

## **A multidisciplinary approach to the understanding of the magmatic and volcanic history of Heard Island, Kerguelen Plateau.**

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Heard Island, a sub–Antarctic volcanic island in the southern Indian Ocean, is heavily glaciated and subject to high winds, snow, and wet conditions. It is the southernmost sub–aerial exposure of the Kerguelen Plateau and the source of its magma is believed to be the Kerguelen plume (Weis et al 2002).

Volcanic rock on the island overlies Paleogene Laurens Peninsula Limestone that is unconformably overlain by the Upper Miocene, predominantly volcanoclastic Drygalski Formation (Truswell et al 2005, Stephenson et al 2006). The lava–dominated volcanic sequences that overlie the Drygalski Formation are interpreted to be less than one million years old (Clarke et al 1983) and constitute most of the island's volume.

Big Ben, a stratovolcanic complex dominated by basanite, basalt, and trachybasalt lava, rises to 2745m and forms the main part of Heard Island (Kiernan & McConnell 1999, Stephenson et al 2006). Mawson Peak is at the summit of Big Ben and has been active as recently as 2012. The smaller centre, Laurens Peninsula, consists of three volcanic peaks. The tallest is Mt Dixon (775m), a volcanic dome that may have been active in the last several hundred years (Stephenson et al 2006). Laurens Peninsula lavas consist of older trachytic lavas overlain by recent basaltic lavas (Quilty & Wheller 2000).

Around the circumference of Heard Island are small scoria and tuff cones and some associated lava flows, these are thought to be younger than 10,000 years old (Stephenson et al 2006). The relationship of these cones to other volcanic features is unclear, although they have been thought to be parasitic in origin (Kiernan & McConnell 1999) and possibly monogenetic (Wheller pers com 2012). A recent bathymetric and seismic review (Leser 2012) has revealed concentrations of relatively low volume cones on the submarine Kerguelen Plateau around Heard and McDonald islands. Some of these may have erupted subaerially, and be contemporaneous with the scoria and tuff cones on Heard Island, implying a more regional, broad scale volcanism.

The Institute for Marine and Antarctic Studies, University of Tasmania is planning a scientific cruise to obtain detailed information about the topography of the seafloor and the interpreted submarine volcanoes of the Kerguelen Plateau, particularly those adjacent to Heard Island. Continuous swath mapping will be conducted using deep and mid–water multibeam sonar systems, a sub–bottom profiler, gravimeter and magnetometer. Back–scatter data will be used to identify which volcanic features may be hydrothermally active. Mapping will be followed by water sampling and rock dredging. Comparison will be made between these rocks samples and existing Heard Island samples with a view to placing the young sub–aerial scoria and tuff cones on the island in the overall context of young volcanism on the Kerguelen Plateau.