



Potential field and bathymetric constraints on volcanism and tectonics at the submarine Monowai cone and caldera (Kermadec arc)

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Repeat swath-bathymetric surveys have been carried out over the Monowai volcanic centre since 1998. The system is one of the most active in the Tonga-Kermadec arc and comprises an active submarine stratovolcano (the Monowai cone) and a hydrothermally active submarine mafic caldera (the Monowai caldera), the largest known mafic caldera on Earth. During a recent survey in April-June 2011 on board R/V Sonne we collected additional bathymetric data as well as, for the first time, marine gravity and magnetic data over the volcanic centre. The Monowai caldera is characterised by a Bouguer gravity anomaly high, corresponding to a mass excess of $\sim 1.5 \cdot 10^{13}$ kg. Forward modelling and inversion of the anomaly require a shallow body with a high-density contrast of several tens of km^3 . The body likely represents an igneous intrusion, perhaps a system of sills, of about 4-5 km radius and 1-2 km thick. The intrusive body is slightly elongate in a direction perpendicular to the strike of a system of extensive faults that dissects the northwestern part of the volcanic arc. Conversely, the Monowai cone is characterised by a Bouguer gravity anomaly low, indicating the absence of a high density core common at many stratovolcanoes, and perhaps the presence of melt in the uppermost part of the crust. A relatively low-density edifice may be indicative of a fast formation mechanism, as suggested by repeat bathymetric observations of very fast growth at the summit of Monowai cone. The orientation of bathymetric features, faults and gravity anomalies, and the southward migration of volcanic activity by about 400 m over the past 8 years, are indicative of a close interplay between volcanism and tectonics at Monowai.