Geophysical Research Abstracts
Vol. 15, EGU2013-10103, 2013
EGU General Assembly 2013

InSAR observations and modeling of plate behavior involved in the eastern Anatolia deformation

Olivier Cavalié and Sigurjon Jonsson
King Abdullah University of Science and Technology, Saudi Arabia (ocavalie@geoazur.unice.fr)

The eastern Mediterranean area is a zone of complex tectonics associated with interactions between three major plates, Eurasia, Africa, and Arabia, as well as the smaller Anatolian plate. The collision of Arabia into Eurasia in eastern Turkey, the Caucasus and the Zagros and a westward movement of the Anatolian plate dominate the deformation in this region. Major right-lateral transform motion along the North Anatolian Fault (NAF) and a left-lateral transform motion along the East Anatolian Fault (EAF) result from this setting. In this study, we focus on the deformation of the eastern part of Anatolia, around the triple junction where the EAF and the NAF meet. We use InSAR data to obtain higher spatial resolution of the deformation than is currently available by GPS. In particular, we are interested in mapping in details of how the Anatolian plate behaves at the triple junction where it is clamped between Arabia and Eurasia. For this purpose, we used SAR data from three adjacent descending tracks and two ascending tracks of the Envisat archive, which at this location includes about 30 acquisitions for each descending track, but only about 10 images for the ascending tracks. The main limitation of using InSAR in this region is phase decorrelation due to temporal changes of the ground scattering, in particular due to winter snow cover. To reduce the phase coherence loss, we adopt a small baseline approach in limiting both the spatial and temporal baseline of the interferograms, and we also exclude images acquired in winter. Moreover, we correct produced interferograms for the stratified part of the atmospheric delay using the global atmospheric model, ECMWF. Corrected interferograms are then combined together to infer the time series of the ground surface displacement via a least square method. In order to model the Anatolian plate movement, we assume a constant velocity during the observation period. We use an interseismic back-slip model in a homogeneous, elastic half space to describe the kinematics of the Arabian, Anatolian and Eurasian system. With a non-linear optimization approach we fit the LOS InSAR measurements computed in this study and the available GPS data to estimate the plates velocities of Anatolia and Arabia (with Eurasia held fixed) and the locking depth along the NAF and EAF.