Stratigraphy and eruptive dynamics of the 2011 Cordon Caulle eruption, Chile

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The Puyehue Cordon Caulle volcanic complex, Central Andes Southern Volcanic Zone, Chile, erupted on June 4th, 2011, after 41 years of repose, from a single vent along the Cordon Caulle fissure system. This system generated at least 5 historic eruptions. The 2011 eruption started with a 10 to 12 km high plume that dispersed most of the tephra towards E and SE by strong winds. The wind shifted towards NE on June 6th and again towards E on June 7th and plume height was between 8 and 10 km. After this initial paroxysmal phase, the activity continued during several months as low level ash emissions (4 to 8 km). Pyroclastic density currents were generated on 5 to 8 June and affected the Nilahue river valley. Lahars damaged the international road and destroyed a bridge in the Nilahue river. On June 20th lava effusion was reported, which lasted until April 2012.
Tephra fallout affected a wide area, including Neuquen, Rio Negro and Chubut provinces in the west part of Argentina and even reaching the Central part of Argentina, Uruguay and Southern Brasil. The eruption significantly impacted both the local and regional economy and caused the evacuation of 3500 people in Chile. Air traffic was disrupted in Argentina with a massive cancelation of national and international flights and the temporary closure of several Patagonian airports. Land and water transportation, water and electricity supplies and telephone communications were significantly affected. Several field surveys were carried out between June 2011 and February 2013. Eruption stratigraphy was characterized based on about 70 outcrops identified between the vent area and 250 km E from the active vent, along the main dispersal axes that characterize the initial paroxysmal phase of the eruption. Various fallout units were identified in the field within the tephra sequence, each characterized by grainsize, componentry and density analyses. Each unit was related to the chronology of the eruption based on ash dispersal as described by satellite images and observed tephra deposits. Volume, total grain size and mass eruption rates associated with the main tephra units were also derived.