for assessing feedback processes between erosion, exhumation and mantle melting in rifts. Inverted relief also protects surfaces that can then record tectonic movement. This is used to clarify the structure of the Limagne Rift margin. At a more local scale, the inverted relief is often characterised by landsliding and deep seated gravitational deformation that is an important hazard in volcanic terrains. Several inverted relief related landslide disasters are recorded in the French Massif Central, and a landslide map is presented for the Chaîne des Puys - Limagne fault area. Finally a global review of inverted relief geosites is presented.