Rittmann volcano, northern Victoria Land, Antarctica as the source of englacial tephra

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ABSTRACT

Northern Victoria Land, Antarctica is the home to the "active" volcanoes: The Pleiades, Mt. Melbourne and Rittmann volcano. All three volcanoes have evidence of recent activity which has resulted in the occurrence of tephra in ice cores, blue ice/snow areas and as surficial tephra layers. Although there is a significant area of geothermal activity at Rittmann, until now there has been no evidence of any recent eruptive activity. A trachytic tephra is described from an ice core at Styx Glacier in northern Victoria Land and is correlated with a known 1254 CE tephra in 5 ice cores from East and West Antarctica. The tephra is also identified in a blue ice patch near Brimstone Peak and a tephra in a sediment core from the Ross Sea has many similarities in composition. A volcanic breccia, presumably formed by large explosive pyroclastic eruptions from Rittmann volcano, has glassy fiamme-like clasts. Electron microprobe analyses of the glass and some whole rock analyses of lavas have trachytic compositions identical to the 1254 tephra. Rittmann volcano is now considered the source of the 1254 eruption. The 1254 tephra is spread over 2000 km from Rittmann and is the most significant tephrochronological marker in Antarctic ice cores. The eruption of the 1254 tephra is the largest known of any Quaternary volcano in Antarctica and probably resulted in the formation of a 2 km wide caldera which defines the summit area of Rittmann volcano. This new discovery and the occurrence of numerous Holocene eruptions from Melbourne volcano show that there is a significant volcanic hazard from these volcanoes especially to aircraft operations.