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Slow transients recorded by the cGPS network FreDNet at the northern Adria microplate boundary (NE-Italy)

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The northern tip of the Adria micro-plate (NE-Italy) is continuously monitored by the Friuli Regional Deformation Network (FReDNet) of OGS (Istituto Nazionale di Oceanografia e Geofisica Sperimentale), consisting of 15 GNSS permanent sites, the first eight of which were installed between 2002 and 2004. Additional information on the strain field in the region comes from the 10 GNSS permanent sites of the Marussi network of the Friuli-Venezia Giulia regional council, some of which record continuously since 1999. Having at disposal time-series of a certain length (around ten-years), it is possible to evaluate with reliability not only the plate motion direction and velocity, represented by the linear trend of the horizontal components of the records, but also the possible plate acceleration, due to the superposition of other terms of the strain field time-space variations, with different frequency. With the aim of investigating such terms, we first processed the GPS data of the longest time series from both networks, starting from 2002, using GAMIT/GLOBK, eliminated the outliers, and filled the eventual short gaps in the data through linear interpolation. A low-band pass filter allowed obtaining the time-series cleaned from the components with frequencies higher than 1.5 years, so to eliminate the annual and quasi-annual terms, and the highest frequencies. The so-obtained time-series for the two horizontal components result dominated by a linear trend, as expected, to which clear oscillations of some years of duration are superimposed.
From the analysis of the linear trend, the resulting velocity field suggest crustal shortening, with values ranging between 0.6 and 2.8 mm/year, decreasing from South to North and, more slightly, from East to West. This is in agreement with preceding observations and with the geodynamic character of the region, located in the area of convergence between Adria microplate and Eurasia.
As regards as the deviations from the linear trend, the present work focuses on a sort of transient, of "period" between 1.5 and 2.0 years, involving 11 of the 13 stations considered, distributed over the whole area, and causing a bending along the main tectonic directions. In order to state, whether the transient is due to hydrologic or tectonic phenomena, data from rainfalls from the meteorological stations of the regional council networks nearest to each of the GNSS stations have been similarly analysed and compared. In particular, the cumulative de-trended curves have been considered and cross-correlated with the deformation data. The correlation, however, is generally poor. The next step will be the comparison with the seismic activity in the region, from the catalogue of the Friuli-Venezia Giulia seismological network, managed and ruled by OGS.