Geophysical Research Abstracts
Vol. 14, EGU2012-7588, 2012
EGU General Assembly 2012

Constraints to the strain field of Africa from geodetic solutions: a contribution for the Seismotectonic Map of Africa

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This work presents the strain field of Africa derived from the current GNSS velocity field of Africa. It is being carried out in the framework of the IGCP Project 601 – "Seismotectonics and Seismic Hazards in Africa", which ultimate goal is to create thematic maps of the earthquake hazards of Africa.

The geographical distribution of the existing network of permanent GNSS stations is still far from optimal with significant gaps existing particularly on the Central and North (Sahara) Africa. This is even more evident when we consider the stations with enough long data span and monument/equipment stability (no significant number of epochs with offsets) to produce reliable velocity solutions (we use here a threshold value of 2.5 years data span to compute the station velocity). Nevertheless, the existing number of sites ($\sim$100) already permits to compute a velocity field that can be used to infer the current strain field for Africa. This provides us an indicative picture of the main seismotectonic hazards areas of Africa.

We also compute reliable uncertainties associated with the strain velocity field in order to determine the regions where the estimated strain is significant. For this, our GNSS velocity solutions with respect to the latest global reference frame, ITRF2008, is computed taking into account the existing temporal correlations between the daily solutions of the stations.

This strain field, derived solely from space-geodetic data is correlated with the seismicity map of Africa in order to identify the regions prone to seismic hazard and risk and also to detect areas where aseismic processes can be the main cause to accommodate the observed deformation in Africa.