Reconstructing the Late Cretaceous geodynamics of Neotethys by geochemical study of the mudstones in the Central Sakarya Region, NW Anatolia

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In this study geochemical composition of the Late Campanian – Early Danian deep-marine mudstones were investigated to enlighten the provenance of the Central Sakarya Basin. Changes in the ratios of elements related with ultramafic/mafic (Ni, Cr, Ti, Rb) to felsic (Zr, Y, K2O) provenances were examined through the section. Furthermore some trace element based graphs were used to understand the tectonic setting.

The 725 m thick İsmailler section is composed of mostly mudstones; only the Early Danian shows alternation of thin limestones with mudstones. To understand the characteristics of source rocks Rb/K2O, Ti/Zr, Ni/Zr, Ni/Y and Cr/Zr ratios (mafic/felsic ratios) were used and similarities of trends in all ratios were remarkable. According to the trends of graphs the section can be divided into three parts: 0-254 m (latest Early Campanian – earliest Early Maastrichtian), 254 – 709 m (earliest Early Maastrichtian – Early Danian), and 709th m to the top (Early Danian). Mafic/felsic ratios increase over the first 254 m and thereafter remain nearly constant. After the K/T Boundary (709th m) a major decrease occurs. When the trends in all ratios are considered it can be suggested that in the first 254 m of the section, source area was firstly dominated by felsic rocks. Towards the top mafic/ultramafic sources become abundant and till the K/T Boundary changes in the provenance were not significant. Although in all graphs major shifts can be seen at K/T Boundary, these should be controlled by the impact rather than change in provenance.

To understand the tectonic setting of the İsmailler Section, graphs of La vs Th, La/Th vs Hf and Th/Sc vs Zr/Sc were used. In these graphs each part of the section is investigated separately. In the La vs Th graph, 0-254 m of the section corresponds to a continental island arc while upper levels belong to an oceanic arc setting. La/Th vs Hf graph plots Late Campanian levels in to a felsic arc setting, however towards the top first a mixed arc and later an andesitic arc setting becomes significant. According to the Th/Sc vs Zr/Sc graph, contribution of upper continental crust is obvious for first 254 meters, but at the end of the Cretaceous contribution of mantle becomes more dominant.

The chemical composition of the mudstones summarized above, suggest that the basin was fed from a continental island arc/continental crust (felsic source) in Late Campanian and from the beginning of the Late Maastrichtian, oceanic arc or most probably uplifted slices of oceanic crust (mafic source) became dominant source area due to the beginning of collision.