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Nubia rigid plate motion as seen from far south

R. Malservisi (1), U. Hugentobler (), and R. Wonnacott ()
(1) LMU, Germany, (2) TUM, Germany, (3) Chief Directorate Survey and Mapping, South Africa

The motion and the rigidity of the Nubian plate provides a critical constraint to the geodynamics of the surrounding plates. Unfortunately, the sparse distribution of geodetic continuous GNSS stations across the plate does not provide a high precision solution for an Eulerian pole and to test statistically for the rigidity. The presence of 3 separate cratons, Rift Valleys, and old deformation belts along the cratons' sutures, indicate that in geological time the plates have not been completely rigid. The amount of current deformation is very difficult to derive from the GPS observations due to the sparse distribution of receivers within the rigid plate. Using IGS sites the deformation has been constrained to be smaller than a few mm/yr.
Here, we present the velocity field for 42 stations of the continuous GPS network TrigNet, a network covering South Africa with an average distance of 200 km. We present the velocity field for the period 2002-2008, the strain rates between individual TrigNet sites, and the relative Eulerian pole and corresponding residuals assuming rigid motion of the network. The distribution of these stations on the stable part of the Kalahari craton, allows computing a pole of rotation that can be compared with the rest of the stations within the Nubian plate. Preliminary results show that the entire network behaves as a rigid block with negligible average residual. Exceptions to this rigid motion are some of the coastal stations, mining areas around Johannesburg and the Northeast portion of the TrigNet network. The relative motion of the TrigNet network with respect to the African plate is investigated using the Eulerian pole that minimizes the residual for the IGS stations on the Nubian plate and shows that the average residuals are well within the errors indicating that the Nubian plate behaves as a rigid block within our resolution. On the other hand, the analysis of the strain within the TrigNet network and the non-random distribution of the azimuth of the residual with respect to the motion described by a TrigNet only Eulerian pole, does not exclude a possible counter clock wise rotation of the craton with respect to the Nubian plate and an influence of the Nubia/Somalia plate boundary for the Northeastern region of South Africa that at this stage still cannot be distinguished from the noise.