Diagenetic Origin of Moretane Anomalies in the Late Permian and Early Triassic K. L. French[1], N.J. Tosca[2], C. Cao[3], R.E. Summons[4] [1]Joint Program in Chemical Oceanography, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, Cambridge, Ma 02139, United States. [2]Department of Earth Sciences, University of St Andrews, St Andrews, KY16 9AL, Scotland UK. [3]State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, Jiansu, 210008, China. [4] Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Ma 02139, United States

The spatial distribution of clays has played a key role in the evaluation of potential landing sites for the Mars Science Laboratory (MSL) and the eventual selection of Gale Crater. The reasons for considering clays in this decision are two-fold. First, the presence and types of clays as indicated by spectroscopic data provide strong indicators of past environmental conditions. Second, the exceptional preservation of organic matter by clays is highly relevant for accomplishing the scientific objectives of the MSL. However, clays also mediate the stereochemistries of organic molecules. Stereochemistry, in particular enantiomeric excess and diastereoisomeric preference, are measurable and valuable molecular biosignatures by which we might recognize other carbon-based life forms [1]. Yet in the terrestrial system, biological stereochemistries are altered over time as organic matter undergoes degradation and these diagenetic processes are mediated by organic-mineral interactions. The exact mechanisms by which certain minerals affect biomarker stereochemistries are not well constrained, but the Permian-Triassic Boundary (PTB) section at Meishan in South China provides an opportunity to test the complex relationship between lithology and the stereochemistry of bound molecules.

The 17β(H),21α(H)-moretane/17α(H),21 β (H) hopane ratio is conventionally used as a thermal maturity indicator, but like other geochemical parameters, organic source input and depositional environment can modulate the measured moretane/hopane ratios of lipid extracts [2]. We present the moretane/hopane record of $C_{30\text{-}34}$ homohopanes and $C_{31\text{-}33}$ methylhomohopanes from a drill core spanning the initiation and recovery intervals of the Late Permian Extinction (LPE; 252.25 Ma) as recorded in the Meishan section [3]. Three intervals of anomalous moretane/hopane ratios are observed. Carbonate measurements and clay analysis implicate lithology as a primary factor for generating the moretane/hopane anomalies at Meishan. It seems likely that certain clay types, particularly chlorite, illite, and illite/smectite mixed layer clay, preferentially bind and protect triterpanes having the unstable 17β(H),21α(H) stereochemistry. The C_{35} Homohopane Index, a redox indicator, shows an inverse correlation moretane/hopane ratios implicating a detrital origin for the moretane anomalies. These results have important implications for the interpretation of stereochemical biosignatures in the context of life detection on early earth and in extraterrestrial materials.

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