Mercury deposition as a proxy for volcanism through the Ordovician-Silurian boundary, South China

QING GONG[1], LAISHI ZHAO[1,*], ZHONG-QIANG CHEN[2], XIANGDONG WANG[3]

[1]State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan, 430074, CHINA
[2]State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Wuhan, 430074, CHINA
[3] State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan, 430074, CHINA
*corresponding author, email: zhaolaishi5@sina.com

Recently, researchers gradually found that the drastic volcanisms in Late Ordovician may have been responsible for the mass extinction events in Ordovician-Silurian boundary. However, the triggering mechanism for this great biocrisis has long been debating, with various hypotheses proposed. Meanwhile, growing evidence shows that Hg can be a proxy for volcanism. Here, we use the Hg element to verify the hypothesis of whether the intense volcanisms caused the mass extinction events through the Ordovician-Silurian boundary.

The samples including the whole Ordovician and early Silurian have been systematically collected from three sections in Yangtze region (platform), south China and formed a complete Ordovician succession. In the laboratory, fresh parts of clean samples were powered in a Retsch® MM400 oscillating mill. Hg was measured by a LECO® AMA254 mercury analyzer, and total organic carbon (TOC) content by a Elementar® vario Macro cube.

The data show that overall Hg concentrations varied from 0.001 to 0.233 μg/g throughout the whole Ordovician and Early Silurian. Hg concentrations have a long-term trend of low value (0.001 to 0.005 μg/g), which is the background value before late Katian. In Hirnantian there is a slight shift to higher value about 0.2 μg/g. In general the Hg data have closely parallel trends with total organic carbon (TOC) content. The Hg/TOC ratio dramatically increased at the Katian-Hirnantian boundary, near the biotic extinction horizon, and then decreased to the background level. The results suggest that the anomalous Hg/TOC ratio levels may be attributed to the significant natural atmospheric emissions of Hg caused by catastrophic volcanic eruptions in Late Katian, which produced global Hg positive anomalies and may cause the mass extinction events in the Ordovician-Silurian boundary.