Geophysical Research Abstracts, Vol. 8, 08772, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08772


# Tectonic and climatic control of rift escarpments: erosion and flexural rebound at the Dhofar passive margin (Gulf of Aden, Oman)

**C. Petit** (1), Y. Gunnell (2), and M. Fournier (1)

(1) Laboratoire de Tectonique, CNRS-UPMC, 4 Place Jussieu, boîte129, 75252 Paris Cedex 5, France, (2) Department of Geography, Université Denis-Diderot, boîte 7001, 2 Place Jussieu, 75251 Paris cedex 05, France (carole.petit@lgs.jussieu.fr)

The Gulf of Aden rifted margin in Dhofar (Oman) is dominated by a homoclinal plateau tilted a few degrees towards the north. This plateau is bounded to the south by contiguous south-facing escarpments of two different types. The main type-1 escarpment, the Jabal Samhan, is high, sharp-ridged and has retreated several kilometres landward with respect to its master fault. Erosion has generated a dissected coastal piedmont with limestone-capped buttes. This denudational escarpment is carved out of a sequence of Cenozoic limestones that rest unconformably upon the exposed, underlying basement. Type-2 escarpments, like the Jabal Qara, exhibit a convex slope profile and have not retreated significantly from their boundary fault. In contrast to the type-1 scarp, and as suggested by the absence of outcropping basement, denudation has also not been deep enough to remove the entire Cenozoic sequence. Furthermore, the type-2 fault scarps are predominant in the area under the influence of the summer monsoon.

Using a 2D surface-process numerical model combining short-range diffusion, long-range fluvial transport, and flexural response of the lithosphere, we investigate the respective roles of exogenous (i.e., climatic) and endogenous (effective elastic thickness) parameters in controlling the long-term erosion of these contrasting escarpments.

Results suggest that climatic conditions have controlled only scarp-profile morphology. The onset of the monsoon at ca. 15 Ma (i.e., $\sim$10 Ma after the end of rifting) smoothed the type-2 scarp profile. Meanwhile, the type-1 scarp, more typical of arid conditions, has remained less detectably affected by climatic changes since rifting.

However, climatic distinctions seem inappropriate to explain the contrasting depths of erosion and respective distances of scarp recession, which are reverse to what would be expected from the long-term exposure of the more stagnant, type-2 fault scarps to runoff supply by the monsoon. Accordingly, pre-rift topography and along-strike variations in lithospheric flexural response to erosional unloading are highlighted as being the most likely causes of scarp sensitivity to post-rift processes.