Permian volcanism contributed to atmospheric greenhouse gas content in Antarctica

April 2 2019

The Choiyoi magmatic Province, with an estimated volume of ~1.3 million square kilometers, represents a voluminous Permian subduction-related volcanic episode that has thus far been described only from South America. In their new paper for *Lithosphere*, Demian Nelson and John Cottle investigated Permian volcaniclastic rocks from central Antarctica to determine the potential magmatic source of volcanic detritus in southwestern Gondwana.

Permian volcanic deposits are and record voluminous silicic continental arc that may have contributed to Permian global warming and environmental degradation. Nelson and Cottle present new age and in-situ Hf isotopic data from the mineral zircon greatly expand the known distribution of Choiyoi-related deposits and highlight the importance of voluminous subduction-related volcanism, termed "arc flare-up" events, that may contribute a first-order control on atmospheric greenhouse gas contents.

For instance, the Permian period contained one of the most severe environmental degradation and mass extinction events in Earth's history. Climate change and biotic crises during this time have been attributed to the massive release of greenhouse gases during Large Igneous Province eruptions (e.g., the Siberian Traps and Mishna).

These new age data for the Choiyoi Province correlate with a global

increase in arc magmatic flux, a decrease in delta-13C, and an increase in global atmospheric CO2 that began prior to emplacement of the Siberian Traps. Consequently, these findings support recent advancements in the field that point to arc flare-up events as contributing a first-order control on atmospheric greenhouse gas content. Major environmental degradation and mass extinction events, ultimately, may have been the result of high magmatic flux events, such as the Choiyoi Province occurring synchronously, or near synchronously, with a Large Igneous Province event, such as the Siberian Traps or the Mishna.

This finding represents the southernmost documented extension of this broad volcanic and magmatic province that is distinct from continental arc activity recorded in the central Transantarctic mountains, Marie Byrd Land, Zealandia, and Australia.

More information: D.A. Nelson et al. Tracking voluminous Permian volcanism of the Choiyoi Province into central Antarctica, *Lithosphere* (2019). DOI: 10.1130/L1015.1

Provided by Geological Society of America