Clay mineralogy and geochemical characterisation of the Lutetıen aged sedimentary formation in Kastamonu region (N. Turkey): Determining the origin and province

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The study area is situated in Seydiler and İmranlar village, at the north of Kastamonu (Turkey). In this area Precambrien aged basement rocks take place at the bottom of the stratigraphical sequence. This basement rocks consist of gneiss, granite and marble. Paleozoic and Cenozoic units unconformably overly on the older formations. Cenozoic aged formations consist of polygenic conglomerate, sandy limestone, marl, limestone, clayey limestone. In this study, stratigraphic sections were measured at the different locations from Seydiler formation and samples were collected from these sections. The purpose of this study is to determine the whole rock analysis, the mineralogical and geochemical properties and clay fraction, and to investigate the origin and provenance. Based on the results of whole rock analysis, clay, calcite, mica, quartz, feldspar are the main minerals identified.In clay fraction, smectite was found as a dominant mineral, illite is the second important mineral in the study area. Kaolinite, 10I-14C and vermiculite minerals were also found as minor amounts.

Based on the chemical analysis results of clay fractions, Al_2O_3 is an important oxide in the clay minerals and which were named as beidellite. Fe_2O_3 is the second important oxide and it is found in octahedral position. Content of MgO is lesser amounts in clay fraction and K_2O is found in interlayer position. Variation of clay mineral abundance can be interpreted, the sediments derived from different source areas. In this study, illite derived from the metamorphic rocks located at the basement rocks in the study area. Smectites can occur as a result of the transformation product of feldspars.

Hf and Nd isotope records of West African monsoon precipitation in sediments from the Niger Delta

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The Niger River basin is characterized by a strong north to south precipitation gradient, encompassing several climatic zones from the arid Saharan desert to the Adamawa tropical highlands in eastern Nigeria. The precipitation patterns over the Niger Basin are linked to the northward migration of the InterTropical Convergence Zone (ITCZ) during northern summer, which controls the West African monsoon. To assess past precipitation changes in the Niger Basin during the Late Quaternary is important for better understanding the factors controlling West African monsoon climate.

Here, we report Hf and Nd isotope compositions in marine sediments collected off the Niger River. Core N1-KSF-39 was recovered from the Niger Delta, at 1200 m water depth, providing a continuous record of the Niger sediment discharge over the last 70, 000 years. Nd isotopic analyses of the terrigenous fractions provide quantitative information on the geographical provenance of the sediment. In contrast, the Hf isotopic composition of clays can be used as a proxy for silicate weathering intensity [1]. The decoupling between Hf and Nd isotopes during weathering is clearly illustrated in the ε_{Hf} vs. ε_{Nd} diagram [1], where four distinct arrays can be recognized: 1) the ‘igneous rock array’, corresponding to unweathered silicate rocks; 2) the ‘sand array’, formed by all zircon-bearing coarse-grained sedimentary rocks; 3) the diffuse ‘clay’ array’; and 4) the ‘seawater array’ defined by marine ferromanganese precipitates.

Both Nd and Hf isotope ratios exhibit marked down-core variations over interglacial vs. glacial timecales, which indicate abrupt changes in the provenance of the material delivered by the Niger River. In addition, the deviation of ε_{Hf} relative to the ‘clay array’ ($\Delta clay\varepsilon_{Hf}$) also follows closely the Late Quaternary climatic trend, providing a record for silicate weathering intensity in the Niger Basin. Both provenance and silicate weathering proxies can be directly related to abrupt changes in West African mosoon precipitation and associated reorganizations of the Niger River system.

[1] Bayon *et al*. (2009) *Earth Planet. Sci. Lett*. **277**, 318–326.