The geomorphic evolution of the Warrumbungle Volcanic Complex, New South Wales, Australia.

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Cover page: Arbuthnot's Range (the Warrumbungle Volcanic Complex) from the west, redrawn by Major Taylor from a sketch by Mr Evans during John Oxley's 1818 expedition into the interior of New South Wales.

Declaration

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree.

I certify that to the best of my knowledge any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

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Dedication

I dedicate this work to my Pop, who passed away during my candidature, and to Chandelle.....

Abstract

Geomorphic analysis of the mid-Miocene Warrumbungle volcanic complex in north-central New South Wales revealed a highly dissected multi-vent ovoid shield, 55 km long and averaging 32 km wide. The volcanics rest unconformably on a pre-volcanic medium-relief sandstone landscape of broad valleys and flat interfluves.

The degree of dissection, a function of the exceptionally large proportion of easily erodible pyroclastic material erupted during the volcano's 3.7 million year active life, varies considerably between the distal and proximal zones of extrusion. The proximal zone is preserved only in a skeletal state and is dominated by less erodible domes, plugs, and dykes. By contrast, the distal zone presents a characteristically gently sloping shield landscape with terraces where flow units are exposed.

Remarkably, and probably as a result of the large number of explosive eruptions that were a dominant feature of Warrumbungle activity, four previously unrecorded crater remnants were recognised, as well as other previously unrecognised features. The preferential preservation of their lithology is perhaps a result of the partial/complete burial of these features by coeval activity and the development of dual scale radial drainage networks, with exhumation only occurring when local sub-drainage had been captured.

There is strong structural control on volcanic morphology, with a fracture joining the ends of offset parallel lineaments. This fracture corresponds to a 40 km long northeast-southwest trending belt that controlled the emplacement of some 100 vents. This belt may reflect the migration of the Indo-Australian Plate over a fixed sub-lithospheric heat anomaly. However, analysis of age trends indicate a west-east (age-longitude) younging of volcanics contrary to the expected east-west younging, and no significant north-south (age-latitude) younging.

The geomorphic evolution of the Warrumbungle Complex is a consequence of the interaction of sub-basement structure, multiple dome emplacement and preferential preservation of lithology caused by compositionally diverse pyroclastic ejecta and lava distributed disproportionately in the proximal and distal zones respectively. Coeval activity, dual scale drainage and denudation that was highly localised over time and space allowed preservation of individual landforms, while the overall radial pattern of a volcanic centre combined with the effects of pre-volcanic topography to reshape regional drainage.

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