Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9184

Reconstruction of the late Miocene redox condition in the eastern Arabian Sea at IODP Site U1457 of Laxmi Basin using stable isotopes of molybdenum and tungsten

MAHBOOB ALAM[1], MUGULI TRIPTI[2], GP GURUMURTHY[1], YOSHIKI SOHRIN[3], TSUJISAKA M[4], AD SINGH[5], SHOTARO TAKANO[6] AND KOMAL VERMA[5]

[1]Birbal Sahni Institute of Palaeosciences
[2]National Centre for Earth Science Studies
[3]Kyoto University
[4]Institute for Chemical Research, Kyoto University, Japan
[5]Banaras Hindu University, Varanasi
[6]Institute for Chemical Research, Kyoto University

Presenting Author: mahboob.alam@bsip.res.in

This study presents the first results on palaeoredox condition in the northern Indian Ocean since the late Miocene using non-traditional stable isotopes of molybdenum (Mo) and tungsten (W). For this, the marine sediment samples were collected at the Site U1457 (67°55.80'E, 17°9.95'N, water depth 3534m) of Laxmi Basin during IODP 355 Arabian Sea monsoon expedition. The redox sensitive trace elements (Mo, W, U, V, Ba, Cd and P) as well as stable molybdenum isotope ($\delta^{98/95}$Mo relative to NIST SRM 3134 lot No. 130418) and stable tungsten isotope ($\delta^{186/184}$W relative to NIST SRM 3163 lot No. 080331) compositions were used as a palaeoproxy to demarcate the long-term (million-year scale) ocean deoxygenation history. The bulk Mo concentration in the core sediment varied from 0.25 μg g^{-1} to 3.59 μg g^{-1} (avg. 0.74 μg g^{-1}) which is less than that of the average upper continental crust (UCC) concentration. The W concentration in the sediment varied from 0.49 μg g^{-1} to 3.67 μg g^{-1} (avg. 1.75 μg g^{-1}) which is close to the UCC value. The concentrations of other trace elements were in the range of 0.63 μg g^{-1} to 4.55 μg g^{-1} (avg. 1.93 μg g^{-1}) for U, 50 μg g^{-1} to 240 μg g^{-1} (avg. 136 μg g^{-1}) for V,0.81 μg g^{-1} to 1.65 μg g^{-1} (avg. 0.26 μg g^{-1}) for Cd, 112 μg g^{-1} to 690 μg g^{-1} (avg. 391 μg g^{-1}) for Ba, and 0.04 μg g^{-1} to 0.27 μg g^{-1} (avg. 0.06 μg g^{-1}) for P. The $\delta^{98/95}$Mo values were between -0.70‰ and +1.18‰ while the $\delta^{186/184}$W values were between -0.02‰ and +0.21‰. The results suggests that the water column in the eastern Arabian Sea was oxic during late Miocene and Pliocene while oxic to suboxic during Pleistocene. The molybdenum isotope composition represents minor authigenic component whereas tungsten isotopic composition reflects detrital source signature. The study also demonstrates that tungsten isotope undergoes less fractionation under oxic to suboxic condition with limited particle shuttling.