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Quantifying the contribution of Tibetan Plateau (TP) uplift and CO2 decrease for late Eocene and present day climate with emphasis on Meridional Ocean Circulation.

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Since late Eocene (40 Ma), atmospheric CO2 drastically decreased from 4 to 1 PAL. During this period, two major geological events occurred over Asia: the India/Asia collision producing the uplift of large mountain ranges and the shrinkage of the Paratethys (G. Ramstein et al., Nature, 1997; F. Fluteau et la., JGR, 1999). Most modeling studies focused first on the sensitivity of AGCMs to the Tibetan plateau elevation through simple experiments; then new simulations accounting for more realistic description of paleogeographic reconstructions have been published. Indeed, progress has been done concerning both: paratethys evolution (Z. Zhang et al., PAL PAL PAL, 2007), chronology of uplifts of different mountain ranges (R. Zhang et al., JGR, 2017) and large TP northern shift (R. Zhang et al., EPSL, 2018), but again these experiments focused mostly on atmosphere circulation and hydrologic pattern (monsoon evolution) not specifically on their impacts on ocean dynamics.

Therefore, this study aims to investigate the role of TP uplift on Northern hemisphere ocean circulation through long runs of coupled ocean atmosphere model to analyze its impact not only on atmosphere but also on ocean dynamics. We provided a series of sensitivity simulations disentangling the two different factors, pCO2 decrease and TP uplift. These simulations allow analyzing the response to TP uplift in a warm high CO2 world as Eocene and in a cold low CO2 world as Quaternary (B. Su et al., CP, 2018).

We describe how the TP uplift through changes of atmosphere (surface winds and planetary waves) and hydrology (runoff and precipitation/evaporation patterns) modified the meridional circulation in the North Atlantic and Pacific basins with emphasize on the causes of the two different basins sensitivity to this major mountain range uplift in both contexts.