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How variations in the rates of effusive basaltic flood volcanism versus aerosol-forming explosive volcanism have driven climate change and rates of mass extinction throughout Earth history and how humans have modified this interaction

Peter L. Ward, US Geological Survey retired

Explosive volcanoes form sulfate aerosols in the lower stratosphere that reflect and scatter sunlight, cooling Earth for a few years. Several major explosive volcanic eruptions per century increment the world over millennia into ice ages. Effusive basaltic volcanism, on the other hand, warmed the world very rapidly out of the last ice age 24 times during the past 120,000 years but did not last long enough to warm the oceans that cooled Earth back into ice age conditions. Finally, 12,000 years ago, major basaltic eruptions in Iceland lasting 2500 years warmed the world out of the last ice age. Plate tectonics determines the relative importance of subduction-related explosive volcanism versus sub-aerial, ridge-related effusive basaltic volcanism. LIPs and the PETM are examples of long-lived, extreme basaltic volcanism. Aerosol-forming volcanism depletes ozone substantially while plumes of ozone have been observed by satellites to be emitted months before large eruptions. A very interesting interrelationship between monthly global temperature anomalies, ozone anomalies, and the Multivariate ENSO Index provides new insights into these interrelationships.

T145. Volcanism, Mass Extinctions, and Environmental Change
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GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Sedimentary Geology Division; SEPM (Society for Sedimentary Geology); Paleontological Society; Paleontological Research Institution
Important new data and observations increasingly link four of the five major mass extinctions directly to LIPs, as well as PETM and OAEs, particularly based on the fields of paleontology, stratigraphy, geochronology, geochemistry, climate, sedimentology, mineralogy, and volcanology.
Paleontology, Diversity, Extinction, Origination | Stratigraphy | Volcanology
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