Productivity markers: inorganic and isotopic proxies versus biomarkers

C. OSTERTAG-HENNING

Geologisch-Paläontologisches Institut, Westfälische Wilhelms-Universität, 48149 Münster, Germany, (coh@uni-muenster.de)

During ODP Leg 167 aiming at the long-term reconstruction of the California current system a dedicated hole (E) has been drilled at site 1017 60 km offshore Point Conception. Nowadays this location is situated within an upwelling center. The core interval presented here spans the continuous uppermost four sections – dated by ^{14}C AMS as the time frame of the last 25 ka with nearly constant sedimentation rates – and hence changes in concentrations equal changes in accumulation rates. The trace element contents point to oxygen depleted conditions at the sediment-water interface for the time interval investigated.

A variety of possible productivity proxies have been determined, ranging from inorganic measures as $Ba_{(bio)}$, the nitrogen isotopic composition of the sediments, to a number of organic biomarker concentrations.

The signature of biogenic barium in the sediments is overwhelmed by the varying contents of Ba-rich K-feldspar, which account for more than 90% of the sedimentary Ba. The nitrogen isotopic composition changes rapidly from low values in the glacial to elevated values in the Bölling/Alleröd, then back to lower values in the Younger Dryas and finally to high values in the Holocene. But this change can be attributed likewise to a local variation in productivity or a more than regional variation in the influence of subtropical water masses with ^{15}N enriched nitrate.

The total organic carbon contents mimic the large changes of the $\delta^{15}N$ signal: Low values in the glacial and the Younger Dryas, elevated ones in the Bölling/Alleröd and the Holocene. The increase in the uppermost centimetres is attributed to incomplete early diagenesis. This is reflected by the highest biomarker concentrations there, too.

The chlorophyll- and pigment-derived compounds measured – total chlorins, phytol, loliolide, isololiolide – confirm the trend of TOC. And they confine the variations as changes in marine export productivity as the mentioned compounds differ in their resistance to degradation under varying diagenetic conditions.

The more producer-specific compounds as alkenones, alkandiols, alkanketools and some sterols point to variations in the primary producer assemblage, especially during the glacial-interglacial transition. But in general they confirm the aforementioned productivity changes in time. And taken together they rule out an artificial alteration of the biomarker signal by diagenesis.

Therefore a combination of less organism-specific organic molecules (chlorins) and more specific biomarkers with different susceptibility to diagenetic alteration (e.g. alkenones and sterols) is suggested as the most practical tool to decipher changes in past ocean productivity in comparable settings.

Geochemical compositions of carbonate rocks and their acid-insoluble residues: implications for the genesis of dolomite

OUYANG ZIYUAN, JI HONGBING, WANG SHIJIE, YANG RUIDONG ANDWANG SHANGYAN

State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China (hbji@sina.com)

This paper attempts to constrain the genesis of Paleozoic dolomites developed on the carbonate platform in Guizhou Province, China from studies on the mineralogy, geochemistry, Sr and Nd isotopic composition of carbonate rocks and their acid-insoluble residues from southwestern Yangtze platform. The contents of Na, Fe, Mn and Sr in carbonate rocks are: 371-593 ppm, 155-1787 ppm, 23-62 ppm and 62-136 ppm, respectively for the Triassic dolomites, and; 591-667 ppm, 622-933 ppm, 38-139 ppm and 358-117 ppm respectively for the Triassic limestones. Only the chondrite-normalized rare earth element distribution patterns of the Triassic limestones are approximate to those of shales and the upper continental crust (UCC) while those of most of the dolomite samples are consistent with the REE distribution patterns of seawater. An Early Triassic dolomite section is characterized by a high total REE amount, a remarkable Ce anomaly and abnormal MREE and HREE enrichments. As for the Sr and Nd isotopic composition of carbonate rocks are $^{87}Sr/^{86}Sr$=0.7080-0.7083, $\varepsilon_{Nd}(_0)$ = -10.7- -8.4 and $f_{Sm/Nd}$ = -0.44- -0.38. The abnormal REE distribution patterns are corresponding to the positive $f_{Sm/Nd}$ values and $\varepsilon_{Nd}(0)$ = -6.2. Geochemical characteristics of the acid-insoluble residues suggest that the composition of continental source region be an indispensable factor that constrains the formation of dolomites. Isotopic and trace elemental compositions suggest that dolomites developed from normal seawater. The formation of dolomites seems to have been reworked by later processes of diagenesis. A forming model has been suggested for the Early-Middle Triassic dolomites under our investigation.