Geophysical Research Abstracts
Vol. 12, EGU2010-8751, 2010
EGU General Assembly 2010

Earthquake cycle on a transform fault in the Gulf of California, Mexico.

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South of the San Andreas Fault system, ∼90% of the North America/Pacific plate motion is accommodated along the Gulf of California. Here the plate boundary deformation is partitioned in deep basins formation, often resulting in production of new oceanic crust, connected by long transform faults. In the central part of the Gulf, one of these transform faults, the Ballenas fault, is localized in the Canal de Ballenas, a ∼30 km wide channel between Isla Angel de la Garda and mainland Baja California in an area where full oceanic crust is still not generated. The presence of land on both the sides of this "quasi marine" transform fault give the unique opportunity to perform geodetic studies across its trace. On August 3rd 2009, a series of seismic strike slip events (including a M6.9) happened along this segment of plate boundary allowing a combined study of co- and inter-seismic deformation.
Here we present the results from 5 years of EGPS along a transect perpendicular to the plate motion direction at approximately 29 degrees North. These surveys include at least 3 occupations before the seismic event and at least 2 occupations after the earthquake. The analysis of the inter-seismic data shows that ∼46 mm/yr of relative motion is accommodated within the Canal de Ballenas. Co-seismic data show displacements up to 25 cm on the two sites closest to the event and a pattern compatible with the finite fault model computed by USGS (although the USGS location of the hypocenter is probably 100 km too much to the East). The geodetically estimated fault location is also compatible with multibeam bathymetry. The data collected after the earthquake show also the possibility to identify postseismic displacement from the campaign data. They also show the possibility that the postseismic behavior of the “marine” side is different from the one of the on land side.