

Large igneous provinces linked to extinction events

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Mass extinction events are sometimes portrayed in illustrations of volcanic eruptions causing widespread destruction. According to Dr. Richard E. Ernst of Carleton University, Ottawa, Canada, expert on Large Igneous Provinces (LIPs), this interpretation may have some truth behind it, but not in the instantaneous way we might think. Ernst will report on his research on 1 November at the Geological Society of America's Annual Meeting in Baltimore, Maryland, USA.

The basaltic lava flowing from ancient volcanoes and the portion of magma (liquid rock) emplaced underground can create geologic conditions linked with climate change and, subsequently, extinction events. This climatic effect is particularly true for LIPs, in which mainly basaltic magma up to millions of cubic kilometers can be emplaced in a geologically short time of less than a few million years.

"The most dramatic climatic effect is global warming due to greenhouse-gases from LIPs," explains Ernst. "Subsequent cooling (and even global glaciations) can be caused by CO₂ drawdown by weathering of LIP-related basalts."

There are currently numerous LIPs correlated with the timing of [extinction events](#) over the last few hundred million years, so there is a clear link to be explored by researchers like Ernst and his colleagues. He notes that the research literature on the links between LIPs and catastrophic climatic change is rapidly expanding.

How do researchers know this occurred? Improved isotope dating is confirming the long-proposed extinction-LIP link. Additionally, the environmental/climatic changes can be recorded in sedimentary isotopic compositions that record the structure of seawater in ancient times.

There are additional environmental effects associated with LIP deposition, Ernst reports. "Effects associated with LIPs also include oceanic anoxia (massive marine organism die off due to oxygen deficiency), sea level changes, etc." The sheer size of an LIP is not the only factor. "Also contributing to climatic/extinction effects are the abundance of LIP-produced pyroclastic material and volatile fluxes that reach the stratosphere, and in particular the role of super-eruptions."

Climate feedbacks are also an important factor. Warming caused by LIPs could cause the destabilization of frozen methane clathrates, which then releases more greenhouse gases and causes more warming. Ernst notes that paleogeography and location of the LIPs may have affected the climate as well. "An important global terrane effect is the surface extent of basalts at the time, and the portion which is at low latitudes—factors which increase the efficiency of the CO₂ drawdown (and global cooling) through weathering."

More information: How large igneous provinces affect climate and sometimes cause extinctions , Abstract link:

gsa.confex.com/gsa/2015AM/webp...ram/Paper269036.html

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