



## **The growth of Ritter Island volcano, Papua New Guinea, and the lateral collapse landslide and tsunami of 1888: new insights from eyewitness accounts**

Melanie Jane Ray (1), Simon Day (2), and Hilary Downes (3)

(1) Birkbeck, University of London, London, United Kingdom (melanie.ray@gmx.net), (2) Department of Earth Sciences, University College London, London, United Kingdom (simon.day@ucl.ac.uk), (3) Birkbeck, University of London, London, United Kingdom (h.downes@ucl.ac.uk)

We present a case study of the 1888 edifice lateral collapse landslide and tsunami event at Ritter Island volcano, using a more complete set of primary and secondary eyewitness accounts than has been used in previous studies. The collapse, early in the morning of March 13th, 1888, removed most of the island and its western submarine flank down to the base of the edifice some 900 m below sea level. The resulting tsunami is believed to have eradicated entire coastal communities on the surrounding islands and was recorded by German colonists in several locations around the Bismarck Sea and on adjacent coasts. Our analysis, based in particular upon new and complete translation of the German accounts, considers the evolution of the island over the previous two centuries and the events of March 1888, with the aim of clarifying the constraints that exist upon the cause, kinematics and mechanisms of the lateral collapse.

Our analysis indicates that the pre-collapse Ritter edifice produced frequent strombolian eruptions and steam emissions, building an approximately 1700 m wide, notably steep-sided edifice with a N-S elongated oval shape in plan, by the late 1800s. Most activity was concentrated at a group of summit craters some 800 m above sea level, possibly also in a north-south line, with lesser flank fissure activity. The accounts of the tsunami indicate that the 1888 collapse involved a single large-scale catastrophic landslide, but descriptions of the island in the following days indicate a period in which there were many small landslides from the newly formed and unstable collapse scar. There is no evidence for a sequence of large landslides during this event and there is no clear evidence for a coincident or causal magmatic explosive eruption. One report suggests that there was activity (perhaps phreatic or phreatomagmatic explosions?) prior to the collapse that lead some of the resident local communities to seek higher ground, but evidence for precursory flank movements or changes in eruptive style have not been found in the historical accounts.