Northeastern Section - 59th Annual Meeting - 2024

Presentation Time: 2:55 PM

AN OCEAN ACIDIFICATION EVENT LINKED TO THE CENTRAL ATLANTIC MAGMATIC PROVINCE DETERMINED THROUGH DIRECT MEASUREMENTS OF CO_2 FROM FLUID INCLUSIONS IN DEEP SEA CHERTS DURING THE END-TRIASSIC EXTINCTION

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The Central Atlantic Magmatic Province (CAMP) has been proposed as the most temporally conspicuous trigger for the marine and continental end-Triassic extinction (ETE), ~201.6 Ma. The CAMP may have caused the ETE via short-term but intense volcanic winters from SO_2 and long-term global warming and ocean acidification from CO_2. Previous work has demonstrated a doubling of atmospheric pCO_2 following the initial emplacement of the CAMP. However, the extent of ocean acidification in the deep ocean at the ETE has not been quantified. We use fluid inclusions from bedded cherts (Inuyama, Japan) to reconstruct the deep ocean volatile content through the onset of the ETE and test the ocean acidification hypothesis. Volatiles in chert fluid inclusions were quantified by crushing under high vacuum into a quadrupole mass spectrometer. Our results show a tripling of CO_2 mol% and $[CO_2]_{aq}$ as well as a decrease in pH and Ω_{arag} through the extinction interval followed by a return to pre-event values after the ETE. The maximum CO_2 values, minimum pH, and Ω_{arag} values in the deep ocean coincides with the onset of the oldest known CAMP lava flows in Morocco, based on the alignment with the continental and marine biotic extinction. However, an increase of CO_2 before the earliest of the preserved lava flows suggests a significant unknown earlier eruptive phase or degassing of CO_2 before the initial eruptive phase of the CAMP. The gradual pH and Ω_{arag} decrease following the event is consistent with model predictions of the continental silicate weathering response to the emplacement of continental flood basalts. The calculated pH and saturation, based on the fluid inclusion data, suggests that the deep ocean experienced intense and protracted acidification prior to and during the initial extrusive phase of the CAMP. This observation is consistent with previous work showing surface ocean acidification and a coral gap at the onset of the ETE. Intense ocean acidification and warming was likely the driver for the marine extinction, causing calcifiers to perish and other organisms that depend on them to follow suit, whereas the pattern of the terrestrial extinctions is most consistent with volcanic winters that favored survival of insulated forms capable of surviving.

Session No. 26

T3. Northern Appalachian Magmatism: From the Precambrian to the Cretaceous
Monday, 18 March 2024: 1:30 PM-5:30 PM

Merrimack Room (Doubletree by Hilton)

Geological Society of America *Abstracts with Programs.* Vol. 56, No. 1
doi: 10.1130/abs/2024NE-397766

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