Geophysical Research Abstracts
Vol. 16, EGU2014-6084-1, 2014
EGU General Assembly 2014

Dinoflagellate cysts as indicators of palaeoenvironmental and sea-level change: the Late Cenomanian - Early Coniacian (Cretaceous) of Europe

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The Late Cretaceous represented a period of greenhouse climate of Earth history, and was characterised by high temperatures, high atmospheric CO_2 and high eustatic sea level, with large areas of shallow, warm, epicontinental sea. Understanding the dynamics of the Late Cretaceous climate is important for understanding the Earth System and the impact of modern climate change. The productive Late Cretaceous oceans led to the deposition of a large portion of the world's oil and gas resources, so reconstruction of depositional environments and refinement of stratigraphic correlation are important for the petroleum industry. Dinoflagellates were a prolific and diverse group within the phyto- and zooplankton throughout Late Cretaceous oceans, and their cysts display good preservation across different facies, and so are a good group for biostratigraphic and palaeoenvironmental study.

Selected results from a high-resolution quantitative study of the palynology from 5 European Upper Cenomanian to the Lower Coniacian (Upper Cretaceous) sections are summarised, along with their carbon stable-isotope chemostratigraphy. The sections are from a range of palaeolatitudes and basins, including the North Sea Basin, the Anglo-Paris Basin, the Bohemian Basin, the Polish Trough and the Vocontian Basin.

Palynological assemblages differ between sections in the concentration of palynomorphs, proportions of terrestrial and marine palynomorphs, and in the diversity and varying proportions of species of dinoflagellate cysts (dinocysts). Dinocyst distribution is considered to have been controlled largely by nutrient levels, but was also impacted by temperature, sea level, and water mass changes. Influxes of certain species are related to changes in salinity, changes in temperature, and water mass change, and increased communication between basins. High dinocyst abundance, and particularly a high proportion of peridinioid cysts (which are thought to be derived from eutrophy-adapted heterotrophic dinoflagellates), is related to intervals of upwelling. The relationship between basinal transgressive-regressive histories and the ratio between terrestrial and marine palynomorphs is not simple, and increased terrestrial influx is not related to high productivity indicators within the dinocyst assemblages.