Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09294, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09294
EGU General Assembly 2008

Flat Moho below rift zones

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Rifting is a fundamental plate tectonic process that creates elongated depressions in the Earth's surface, which become filled with sedimentary and volcanic material, as it is presently observed at the Baikal, East African, Rhine Graben and Rio Grande Rift Zones. All rifting models predict Moho uplift due to crustal thinning, and reduced seismic velocity in the uppermost mantle due to decompression or heating from the Earth's interior. However, recently acquired data from the presently active Baikal Rift zone in Siberia and the failed Dniepr-Donets rift zone in Ukraine are examples where there is no Moho topography that can related to the rifting process. Further, data from the Kenya Rift Zone shows sign of less Moho uplift than expected from the actual extension. At all these rift zones, we observe a localized zone in the lower crust which has exceptionally high seismic velocity and is highly reflective. We suggest that rift related crustal thinning took place, but the expected Moho up-warp was compensated by magmatic intrusion in the lower crust at the high-velocity zone. This finding has significant implications for modelling of the evolution of sedimentary basins around rift structures.