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The Gargano promontory: interseismic deformation growth by ground motion time series analysis

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The Gargano Promontory (southern Italy) is an ENE-WSW oriented topographical and structural high, located in the Adriatic foreland between the Apennines and the Dinarides-Albanides fold-and-thrust belts. The stratigraphy of the area is characterized by a succession of Neogene shallow-water rocks (Early Miocene to Late Pliocene age), that unconformably covers the Mesozoic substratum. The entire succession is dissected by a complex and active fault system: the most prominent and the most active evidence of these structures is the Mattinata fault. In general a shared kinematic interpretation of the Gargano structure still does not exist and the debate is still open. In fact, previous works have inferred a reverse, right-lateral, left-lateral or inverted kinematic for the Mattinata fault, while the NW-SE fault system, located north of the Mattinata fault, has been interpreted either as a normal or a reverse fault system. The understanding of the kinematics related to the Gargano area plays an important role for the development of a new geodynamical model of the Appenninic outer deformation front and, ultimately, could provide important insights into the evolution of the Africa-Eurasia plate boundary in the central Mediterranean region. Another central point is that, although the Gargano area is located in the foreland, it is seismically active: the present level of the background seismicity is low (maximum magnitude Mw=5.4 occurring in the central part of the promontory), but destructive earthquakes (and even a tsunami) have occurred in historical times, with felt effects up to XI MCS.

We have investigated the surface deformation by InSAR methodology: we have obtained ground motion time series using PS (Permanent Scatter) and SBAS (Small BAseline Subset) processing techniques. Both methods allow us to generate long time series of displacement and to analyse the velocity variation during that time. In the PS technique only the natural targets, showing a good stability of the backscattered signal in all the images, are considered for the calculation of the phase difference between acquisitions. In the SBAS approach, the entire image dataset is split into different subsets, characterized by small temporal and spatial baseline. With regard to the SBAS we have considered both ERS and ENVISAT orbits (93 descending and 47 ascending data) to obtain time series starting from 1992 to 2006. Instead the PS technique has been applied to the Gargano area using 83 ERS1-2 images relative to descending orbit and 31 images from ascending orbit respectively, in the period 1992-2002.

We interpret the velocity fields retrieved by SBAS/PS technique in term of interseismic strain accumulation and propose some preliminary model to describe the underlying kinematic mechanism.