Geophysical Research Abstracts
Vol. 12, EGU2010-5774, 2010
EGU General Assembly 2010

Hazard assessment at Teide-Pico Viejo volcanic complex (Tenerife, Canary Islands)

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Mid to long-term hazard assessment is conducted at Teide-Pico Viejo volcanic complex as a first step to evaluate volcanic risk in Tenerife, a densely populated island that is one of the biggest tourist destinations in Europe. Teide-Pico Viejo stratovolcanoes started to grow up in the interior of the Las Cañadas caldera, in the central part of Tenerife, about 190 ka ago, after the formation of the youngest sector of the caldera. Since then they have produced more than 150 km3 of rocks which represent a complete basanite to phonolite series. Eruptive activity at Teide-Pico Viejo complex has been traditionally considered as mostly effusive, but new field data has revealed that explosive activity of phonolitic and basaltic magmas, including plinian and subplinian eruptions and the generation of a wide range of PDCs, has also been significant, particularly during the last 30 ka. Most of the Teide products have been emplaced towards the north, inside the Icod and La Orotava valleys, or at the interior of the caldera, while towards the south the caldera wall has stopped the emplacement of such products from going further. The last eruption from the Teide-Pico Viejo central vents, the Lavas Negras eruption, took place about 1000 years ago, but younger eruptive episodes have occurred along the flanks of these stratovolcanoes.

Despite the occurrence of numerous eruptions during the last 30 ka and the existence of unequivocal signs of activity in historical times (fumaroles, seismicity) and, even, a clear unrest episode that started in 2004 and is still ongoing, Teide-Pico Viejo stratovolcanoes have not been considered as a major threat by some scientists and also by the local authorities who have dedicated minimum attention to them in the recently approved regional emergency plan. If this view prevails it is obvious that risk mitigation in Tenerife will not succeed. In order to contribute to change that view on the danger potential of Teide-Pico Viejo, and to insist on the need to include these volcanoes in any local and regional risk-based decision-making planning for land use and emergency management, we have conducted a detailed hazard assessment of Teide-Pico Viejo.

The aim of this work is to raise awareness towards the degree of threat that Teide-Pico Viejo represents for the island of Tenerife, by means of evaluating the current eruption hazard of the volcanic complex based on a statistical analysis of the time distribution of past eruptions and the spatial extent of some of their products. The analysis of past activity and the extent of some well-identified deposits are used to calculate the recurrence probabilities of eruptions of various sizes during time periods useful to assist the intermediate and long-term land-use and emergency planning.

The results indicate that Teide-Pico Viejo stratovolcanoes represent a VERY HIGH threat for Tenerife and that the northern side of the island, in particular the Icod Valley, is directly exposed to most of their hazards, so making that region highly vulnerable to any new eruption from Teide-Pico Viejo.