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Insights into the environmental impacts of large igneous province volcanism from volcanology, atmospheric modelling and sedimentary archives

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Episodes of large igneous province (LIP) volcanism punctuate Earth history. LIPs are anomalous geologically rapid large-volume accumulations of igneous rock on the Earth's surface and in the shallow crust. Periods of LIP emplacement are often temporally associated with times of profound environmental and climatic change throughout Earth history, particularly during the last 300 million years. The fluxes of gas and particles emitted during LIP volcanism are key candidates for triggering these Earth system responses. Understanding these events, their feedbacks and impacts on the Earth system requires collaboration between the fields of volcanology, atmospheric science, ocean chemistry, sedimentology and palaeobiology amongst other fields. This presentation will explore how evidence of the environmental impacts of LIP volcanism and the processes leading to these effects is best combined often from disparate sources including: (1) temporal associations between the dates or proxies of LIPs and evidence of environmental change captured in the geological record; (2) historical records or monitoring studies of the effects of large-scale recent volcanic activity such as the Laki eruption in 1783–1784 CE and its deposits; and (3) scaling up from observations and measurements of the environmental impacts of present-day volcanism such as the 2014–2015 Holuhraun eruption and the 2018 Lower East Rift Zone eruption at Kilauea, Hawai'i. Recent progress in each of these areas sets the scene for future advances in our understanding of these profoundly important events in Earth's history.