LATE TRIASSIC VOLCANISM OF THE IPSWICH BASIN

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I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

Andrew Roach

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Abstract

The Ipswich Basin, an extensive Late Triassic basin that straddles the Queensland-New South Wales border in eastern Australia, contains a basal sequence of felsic and mafic volcanic rocks, which, together with the Agnes Water Volcanics, Aranbanga Beds , Mount Byron Volcanics, Muncon Volcanics, North Arm Volcanics, and numerous plutons, form a major igneous province. Volcanism in the Ipswich Basin was manifested in an older mafic- dominated (in parts bi-modal) belt on the west, and a younger, silicic belt to the east. An early phase of calc-alkaline rhyolitic lava in the sub-surface is succeeded by exposed basaltic andesite lava flows and air-fall tuffs of the Sugars Basalt and Weir Basalt. Commencing in the westernmost sections, coarse clastic sedimentary rocks were deposited in fans along the West Ipswich Fault. Farther east near Brisbane and south to Mount Warning, extensive rhyolitic volcanism generated the ignimbrites of the Brisbane Tuff, the rhyo-dacitic air-fall tuffs and ignimbrites of the Mount Crosby Formation and Hector Huff, the rhyolitic lavas and pyroclastic rocks of the Chillingham Volcanics, and the isolated exposures of rhyolitic lavas on Moreton and Stradbroke Islands. The Brisbane Tuff is a valley-fill ignimbrite, with minor air-fall tuffs and ground surges, and at Carindale an ignimbrite outflow sheet. The Brisbane Tuff is a single cooling unit of flows continuously emplaced from a single vent. The coeval Chillingham Volcanics extend southward from Brisbane in an 80 km long belt of silicic volcanism. The Chillingham Volcanics follow a cycle of precursory pyroclastic eruptions and subsequent fissure-type lava effusion. In the south and centre, an earlier cycle of pyroclastic rock eruption and lava emplacement in domes also occurs. The northerly strike of vertically oriented zones of flow banding, thought to reflect feeder dykes, parallels the regional strike so the eruptive fissures may be related to deep basin-forming structures.

The chemistry of the Ipswich Basin mafic rocks differs from that of mafic rocks from volcanic-arc or within-plate settings, though sharing features of both. I interpret the "mixed" signature as reflecting the tectonic environment into which the mafic rocks were erupted, namely an area of back-arc extension. Rocks with chemical characteristics similar to the Ipswich Basin mafic rocks are present in the early stages of rifting in the Basin and Range Province of the western United States, the South Shetland Islands, and parts of the Central Andes. Geochemistry is consistent with the postulated tectonic setting of the Ipswich Basin in an area of back-arc extension associated with strike-slip faulting.

Volcanism ceased later in the Late Triassic during the eastward migration of the heat source, and was followed by deposition of the thick coal measures around Ipswich.