Geophysical Research Abstracts, Vol. 9, 03604, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03604

Thermal regime of a young passive margin: the eastern Gulf of Aden

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The mechanisms for the transition from rifting to spreading at passive margins is an actively debated problem. Whether passive margins are volcanic or not depends mostly on the thermal regime and the fertility of the underlying mantle. The Gulf of Aden that formed about 20 My ago, evolves from a western volcanic to an eastern non-volcanic margin, and is a suitable place to study this problem. 169 new heat-flow measurements have been obtained in november-december 2006 with R/V "Le Suroit" along seven multichannels seismic lines previously acquired (Encens cruise) on the Oman coast in the eastern Gulf of Aden. A POGO technique that allows close measurements was used for a relevant interpretation of the heat-flow (superficial or deep origin). Additionnal oil exploration data have been used to constrain the onshore thermal regime, around 45 mWm-2. The offshore heat-flow has been measured for water depths deeper than 1000 m. Superficial effects are observed nearby continental slope where sediment packages slump down, or nearby submarine reliefs. On the oceanic part of profiles, heat-flow corresponds to the theoretical value predicted by conductive cooling models for that age (˜120 mWm-2 for ˜16 Ma). On the continent-Ocean transition (COT), several profiles show high heat-flow values (˜100-110 mWm-2), close to the value that would have an ocean of the same age. On one profile a serie of high values culminating around 900 mWm-2 was observed above a volcanic structure, while lower values (40-60 mWm-2) were observed along an other profiles where a low angle reflector has been observed. The nature of the COT will be discussed with respect to these results and conceptual or numerical models. Further consequences for older margins such as Atlantic margins will be also discussed, as there are several lines of evidence that they are permanently hot and weak.