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Crustal deformation patterns in Northern Egypt derived from GPS campaign data

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The North of Egypt is located on the triple junction between three major tectonic plates: Nubia, Eurasia, and Arabia. The interaction between these plates created several major fault systems forming a complex tectonic frameset that includes other minor tectonic blocks in the Mediterranean and Middle East region. In particular, the Sinai Peninsula is acting as a separate tectonic block with respect to the stable part of these three plates.

In order to monitor and understand the kinematics of Egypt, NRIAG setup different GPS campaign networks during the last decade that have been reobserved periodically. Namely, dedicated networks for geodynamic studies were installed in Sinai and Red Sea, in the Great Cairo region, and further south, in Sohag (Middle Nile) and Aswan areas, in a total of 43 campaign sites.

In the past, the velocity fields estimated for the different networks have been computed and analyzed using separate approaches. Here, we present an integrated analysis of the velocity field derived for the Northern Egypt. New models adopted recently in the processing of GPS data are consistently used to analyse all observed epochs.

The solutions for all epochs are computed with respect to the latest global reference frame, ITRF2005. In this respect, a comparison with previous solutions is carried out in order to evaluate the benefits of the new models and the new ITRF realization in the computation of motions in regions where few reliable reference stations were available in the past.

Strain rate tensors are computed by inverting the GPS motions. The analysis of the

strain rate field and the motions relative to the stable plates is used to describe and discuss the current active deformation in the Northern Egypt. In particular, we compare the strain rate directions deduced from focal earthquake mechanisms with the strain rate directions deduced from GPS data. Finally, we discuss our results against previous models based on different processing and analysis approaches.