Geophysical Research Abstracts
Vol. 12, EGU2010-11636, 2010
EGU General Assembly 2010

Late Eocene sea retreat from the Tarim Basin (West China) linked to Asian aridification and Mediterranean Tethys

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The Paleogene sediments of the southwest Tarim Basin along the West Kunlun Shan in western China include the latest remnants of the easternmost extent of an epicontinental sea. It has been suggested that this sea used to extend across the Paleogene Eurasian continent and may have been linked to the Mediterranean Tethys before it separated as the Paratethys. However, the cause and paleoenvironmental impacts of this sea retreat remain elusive because of its still loosely constrained age. The regression has been associated to regional tectonics of the Indo-Asia collision or to global eustatic lowering during the initiation of Antarctic glaciation at the Eocene-Oligocene transition (EOT) 34 million years ago. Also, paleoenvironmental data is lacking to test climate model suggesting that the contribution of the sea retreat to aridification of Asian continental interiors and monsoon intensification is potentially as important as Tibetan plateau uplift.

In this study, bio- and magnetostratigraphic results from two sections recording the final marine regression out of the Tarim Basin are presented, providing a framework to reconstruct the role of the sea retreat with respect to global and regional climate. The regression is expressed by a transition from marine greenish clastic limestones to continental alluvial red beds. A rich biostratigraphic assemblage is recovered from the marine sediments including calcareous nannofossils, bivalves, dinoflagellate cysts, benthic foraminifera and ostracods. The microfossil associations indicate a shallow, saline, eutrophic and proximal depositional environment near a strongly arid continental catchment area. The last marine sediments are not younger than mid-Priabonian, whereas polarity pattern recognition in the directly overlying continental red-beds indicate a late Priabonian to Rupelian correlation. Chronostratigraphic synthesis of the bio- and magnetostratigraphic results thus reveal a major hiatus and indicate the long-term eustatic sea-level fall of the late Eocene led to the final retreat of the sea. As suggested by climate models, a late Eocene sea retreat may be linked to coeval aridification of the Asian interior expressed by other regional paleoenvironental records. Additionally, the strong correspondence of the dinoflagellate cysts recovered from the Paleogene sections of the Tarim Basin with records from the Western Tethys shows well-established connections existed between the Mediterranean Tethys and the basins of the Eurasian platform, which confirms the sea that covered the Tarim Basin during the Paleogene did belong to the Tethyan realm and the Paratethys had not yet separated in late Eocene time.