Late Cretaceous cooling enhanced by continental weathering expressed by clay minerals in Campanian sediments

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The latest Cretaceous was marked by major changes in the ocean-climate system, with oxygen isotopes indicating a long-term cooling that seems to have accelerated during the Early Campanian (FRIEDRICH et al., 2012), while ε_{Nd} data from ocean sediments demonstrate a contemporaneous reorganization of the overall thermohaline circulation (MOIROUD et al., 2016). A recent study performed on Campanian sediments of the Tercis-les-Bains section (Aquitaine Basin) and of the Poigny borehole (Paris Basin) has shown evidence of detrital input of illite, kaolinite and chlorite that coincides with a global carbon-isotope negative excursion, the so-called "Late Campanian Event" (CHENOT et al., 2016). Although conducted in a limited region of the western Tethys, this study hints toward possible modifications of continental weathering that may have affected climate through enhanced atmospheric CO_2 consumption. In order to better constrain the spatial extent of this event characterised by enhanced detrital inputs, we have analysed clay mineralogical assemblages of sediments from several additional sections and boreholes of Campanian sediments from the Tethyan and Boreal realms, along a palaeolatitudinal transect from 20° to 45°N (Danish Basin, North Sea, Paris Basin, Mons Basin, Aquitaine Basin, Umbria-Marche Basin, Saharan Platform). Our results show that the clay fraction of the Campanian sediments from all sections is largely dominated by smectites, which represent the background of Late Cretaceous clay sedimentation (DECONINCK & CHAMLEY, 1995). However, in several sections, intervals of significantly enhanced detrital input are evidenced by increased proportions of illite, kaolinite, chlorite, palygorskite and talc at various levels in the Upper Campanian.

These detrital inputs result from the erosion of nearby continental areas and thus reflect an intensification of continental weathering during the Late Campanian. This may be explained by a tectonic rejuvenation of exposed continental areas, triggered by closure of the Tethyan Ocean and the anti-clockwise rotation of Africa (JOLIVET et al., 2015). As this event seems to be recorded at a broad geographic scale in the Tethyan Realm, the associated increase in chemical weathering may have induced a decrease in pCO_2 levels, thereby contributing to the Late Cretaceous global cooling trend.

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