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A multiproxy approach to identify the Tambora volcanic fallout in 1810s from the Styx glacier in Victoria Land, Antarctica

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Ice cores provide records of past aerosol composition and have been used to reconstruct the relative contribution of different emission sources changing in time. A precise age scale is essential to achieve this goal, for which annual layer counting of seasonal cycles in water stable isotope ratios ($\delta^{18}O$ and δD) and major ion concentrations have been basically utilized. Introducing additional time markers are helpful for reducing the uncertainty of the depth-age scale, and the fallout of volcanic products has offered useful time markers when they are well-dated. Here, we report lead isotope ratios ($^{206}Pb/^{207}Pb$ and $^{208}Pb/^{207}Pb$) and concentrations of thallium (Tl) and major ions in a shallow ice core from the Styx Glacier (73°51 S, 163°41 E) in the Victoria Land, Antarctica, analyzed for discriminating volcanic products of the 1815 AD Tambora eruption, Indonesia from local volcanic inputs. Mechanically decontaminated 19 inner core pieces between the depth interval 40.8 – 42.4 m were analyzed. The results show that the increases of volcanic SO_4^{2-} input are accompanied by either (1) input of more-radiogenic lead (higher $^{206}Pb/^{207}Pb$) and Tl or (2) relatively ^{208}Pb enriched lead. These results suggest that the Tambora volcanic input is overprinted by local volcanic aerosol input and that the isotope-based assessment of the Pb sources can help to discriminate between remote and local components of the volcanic input signals recorded in Victoria Land glaciers.