Geophysical Research Abstracts
Vol. 16, EGU2014-10573, 2014
EGU General Assembly 2014

Coupled tectonic/surface processes modeling of the Neogene Mesopotamian basin evolution

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Understanding how wide and long-lived drainage systems respond to changes in plate configuration is key to decipher between climate and tectonic forcing on the sedimentary record. The Mesopotamian large foreland basin results from flexure of the Arabian plate controlled by tectonic load of the Zagros Mountains to the East. In contrast, the current drainage pattern seems to be ruled by the uplift of the Anatolian region to the North, forcing the two main river systems (Tigris and Euphrates) to drain the basin longitudinally. In addition to that, the Mesopotamian area developed where the Neogene closure of the gateway between Mediterranean sea and Indian ocean occurred consequently to the convergence of the Arabian and Eurasian plates, but modes and timing of basin development remain poorly constrained. Moreover, the connection between the Mesopotamian basin and the Indian Ocean via the Persian Gulf still remains to be understood.
The purpose of this study is to understand and investigate the processes involved in the Mesopotamian basin evolution, with an emphasis on the evolution of drainage conditions, from the closure of the basin as a result of the propagation of the collision, to the opening of the drainage through the Hormuz Strait and contribution of the uplift of the Oman Mountains. To that purpose, we perform integrated modeling of surface processes (erosion/transport/sedimentation), lithospheric flexure and kinematic fault deformation. The numerical model is particularly designed to study the 3D foreland basin evolution and to dentify large-scale relationships between tectonic movements and sediment transport. This model allows us to investigate the basin history at the scale of the Arabian plate and over a long period of time, i.e. since the collision (35-20 Ma) to present day.