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'Understanding volcanoes and society: the key for risk mitigation'



A tale of three rivers: Volcano-sedimentary response to the 2015 Calbuco eruption, Chile

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On 22-23 April 2015 Calbuco Volcano in southern Chile erupted, generating sub-Plinian eruption columns, multiple topographically confined pyroclastic density currents (pdc's), and both hot and cold primary eruption-triggered lahars (etl's) in 11 drainages that caused significant damage to infrastructure. The eruption emplaced c. 0.31 km³ of NE-dispersed tephra fall and pdc deposits, dominated by relatively coarse-grained and dense scoria and lapilli (1800-2100 kg/m³), suggesting that a significant secondary, rain-triggered lahar (rtl) hazard had been created at the onset of the wet Austral winter. Fieldwork focused on 3 major catchments that received differing proportions and volumes of tephra and pdc material highlights a range of local and more general controls on the post-eruptive sedimentary response and remobilization story. In the Rio Blanco East, which lay under the tephra dispersal axis and received extensive pdc's, major rtl activity was delayed until the first significant post-eruptive rainfall event on 16-17 May 2015, following which up to 12 m of (ongoing) aggradation occurred. Run-off and remobilization appears to have been locally enhanced by the presence of a (since dispersed) surficial layer of co-pdc ash and development of an internal crust in the tephra blanket. The Rio Tepu to the north appears to have behaved more like a conduit, translating material eroded from the upper catchment to its distal reaches. The Rio Blanco Sur, which bore the brunt of the largest primary lahars has suffered minimal secondary flows due to a paucity of tephra fall, with reworking limited to cannibalization of etl deposits. Overall, except for where an internal impermeable crust was developed, the majority of the coarse tephra deposited during the 2015 eruption appears to have a low remobilization potential, suggesting that Calbuco lies close to the other end of the spectrum of post-volcanic landscape sensitivity to that shown by the 2008 Chaitén eruption.