



Hydromagmatically dominated Hawaiian-type Eruptions of andesitic Magma associated with shallow level Sill Emplacement into wet Sediments: Initiation of Plateau-Basalt Volcanism in the Ferrar Province, Antarctica

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Below the effusive section of the Jurassic Ferrar Large Igneous Province, extensive sections of fluvial and lacustrine sediments are exposed in Northern Victoria Land, Antarctica, overlying crystalline basement. The sediment sections can be subdivided into (1) approximately 250m of quartz sandstones of Triassic (to Early Jurassic?) age in the lower part and (2) about 50m tuffaceous sand-siltstone of reworked, well sorted, distal rhyolitic fall out shards of Early Jurassic age in the upper part. The succession is intruded by andesitic sills, several 10m to a few hundred meters in thickness. The older quartz sandstones are fractured and occur as angular fragments in the magma. The younger tuffaceous sandstones, however, show soft sediment deformation and fluidization that lead to igneous block bearing sediment dike intrusions into the sills as well as into the fluvial sediments.

Locally, these sills exhibit upwards directed protrusions in the form of dm to meter sized apophyses and meter to deca-meter sized plugs. Where these plugs reach the tuffaceous sandstones, diatremes are formed with flatly inclined outer boundaries (width to depth ratio of 2:1). They are filled with chaotic volcanoclastic breccias and block bearing tuffs, intruded by mafic igneous bodies, and grade upwards into block

bearing tuffs. Often such a sequence is capped by black (carbonaceous) lacustrine shales.

Proximal intrastratigraphic expressions of these diatreme forming eruptions are massive layers of hydroclastic breccias and block-bearing tuffs. They are free of any basement clasts and contain only angular, sill-type igneous clasts of variable crystallinity (medium- to microcrystalline), and round to elongated vesicular lumps of bomb-size. Locally, such deposits are interbedded with layers enriched in collapsed lumps, which sometimes develop into welded spatter of bombs > 1 m in length. While the intrastratigraphic hydroclastic products can be traced only for a few km, the distal facies of these explosive events are marked by abundant lapilli- to ash-sized magma lumps with aerodynamic morphology embedded in the succession of fluvial sediments.

These widespread lumps are thus useful stratigraphic indications for the first shallow level emplacement of sills into wet sediments and associated hydroclastic eruptions and peperite formation. The andesitic magmas were characterized by an extraordinary fluidity that allowed a steady hawaiian-type eruption component.