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Deep-time simulations with the IPSL Earth System Model

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For many years, the use of the french IPCC-like model was not possible owing to several numerical problems. Putting a lot of efforts the last two years, we are now into the position to perform climate simulations for time periods back till the Early Cretaceous. One of the strenght of the Paleo-IPSL (i.e. CM5A2) is the inclusion of a marine biogeochemical model allowing to simulate the type of primary producers and the nutrient concentrations as well. Here I will detail two example of applications, one on the Cretaceous climate and in particular on the simulation of the oxygen concentration in the ocean, an other on the Eocene climate with simulations designed to participate to the Deep-MIP project (Lunt et al., GMD, 2017). Cretaceous simulations will be used to study the major controlling factor of the oxygenation of the ocean. Using an age model for deep-water bodies, we will tease out the effect of the ocean dynamics from the effect of the primary production. Deep MIP simulations will be used to evaluate radiative feedbacks when increasing atmospheric CO_2 concentrations from 420 ppm to 1680 ppm.