



Insights into the Toba Super-Eruption using SEM Analysis of Ash Deposits.

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The ~74 ka Youngest Toba Tuff (YTT) super-eruption of Toba volcano, Northern Sumatra, was the largest eruption of the Quaternary (magnitude $M= 8.8$) and injected massive quantities of volcanic gases and ash into the stratosphere. YTT deposits covered at least 40,000,000 km² of Southeast Asia and are preserved in river valleys across peninsular India and Malaysia, and in deep-sea tephra layers in the Indian Ocean, Bay of Bengal and South China Sea. Initial studies hypothesized the eruption caused immediate and substantial global cooling during the ~ 1 kyr between Dansgaard-Oeschger events 19 and 20 which devastated ecosystems and hominid populations. A more recent review argues against severe post-YTT climatic deterioration and cannot find clear evidence for considerable impacts on ecosystems or bio-diversity.

The determination of the eruptive parameters is crucial in this issue to document the eruption and understand the potential impacts from future super-volcanic eruptions. Volcanic ash deposits can offer dramatic insights into key eruptive parameters, including magnitude, duration and plume height. The composition and shape of volcanic ashes can be used to interpret physical properties of an erupting magma and tephra transport, while textural characteristics such as grain roughness and surface vesicularity can provide insights into degassing history, volatile content and explosive activity of the volcano.

We present a stratigraphic and sedimentological analysis of YTT deposits in stratified contexts at three localities in India and at two sites in Peninsular Malaysia. These sites offer excellent constraints on the spatial distribution of YTT deposits which can be used to infer dispersal directions of the cloud, thickness of the deposits and provide insights into environmental controls on preservation of tephra beds. The research aims at a systematic interpretation of the Toba tephra to understand the volcanic processes, spatial distribution and environmental impacts of the largest known Quaternary volcanic eruption.