

ORBITAL CYCLICITY IN HIGH-LATITUDE SEDIMENTS: SPECTRAL ANALYSIS OF MULTI-SENSOR, CORE-LOGGING DATA

J. Chi (Special Research Project 313, Kiel, Germany) and J. Mienert

Multi-Sensor, core-logging data (magnetic susceptibility, gamma ray attenuation density, compressional-wave velocity) plotted against depth show cyclic patterns. If these patterns are records of periodic orbital forcing, then they have to conform to its frequencies.

In this study the logging data were time-calibrated using a standard oxygen isotope record. The magnetic susceptibility records were converted to age and show a good correlation between sites in a variety of pelagic sediment provinces.

We represent the spectral analysis of several deep-sea sediment cores retrieved from the Rockall Plateau and the Norwegian-Greenland Sea. The spectrums reveal most of the mean frequencies centered at 19 ka, 23 ka, 41 ka and 100 ka. The predominant period corresponds to 100 ka with large variations in the amplitudes of the peaks. The common characteristics, differences and difficulties in applying spectral analysis to high-latitude, core-logging data will be discussed.

COUPLED STABLE-ISOTOPE AND TRACE-ELEMENT ANALYSIS OF MICROGRAM QUANTITIES OF CARBONATES AS INDICATORS OF MARINE ENVIRONMENTS

(Abstract prepared for the ICP IV workshop on Stable Isotopes in Paleoceanography)

A. Chivas (Research School of Earth Sciences, The Australian National University, Canberra), J.A. Cali, A. Chapman, E. Kiss, J.M.G. Shelley, X. Wang, P. De Deckker, F. Peerdeman, and M.K. Gagan

A new analytical technique that produces $\delta^{18}\text{O}$, $\delta^{13}\text{C}$, Sr/Ca, Mg/Ca (and potentially $^{87}\text{Sr}/^{86}\text{Sr}$) results on the same microaliquot (down to $\sim 30 \mu\text{g}$) of CaCO_3 is being applied to the study of climatic histories in both the lacustrine and marine environments.

The apparatus consists of a Finnigan automated individual-carbonate reaction device (Kiel), wherein a few drops of 107% H_3PO_4 acid are dosed into 44 individual reaction thimbles at 70°C containing the carbonate samples. The originally designed apparatus has been modified both in the Bremen factory and in Canberra to accommodate longer sample thimbles (66 mm) composed of pure silica. The acid is also delivered from a silica reservoir. The required high-purity phosphoric acid currently manufactured in our laboratory has reaction plus reagent blank levels of 14 ppb Ca, 2 ppb Mg and 0.04 ppb Sr. After mass spectrometric analysis of the evolved CO_2 , the acid-reaction residues are diluted in each reaction thimble and these thimbles transferred directly to the sample holder of an automated inductively-coupled argon plasma atomic emission spectrometer for analysis of Ca, Mg and Sr contents. The limits of detection for Ca, Mg and Sr are respectively 36, 24 and 32 pg/g (parts per trillion) in solution.

The technique has been applied to situations where decoupling of palaeoclimatic signals provided from trace elements and oxygen isotopes is desirable. For example, in some biogenic marine carbonates, the Mg/Ca ratio is a function of temperature and thus coupled Mg/Ca and $\delta^{18}\text{O}$ measurements can