Geophysical Research Abstracts
Vol. 13, EGU2011-1500, 2011
EGU General Assembly 2011


# Coupled mantle, erosion and climate models to explain recent geological events in the African continent.

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In the past 50 Ma, and despite its relative isolation and lack of interactions with other continental masses, the African continent has been affected by large-scale uplift and subsidence events, such as the opening of the East African Rift, the uplift of part of the South African Plateau or the subsidence of the Congo Basin. Therefore a major question arises : what has driven these large-scale vertical movements?

We have investigated whether these could not find their origin in the underlying mantle and, more precisely, in the dynamic topography caused by flow in the mantle. To achieve this we have used sophisticated mantle flow models driven by density heterogeneities derived from global seismic tomographic images of the mantle to predict present-day mantle flow and backward advect it in time to compute an estimate of the dynamic topography that has affected the African continent. However, such an approach depends strongly on a variety of assumptions, including the viscosity structure of the mantle and the density structure of the lithosphere. Uncertainties on both of these parameters lead to non-unique solution for the predicted dynamic topography.

In an attempt to resolve this ambiguity, we have coupled the mantle flow model to a large-scale surface process model that predicts the production (by erosion) and transport of sediments into the continent marginal and intracratonic basins. Because erosion of non-tectonic areas is strongly controlled by precipitation, we have also used estimates of past precipitation patterns derived from a global circulation model adapted to past geographic and C02 atmospheric content conditions, and validated by sparse geological constraints. By comparing the predicted fluxes as well as the geometry of the continental-scale drainage systems to newly collated sedimentary and geomorphological data, we are able to to propose time-integrated scenarios that not only further constraint mantle physical parameters but potentially explain parts of the geological record.