Geophysical Research Abstracts
Vol. 20, EGU2018-5042, 2018
EGU General Assembly 2018

Inversion of topography and sediment budget to unravel tectonic and climatic evolution; application to the Ogooué system (Gabon)

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Numerical forward models have been widely developed in order to understand the evolution of landscape over different time-scales, but also the response of the topography to variations in external conditions, such as tectonics or climate. However, few models have coupled the evolution of the relief in erosion to the evolution of the related foreland in deposition although it is known that these two processes, erosion and deposition, interact together. A better understanding of the evolution of sedimentary systems can be gained by coupling these two key processes. Here, we use an improved version of a numerical landscape evolution model, Fastscape, in which we added a term for continental deposition. Sediments are now allowed to settle within channels and in continental sedimentary basins, allowing a better modeling of the dynamics of continental systems.
We evaluate this new model in the frame of a natural case study, the Ogooué system in Gabon. Our objective is to propose a tectonic and climatic scenario that best accounts for the observed characteristics of the onshore domain. We use the present-day topography, lithologies and source-to-sink sediment budget to constrain the inversion of our model, together with the scenario inferred for the marine part of the system from the detailed stratigraphic study of the offshore Ogooué delta and the numerical inversions performed in the marine domain.