Mg isotope clue for restriction of the Tethys ocean during the P-T transition

WEIQIANG LI[1*], ZHONGYA HU[1], HUA ZHANG[2], KARL KRAINER[3], QUANFENG ZHENG[2], SHUZHONG SHEN[2],

[1]School of Earth Sciences and Engineering, Nanjing University, (*correspondent: liweiqiang@nju.edu.cn)
[2]Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences
[3]Institute of Geology, University of Innsbruck

The Permian-Triassic transition witnessed the largest mass extinction event in Earth's history, but its cause-effect links remain unsolved. Here we address this issue using Mg isotope compositions of syndepositional dolomite from a well-characterized drill core in Carnic Alps of Austria. $\delta^{26}Mg_{dolomite}$ shifted remarkably around the extinction interval, and anti-correlated with the global perturbations in carbonate $\delta^{13}C$ during that period (see figure below). The results suggest that Mg isotope compositions of seawater fluctuated by 0.4‰ within ~750 kyr, at a very rapid rate despite that Mg is a major cation in seawater. Modelings reveal that the fast positive drifts in seawater $\delta^{26}Mg$ required extremely short resident time for Mg in the Tethys ocean, which was caused by 7-times enhanced dolomitization and transient periods of ocean restriction for the Tethys ocean. The restriction may have caused stagnancy in oceans that triggered expansion of ocean anoxia globally. Further, the Mg isotope records reflect radical changes in major cations of seawater in the Tethys ocean during the Permian-Triassic transition, which exacerbated the crisis for skeletal marine organisms.