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On the Pliocene terrigenous supply and the long-eccentricity cycle in the carbon record in the Mediterranean Sea

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The pervasive existence of a long-eccentricity cycles (400 kyr) in carbon records (δ^{13}C and $CaCO_3$) in the global ocean [1] raises a question of how the oceanic carbon reservoir can respond to the orbital forcing, and what the mechanism could be behind this long-term eccentricity cycle. This latter has already been found in the planctonic and benthic foraminifera stable isotopes records in the South China Sea over the last 5 Ma and then correlated to many δ^{13}C records worldwide [1].

The Mediterranean Sea is a basin very similar to the South China Sea: Pliocene sediments, carbon variations well expressed and under the influence of the low latitude climatic phenomenom of the monsoon. Oceanic sub-basins and marginal seas are often more responsive to paleoceanographic and paleoclimatic changes than global oceans because of their smaller size and partial isolation. This sensitivity to climatic change seems to be especially true for the Mediterranean Sea, where its sole connection to the world ocean has been the narrow and shallow Gibraltar Strait for 5.3 Ma.

The Capo Rossello composite section [2] located in the central part of the Mediterranean Sea, on the Sicily island and South Italia, presents one of the most complete sedimentary record from the upper messinian to the lower Pleistocene. It offers the best record of the carbonate cycles in the precession and eccentricity bands, and has been defined as influenced by the African monsoon [3, 4]. This section seems thus to be an excellent place to study the carbon response to orbital forcing during the Pliocene.

The Late Pliocene to Holocene sedimentary record of the Mediterranean Sea con-

tains multiple layers of dark-colored, organic-carbon-rich laminated "sapropels". The repetitive occurrence of these sapropels corresponds to precessional minima (23 kyr cycles), when the African monsoon is enhanced (increased seasonal contrasts and intensified runoff) [e.g. 3, 4]. It is admited that these layers are formed during periods of high rainfall and huge sediment and fresh water supply by the rivers [5]. Likewise, if the terrigeneous supply and the monsoon strength can have played a reliable role in the sapropelitic 23 kyr cycle, it may also be a major forcing parameter in the long-eccentricity carbon cycle.

The results presented here will focus on one 400-kyr cycle from the Punta Piccola section. High resolution records of magnetic susceptibility, major and trace elements geochemistry, and clay mineralogy of the terrigeneous fraction will try to assess the potential link between the 400-kyr carbon cycles in the Mediterranean Sea and the weathering rates on the European and African continents.

References

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