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GPS kinematic field in Central and Northern Italy

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The GPS observation of more than 350 continuous GPS stations located in the Central and Northern Italian peninsula have been analyzed in order to reconstruct the present kinematic pattern in the area. Several sites (about 100) are managed by public companies and scientific research institutions aimed at performing accurate monitoring of earth surface movements, other sites are managed by public institutions and private agencies to support mapping activities, rescue and emergency services and real-time positioning (VRS and RTK).We have processed with GAMIT software all the available data for the period 2001-2012. The network is divided into 21 sub–networks, each including at least the six common stations. The IGS precise ephemerides have been included in the processing with tight constraints, such as the Earth Orientation Parameter (EOP). The daily loosely constrained solutions of the 21 clusters have been combined into a unique solution by the GLOBK software. Such solution has been then aligned into the ITRF2008 reference frame by a weighted six parameters transformation (three translation and three rotation), using the ITRF2008 coordinates and velocities of the five high quality common IGS stations (CAGL, GRAZ, MATE, WTZR and ZIMM). The sites with an observation time span less than two years have been excluded from the analysis of kinematic pattern, because it is hard to get a robust estimate of rate, seasonal signals and steps with less than two years of observation.

The horizontal kinematic pattern has been analyzed in order to gain information about the present short term deformation pattern of this region. This analysis may have significant implications for the recognition of seismic zones most prone to next strong earthquakes.

The vertical velocity field has been also considered in this study. It is largely recognized that vertical movements in the Central – Northern Italy may be considered as the overall result of three main causes: tectonic processes, ground settlement and anthropic activities, whose respective contributions are expected to be rather heterogeneous over the study area.

The daily position time series of the sites located in the Eastern sector of Po Plain have been analyzed in order to evaluate the coseismic and possible pre and postseismic effects of the Emilia sequence earthquakes (May-June 2012).