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Nitrogen isotopes from terrestrial organic matter as a new paleoclimatic proxy for pre-quaternary time

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Marine and lacustrine sedimentary organic matter is often dominated by algal-bacterial production. Its nitrogen isotopic composition (δ15Norg) is frequently used to reconstruct biogeochemical processes involved in the nitrogen cycle, such as N utilization by organisms (e.g. Altabet et al., 1995), denitrification and diagenesis processes (e.g. Altabet et al., 1995; Sebilo et al., 2003; Gälman et al., 2009) or to evidence N sources variability (e.g. Hodell and Schelske, 1998; Vreca and Muri, 2006) . However, all these parameters and processes make N isotopic signals in marine and lacustrine environments often very complex to interpret. After pioneer studies, Mariotti et al. (1981), Austin and Vitousek (1998), Amundson et al. (2003), Swap et al. (2004), and Liu and Wang (2008) have shown that the δ15Norg of modern or quaternary terrestrial plants seem to be positively correlated with temperature and negatively correlated with precipitations. Therefore, δ15Norg of terrestrial OM might be a better record for paleoclimatic studies than δ15Norg of sedimentary OM dominated by algal-bacterial production. Recently, promising organic nitrogen isotopic data (δ15Norg) have been published on lignites from the Dieppe-Hampshire Basin (Paleocene-Eocene transition, Normandy (Storme et al., 2012). Authors suggest that the δ15Norg recorded local paleoclimatic and paleoenvironmental conditions. Following these results, the aim of this work is to test the use of stable nitrogen isotopes in terrestrial OM as a new paleoclimatic marker for pre-quaternary geological series. Does δ15Norg constitute a valuable tool to reconstruct past climates? What are the limits in the use of this proxy and possible methodological bias related to organic sources or diagenetic processes? To address these questions, δ15Norg must be measured in samples from periods associated with large and well documented climate change. We therefore selected a Liassic continental sedimentary succession from Taskomirsay, Kazakhstan. This succession is rich in dispersed OM and wood fragments allowing accurate N isotopes measurements. Preliminary results on δ13Corg and palynology suggest that the Pliensbachian/Toarcian transition is recorded at the top of the sedimentary succession. This transition has been studied for a long time since it is characterized by one of the most important global environmental and climatic change of the Phanerozoic time (Jenkyns, 1988; Hermoso et al., 2012). We are therefore testing the paleoclimatic "proxy" potential of δ15Norg for this time interval by comparing the δ15Norg signal with other indicators more classically used for paleoclimate studies. We have also investigated the influence of differences in organic sources and of early diagenesis on the δ15Norg variations.