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Cenomanian sea level high: a global signal modified by long wavelength deformations of mantellic origin

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Late Cenomanian (93 Ma) is expected to be the period of highest sea-level of all Meso-Cenozoic times, with a value of more than 250 m above present-day sea level (Haq et al., 1987). This maximum marine flooding is not observed in many areas of the world (e.g. South-western Africa, northern Australia, etc…). This suggests that other very long wavelength processes can be superimposed, such as vertical movements due to mantle dynamic (dynamic topography).
In order to evaluate the space and time evolution of relative sea level variations, we compiled world-scale transgression and regression maps for two time-lines: the Albian-Cenomanian boundary and the Cenomanian-Turonian boundary. This study is based on published stratigraphic and sedimentologic data, quite heterogenous in resolution and quality. Results show that the Cenomanian transgressive phase is essentially present around the Tethys, whereas regression prevails at higher latitudes (northern Canada and Europe – southwestern Africa and Australia) and along the pacific margin of eastern Asia.
We tested two processes (1) dynamic topography using the models of Muller et al. (2008) and Flament et al. (2012) and (2) vertical movements due to mantle global cooling in response to continental break-up (Coltice et al., 2009; Phillips & Coltice, 2010).
For the subduction zones (e.g. southern Europe or eastern Asia), dynamic topography and the change of slab buoyancy can explained the observed transgression and regression. On the contrary, the decrease of the temperature below the continents inherited from the Pangea break-up can explained the relative sea level variations along the Atlantic margins.
In conclusion, the stratigraphic record in the world sedimentary basins is controlled by an eustatic signal due to the volume change of the ocean, on which is superimposed long wavelength deformations due to mantle dynamic or temperature changes below the continent lithosphere.