



Paleoclimatic changes at the Pliensbachian-Toarcian transition recorded by δD of n-alkanes and $\delta^{15}N_{org}$ in a continental section of central Asia

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Major paleoenvironmental changes have been recognized at the Pliensbachian-Toarcian transition. Cooler conditions are suggested during the Late Pliensbachian before a drastic increase of temperatures in the Early Toarcian. Most studies were realized on European marine sediments, with little information on the environmental conditions that prevailed in terrestrial ecosystems. Here we present results on a continental section from Taskomirsai (Kazakhstan, Central Asia) showing a succession of sedimentary cycles made of lignites, clayey layers and silty-sandstones most probably deposited in a fluvial/lacustrine environment with nearby swampy areas. Rock-Eval pyrolysis indicates a type-III organic matter, i.e. mainly derived from terrestrial plants. A multi-isotope approach based on bulk organic nitrogen isotopes ($\delta^{15}N_{org}$) and hydrogen isotopic composition (δD) of n-alkanes was developed to document paleoclimatic changes in the area. In the literature, $\delta^{15}N_{org}$ measured on modern or Quaternary plants has been positively correlated with temperature and negatively correlated with precipitations. According to these observations, $\delta^{15}N_{org}$ measured on lignites and clayey layers has been recently used to support humid/dry cycles around the Paleocene-Eocene transition. In Taskomirsai, $\delta^{15}N_{org}$ values ranged from 0.5‰ to 4.5‰ with low values in lignite beds interpreted as humid periods and high values in clayey layers interpreted as drier periods. The δD values of n-alkanes (C17 to C35) ranged from -248‰ to -151‰. Two groups of n-alkanes could be distinguished: an aquatic group (C17 to C23) and a terrestrial group (C25 to C35). In the aquatic group, low δD values in lignites (-219 ± 17 ; n=10) suggest wetter and/or cooler climate during their deposition, whereas high values in clayey layers (-179 ± 13 ; n=6) suggest a drier and/or warmer climate. Low δD values recorded in the aquatic pool prior to the Pliensbachian-Toarcian transition suggest a relatively cooler and wetter climate that could correspond to the global cooling recorded in the Late Pliensbachian. In contrast, drier/warmer conditions (high δD values) took over during the Pliensbachian-Toarcian transition. Evapotranspiration was estimated from the isotopic difference between δD values of the C23 and the C27 n-alkanes. Maximal positive difference was recorded during the coolest/most humid interval (prior to the Pliensbachian-Toarcian), suggesting a contrasted seasonality with a warm/humid growing season. Difference close to zero was recorded in drier/warmer intervals pointing to preponderant evaporative conditions in the aquatic environment during most of the year leading to D-enrichment of this pool. In conclusion, the δD and the $\delta^{15}N_{org}$ are in agreement, even though both proxies suggest different environment in some parts of the section. This apparent discrepancy points to different integration spatial scale of those two proxies: δD being under regional influence (precipitation regimes, air mass temperatures) and $\delta^{15}N_{org}$ being very sensible to local environmental parameters.