CLAY MINERALS IN THE SEDIMENTS OF PALEOCENE–EOCENE SEAS OF NE PERI-TETHYS

Talk

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In Paleocene to Eocene times, epicontinental seas covered most of present southern Russia and adjacent countries. These seas provided depositional environments for terrigenous, biogenic (calcareous, siliceous), and mixed terrigenous/biogenic sediments. Studies of clay minerals from these deposits reveals predominance of mixed-layer illite/smectite, illite, chlorite, and kaolinite. Proportions between these minerals vary across the area and stratigraphically. In general, the mineral assemblages reflect comparatively warm humid climate over most of the basin. At the same time, the basin's eastern margin and adjacent land (eastern Uzbekistan) were dominated by hot arid climate. Major embayments existing there (such as the Fergana embayment) provided environments favoring formation of magnesium silicates (chiefly palygorskite). The palygorskite occurs in considerable amounts in the Paleocene and Lower Eocene sequences (and in Upper Cretaceous strata) and is rock-forming. Higher in the stratigraphic succession it becomes reduced to a minor admixture. Certain Cretaceous–Paleogene sedimentary basins of West and Central Africa show a largely similar pattern of sepiolite and palygorskite distribution through the stratigraphy. Similarity of the magnesium clay mineral patterns in sections several thousands of kilometers apart might be, in our opinion, due to a combination of factors such as similarity of climates (and variations thereof) and eustatic sea-level changes. The hot, arid climate favored magnesium silicate minerals forming in certain environments such as brackish lagoons and shallow bays. These environments were, in turn, controlled by sea-level changes: dropping or rising sea level obliterated topographic features favoring palygorskite formation. At the end of the Ypresian, considerable decreases in sea level resulted in partial emergence of epicontinental basins. In West Africa, this led to vigorous eolation of emerged basinal areas, winds transporting considerable masses of palygorskite material to be deposited in the Atlantic as palygorskite-rich sediments. In Lutetian time, a rapid sea-level rise must have been responsible for open-sea environments expanding into West Africa and Middle Asia, leading to dramatic changes in the character of sediments, previously enriched in palygorskite.

Studying clay mineral assemblages in the sections of the upper Thanetian sapropelite horizon in NE Peri-Tethys (correlatable with LPTM) reveals no contrast between the sapropelite and enclosing rocks; certain sections adjacent to intrabasinal paleo-rises occasionally display slightly elevated kaolinite abundances.

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