

Tephra Fallout risk assessment in Villarrica volcano

Calderón R.¹, Bonadonna C.², Biass S.³, Frischknecht C.², Menoni S.⁴, Lara L.¹

¹SERNAGEOMIN, Chile

²Section of Earth and Environmental Sciences of the University of Geneva - Switzerland)

³Department of Geology and Geophysics of University of Hawai‘i at Mānoa, Honolulu - USA

⁴Department of Civil and Environmental Engineering of Politecnico di Milano – Italy

Key words:

Villarrica volcano is located in the Southern Volcanic Zone (SVZ) (39.42°S-71.93°W) and covers an area around 400 km², reaches an altitude of 2,847 m a.s.l. and rises 2,450 m above its base. It is a 600 ka old stratovolcano, mainly basaltic to basaltic-andesitic and is one of the most active volcanoes in South America. More than 70 historical eruptions have been recorded in the last 500 years, most of them were effusive eruptions and weakly explosive, but geological information show it also had highly explosive behavior in postglacial times (<14 ka). The proximal hazards zone (lavas, lahars and minor pyroclastic flows) covers an area ca. 1.500 km² and encloses 63.697 people living there (data updated until 2002). Critical infrastructures are around Villarrica volcano (international and national roads, airport, schools, hospitals, transmission lines). However, a large explosive eruption could be possible, such as the eruption associated with Chaimilla formation (<3.1 ka) and in current sociodemographic context could threaten even a larger number of inhabitants. At the same time a similar eruption could be affect the systemic life surrounding Villarrica volcano. The aim of this work is to assess how population could be affected by a large explosive eruption in current conditions of Villarrica volcano. Through the advection-diffusion model TEPHRA2 to determine hazard levels; a characterization of physical, social and systemic vulnerabilities to define vulnerability levels; and finally assess tephra fallout risk combining hazard with vulnerabilities through a risk matrix.