Geophysical Research Abstracts, Vol. 7, 09730, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09730

Growth Band Analysis in *Porites* Corals: A fully unexplored Tool in Palaeoclimatology. Late Miocene, Island of Crete (Greece)

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Shallow water limestones of late Miocene age are widely distributed in the Circum-Mediterranean area. On a Mediterranean scale, coral reef growth was largely persistent over the Late Miocene in the eastern Mediterranean province, whereas in the central and western Mediterranean, reef growth was intermittent and ephemeral. The presence of coral reef systems is generally interpreted to reflect warmer than present surface water temperatures, and an increasingly wide geographic distribution of coral reefs over the course of the Late Miocene is believed to reflect overall warming over the reef threshold temperature and less influence of cool waters entering from the Atlantic.

On the island of Crete (Kroussonas area) in the eastern Mediterranean, coral reef growth started during early Tortonian (10 Ma) and was largely continuous until the Early Messinian (5 Ma), however, synsedimentary blockfaulting resulted in dislocation of reef sites and comparatively small patch reefs. The reefs were located on clastic wedges (deltas) and cliffs formed by uplift of Mesozoic basement rocks. The reef framework is made of densely packed massive or branching *Porites* and *Tarbellastrea* with minor *Acanthastrea* and *Siderastrea*. Analysis of annual banding patterns in massive *Porites* shows, that there was a maximum in growth rates during the “early” Tortonian, followed by a minimum during the “middle” Tortonian and a maximum

during the “late” Tortonian and “early” Messinian. A seasonally-resolved oxygen isotope record of a *Porites* coral documents interannual climate variability in the eastern Mediterranean Sea during the “early” Tortonian. The 70-year coral record indicates enhanced variance at interannual timescales that are similar to present-day climate variability in the eastern Mediterranean. Today, the region’s climate is sensitive to the Arctic Oscillation/North Atlantic Oscillation (AO/NAO), the Northern Hemisphere’s dominant mode of atmospheric variability. Based on this coral record we conclude that AO/NAO-like atmospheric variability played a role in Northern Hemisphere climate dynamics 10 Ma ago. From simulations with an atmospheric circulation model coupled to a mixed-layer ocean model we infer that Tortonian interannual variations of sea surface temperature and hydrologic balance in the eastern Mediterranean were controlled by variability related to the Icelandic Low, which is one of the centers of the present-day AO/NAO. Until now, however, a consistent age model is not available and a robust correlation with global changes or events has therefore not been established. Although work is needed to tie our highest-resolution shallow water record into global palaeocenography and stratigraphy, our results clearly demonstrate that growth band analysis can make important contributions to our understanding of Neogene palaeoclimatology.