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The eruptive history of the Troux Blancs pit craters, La Réunion Island: The origin of a 24 km long lava flow

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The assessment of volcanic hazards is strongly based on the past eruptive behaviour of volcanoes and its morphological parameters. Since past eruption characteristics and their frequency provide the best probabilities of such eruptions for the future, understanding the complete eruptive history of a volcano is one of the most powerful tools in assessing the potential hazards or eruptions. At Piton de la Fournaise (PdF) volcano (La Réunion, Indian Ocean), the most frequent style of activity is the effusion of lava flows, which pose the greatest hazard by invasion of inhabited areas and destruction of human property. Here we examined the eruptive history of a previously uninvestigated area, believed to be the origin of a 24 km long lava flow.

The eruptions recurrence time of PdF is about one eruption every 9 months in the central caldera. Besides this central activity, eruptive vents have been built along three main rift zones cutting the edifice during the last 50 kyrs. In this study we focused on the largest rift zone of about 15 km width and 20 km length, which extends in a north westerly direction between PdF and the nearby Piton des Neiges volcanic complex. This rift zone is typified by deep seismicity (up to 30 km), emitting mostly primitive magmas, indicative of high fluid pressures (up to 5 kbar) and large volume eruptions. Our area of investigation focused on four consecutively aligned pit craters called the Troux Blancs. These have been identified [1] as the source area of one of the youngest (ca. 6 kyrs) and largest lava field, which extends for 24 km from a height of 1800m asl, passing Le Tampon and Saint Pierre city, until it reaches the coast. To gain insight into the development of this eruption and possible future similar activity, we collected new field data (including stratigraphic logs, a geological map of the area, C-14 dating and geochemical analyses of the eruptive products).

Fieldwork revealed that the eruption initiated with intense fountaining activity, producing a m-thick bed of loose black scoria, which becomes densely welded in its upper part. It was followed by an alternation of volume rich lava effusions and strombolian activity and deposition of meter-thick massive units of olivine basalt, alternating with coarse scoria beds in the proximal area. Activity ended with the emplacement of a dm sized bed of glassy, dense scoria and a stratified lithic breccia, marking the pit crater formation.

Preliminary dating suggested that this type of eruption could have a millennial recurrence time at PdF. Reoccurring similar activity on the NW rift represents a major source of risk for this now densely populated region (more than 150,000 people living in the affected area).

[1] Villeneuve, N., and P. Bachélery (2006), Revue de la typologie des éruptions au Piton de La Fournaise, processus et risques volcaniques associés, *Cybergeo: European Journal of Geography*, 330,1-26