Authigenic zircons and monazites in Ediacaran sediments of the Yangtze Platform (South China)

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Understanding the appearance of multicellular life during the Ediacaran period (635-542Ma) and the influence of changing environmental conditions, will benefit from the availability of precise absolute time constraints on Ediacaran sedimentary successions. Previous attempts to date these sediments have mostly relied on U-Pb dating of zircons from intercalated ash beds. We have initiated a search for authigenic accessory minerals in Ediacaran shales, carbonate rich sediments, cherts and phosphorites from the Yangtze Platform (Southern China) in order to assess the potential for direct dating of these lithologies.

Selected Ediacaran to lower Cambrian shales, cherts and carbonate bearing sediments were examined petrographically and using electron microprobe analysis. Samples include sediments from both shallow platform settings and deeper depositional environments (slope facies). Presumably authigenic zircons and monazites can be identified on the basis of their shapes, grain size, and absence of chemical zoning. The typical size of these minerals in thin section is ca. 10 µm, with a few grains reaching diameters of up to 30µm. On average, between 5 and 50 of such grains can be identified in a thin section. These grains occur interstitally, or sometimes intergrown with major minerals such as quartz, clay minerals, apatite, calcite, dolomite and feldspar. Monazites often show irregular to framboidal shapes. These grains are aggregates that are comprised of many microcrysts. Angular grains are common among zircons. Their origin as fragments of detrital grains can at present not be excluded. Some zircons, however, are comprised of aggregates of microcrysts, and thus must have formed by diagenetic processes. Both minerals occur in most sediments deposited in deep water environments of the Ediacaran that were studied. In lower Cambrian anoxic sediments, zircon occurs only sporadically, and monazites have not been observed. The formation of authigenic zircons and monazites suggests localized mobilization of rare earth elements and Zr during diagenesis. The physicochemical conditions that lead to the formation of these minerals are at present not understood. Given the small grain sizes, the potential of these minerals for precise *in situ* U-Pb geochronology must be evaluated.

Sterols as markers of climatic variabilities in Southeast Brazil

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Introduction

Cabo Frio upwelling principally controlled by Northeast winds causes intermittent but significant biological responses in the water column. The forces influencing the intensity and frequency of upwelling may be bound to larger scale climatic factors. In this work, aliphatic hydrocarbons and sterols were used to investigate the origin of organic matter in two dated sediment cores and to evaluate possible changes in the upwelling system during the late Holocene.

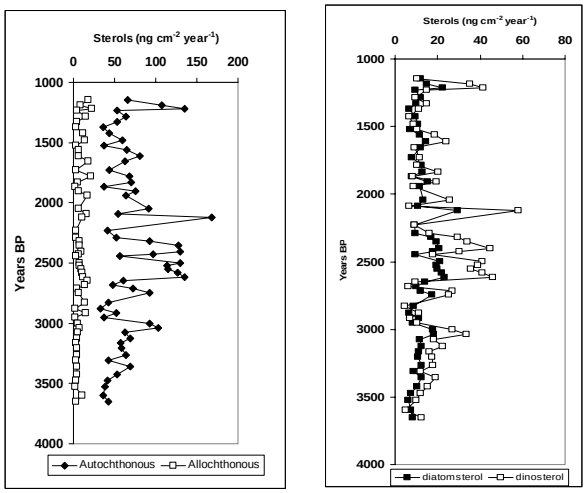

Figure 1: Sterol accumulation rates in core 1.

Discussion of Results

Organic matter is strongly influenced by material derived from diatoms and dinoflagellates, while there is minor influence of allochthonous organic matter. A millennial increasing trend in autochthonous sterol accumulation rates occurs between 3600 BP and 2100 BP (Fig. 1). This is superimposed to 100-200 years variations. Peak production of diatoms appears between 2600 and 2100 BP when ENSO negative oscillation frequency was reduced [1] concurring with more persistent upwelling events.

[1] Moy *et al.* (2002) *Nature* **420**, 162-165.