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Mercury isotope evidence for sustained regional volcanism in south China before and after the Permian-Triassic boundary

Oluwaseun Edward[1], André Navin Paul[2], Hugo Bucher[3], Borhan Bagherpour[3,4], Aymon Baud[5], Thierry Adatte[5], Jeroen Sonke[6], Urs Schaltegger[2], and Torsten Vennemann[1]

[1]University of Lausanne, Institute of Earth Surface Dynamics, Lausanne, Switzerland (oluwaseun.edward@unil.ch)
[2]Department of Earth Sciences, Université de Genève, Rue des Maraîchers 13, CH-1205 Genève, Switzerland
[3]Paläontologisches Institut der Universität Zürich, Karl Schmid-Strasse 4, 8006 Zürich, Switzerland
[4]Department of Earth Sciences, Faculty of Science, Shiraz University, Shiraz, Iran
[5]Institute of Earth Sciences, Géopolis, University of Lausanne, CH-1015 Lausanne, Switzerland
[6]Observatoire Midi-Pyrenees, Geosciences Environnement Toulouse, CNRS/IRD/Universite Paul Sabatier Toulouse 3, 14 avenue Edouard Belin, 31400 Toulouse, France

The Permian-Triassic boundary mass extinction (PTBME) is recognized as the most severe extinction of the Phanerozoic and has been causally linked to the Siberian Traps Large Igneous Province (STLIP) volcanism (e.g., Burgess and Bowring, 2015; Svensen et al, 2009; Sanei et al., 2012). This link is suggested based on the approximate temporal coincidence of STLIP magmatism and sedimentary successions straddling the PTB, which bear evidence of faunal extinction as well as elevated mercury (Hg) concentrations. However, several marine successions spanning the Late Permian to Early Triassic do not have elevated Hg content or are not synchronous in terms of their Hg concentration “anomalies” and the PTB interval (e.g., Sial et al., 2020). Furthermore, Hg sequestered in marine sediments may differ in provenance and its depositional pathways (Yager et al., 2021), complicating the use of Hg anomalies as a direct and reliable proxy for volcanism. This study investigates Hg concentrations and Hg isotopic composition together with total organic carbon (TOC) content, organic carbon $\delta^{13}C$ values and element concentrations from two deep-water PTBME sedimentary sections in the Nanpanjiang basin, south China, spanning the Late Permian to Early Triassic. The Hg anomaly in these successions is found to coincide with the nadir of the negative C-isotope excursion close to the PTB. However, based on both the fossil associations as well as precise U-Pb ages for volcanic ash layers within these successions, these anomalies are of Griesbachian age. Hg isotope compositions support a volcanic origin and constant provenance for the Hg across the entire interval studied. These features, together with the common occurrence of volcanic ash beds throughout the investigated successions, are compatible with regional volcanic arc magmatism as a probable source of the Hg. The present results highlight that elevated Hg concentrations in marine successions straddling the PTB in south China cannot be unequivocally linked to STLIP volcanism.

References

Burgess, S. D., and Bowring, S. A., 2015, High-precision geochronology confirms voluminous magmatism before, during, and after Earth's most severe extinction: Science Advances, v. 1, no. 7, p. e1500470.

Sanei, H., Grasby, S. E., and Beauchamp, B., 2012, Latest Permian mercury anomalies: Geology, v. 40, no. 1, p. 63-66.

Sial, A., Chen, J., Lacerda, L., Korte, C., Spangenberg, J., Silva-Tamayo, J., Gaucher, C., Ferreira, V., Barbosa, J., and Pereira, N., 2020, Globally enhanced Hg deposition and Hg isotopes in sections straddling the Permian–Triassic boundary: Link to volcanism: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 540, p. 109537.

Svensen, H., Planke, S., Polozov, A. G., Schmidbauer, N., Corfu, F., Podladchikov, Y. Y., and Jamtveit, B., 2009, Siberian gas venting and the end-Permian environmental crisis: Earth and Planetary Science Letters, v. 277, no. 3-4, p. 490-500.

Yager, J. A., West, A. J., Thibodeau, A. M., Corsetti, F. A., Rigo, M., Berelson, W. M., Bottjer, D. J., Greene, S. E., Ibarra, Y., and Jadoul, F., 2021, Mercury contents and isotope ratios from diverse depositional environments across the Triassic–Jurassic Boundary: Towards a more robust mercury proxy for large igneous province magmatism: Earth-Science Reviews, p. 103775.