

Direct temporal coincidence between the Siberian Traps and Permo-Triassic Boundary Mass Extinction

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The Siberian Traps are widely considered to be a potential trigger of Permo-Triassic Boundary (PTB) mass extinction mainly based on synchronicity between the Siberian Traps and the extinction. However, this temporal link is indirect and only constrained by absolute radiometric dating on both volcanic ashes around the PTB in South China and intrusives of the Siberian Traps. This study elucidates direct relative temporal relationship between PTB extinction and the Siberian Traps, based on newly acquired mineralogy, whole-rock geochemistry, PGE and in-situ zircon U-Pb and Hf-O isotopic data of the clay layers around the PTB at ten sections in South China.

Results show that clay layers around the PTB in South China are mainly altered volcanic ashes. In terms of geochemistry, the PTB claystones are divided into two groups. Group 1 is pure acidic volcanic ashes, which are distributed below and above the PTB mass extinction interval. Group 2 claystones are mixture of acidic ashes and basaltic tuffs, which are exactly distributed in the PTB main extinction interval. Modeling calculation shows the Group 2 comprises of acidic volcanic ashes (70%) and basaltic substance (30%). This substantial input of basaltic mass to Group 2 claystones can not be explained by change of volcanic nature, the geological settings, depositional environment and terrigenous clasts. Instead, it is most likely from basaltic ashes of the Siberian Traps for voluminous tuffs occur in the lower part of volcanic succession in the Siberian Traps. It is thus direct evidence for temporal coincidence between the Siberian Traps and the PTB main extinction. Our study supports that the Siberian Traps may have been responsible for the PTB mass extinction, as a consequence of voluminous greenhouse gases