Biotic extinction at the Norian/Rhaetian boundary (Upper Triassic): geochemical and isotope evidence of a previously unrecognised global event

MANUEL RIGO1, TETSUJI ONOUE2, HONAMI SATO2, YUKI TOMIMATSU2, KATSUHITO SODA3, LINDA GODFREY4, MIRIAM KATZ5, HAMISH J. CAMPBELL6, LYDIA TACKETT7, MARTYN GOLDING8, JERRY LEI9, JON HUSSON9, MATTEO MARON10, SARA SATOLLI10, MARIACHIARA ZAFFANI1, GIUSEPPE CONCHERTI1, ANGELA BERTINELLI11, MARCO CHIARI12 AND LAWRENCE TANNER13

1University of Padova
2Kyushu University
3Kochi University
4Rutgers University
5Rensselaer Polytechnic Institute
6GNS Science
7North Dakota State University
8Geological Survey of Canada Vancouver
9University of Victoria
10G. d’Annunzio University of Chieti-Pescara
11University of Perugia
12CNR
13Le Moyne College

Presenting Author: manuel.rigo@unipd.it

The latest Triassic was an interval of prolonged biotic turnovers culminating in the so-called End-Triassic Extinction. We attribute onset of this interval of declining diversity to unusually high volcanic activity at the Norian/Rhaetian boundary (NRB) that may have initiated the stepwise extinctions of the Late Triassic [1]. We correlate the initiation of a rapid decline in $^{87}$Sr/$^{86}$Sr and $^{187}$Os/$^{188}$Os seawater values [2, 3] to a negative organic carbon isotope shift, which we attribute to volcanogenic CO$_2$ outgassing to the ocean-atmosphere system by the Angayucham large igneous province (LIP). By studying the geochemical and isotope composition of bulk rocks from different sections located at different latitudes, sides of the Pangea continent and Hemispheres, we documented an accelerated chemical weathering due to global warming by elevated CO$_2$, which enhanced nutrient discharge to the oceans and thus greatly increased biological productivity; higher export production and oxidation of organic matter led to oceanic dysoxia to anoxia at the NRB. Biotic consequences of these climatic and environmental changes include severe extinctions of several fossil groups, such as ammonoids, bivalves and radiolarians, as has been documented worldwide [1].

[1] Rigo et al. (2020), Earth-Science Reviews 204, 103180
[3] Nozaki et al. (2019), Journal of Asian Earth Sciences 1,