



Cities on Volcanoes 9
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'Understanding volcanoes and society: the key for risk mitigation'



Impacts and Dynamics of Lahars Generated by the April, 2015 Calbuco Eruption, Chile

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Calbuco is a 2015m high, glacier capped, stratovolcano in the heavily populated Los Lagos district of southern Chile with a history of volcanic eruptions in 1893–95, 1906–7, 1911–12, 1917, 1932, 1945, 1961 and 1972. Calbuco experienced a powerful 90 minute eruption at 18:04h on 22 April, 2015 followed by additional major eruptions at 01:00h and 13:10h on 23 and 30 April, respectively, resulting in the evacuation of 6,500 people and the imposition of a 20 km radius exclusion zone. Pyroclastic flows descended into several river catchments radiating from the volcano with lahars travelling distances of up to 14 km, reaching populated areas. We detail the impacts and reconstruct the dynamics of lahars generated by the April 2015 eruption. Pyroclastic flows melted glacier ice and snow generating the largest lahars in Rio Este and Rio Blanco Sur on the southern flanks of the volcano. To the north, lahar deposits in the Rio Blanco Este were buried by pyroclastic flow deposits with measured temperatures of up to 282°C three months after emplacement. Lahar erosional impacts included bedrock erosion, alluvial channel incision, surficial deposit erosion and the felling of large areas of forest. Depositional landforms included boulder run-ups on the outsides of channel bends, boulder clusters and large woody debris jams. Lahars deposited up to 8m of sediment within distal reaches. Deposits on the southern flanks of Calbuco evidence the passage of multiple lahar pulses of contrasting rheology. Channel confluence morphology displays evidence of asynchronous lahar deposition between channels. Pre-existing lahar channels controlled flows to lower piedmont zones where routing was determined by palaeo-



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lahar geomorphology. Ongoing erosion of proximal pyroclastic flow and
lahar deposits continues to provide large volumes of sediment to distal



portions of fluvial systems radiating from Calbuco.