"Vertical land motion rates in the Euro-Mediterranean region from continuous GPS data: new evidence of vertical velocity gradients at different spatial scales along the Nubia-Eurasia plate boundary".

This work discusses a new vertical geodetic velocity field for the Euro-Mediterranean region obtained from the analysis of 2.5 to 14 years long position time-series from >800 continuous GPS stations. We estimate and remove common mode errors in position time-series using the results of a principal component analysis, obtaining a significant gain in the signal-to-noise ratio of the displacements data. Following the results of a maximum likelihood estimation analysis, which gives a mean spectral index ~0.7, we adopt a power-law + white noise stochastic model in estimating the final vertical rates, and find 95% of the velocities within ±2 mm/yr, with uncertainties from filtered time-series ~40% smaller than from the unfiltered ones. The analysis carried out allows us to highlight the presence of statistically significant velocity gradients where a higher density of stations is available. We find undulations of the vertical velocity field occurring at different spatial scales both in regions characterized by tectonic activity, like eastern Alps, Apennines and eastern Mediterranean, and regions characterized by low to null tectonic activity, like central Iberia and western Alps. A correlation between smooth vertical velocities and topographic features is apparent in many sectors of the study area. Glacial isostatic adjustment and weathering processes cannot completely explain the measured rates, and a combination of active tectonics and deep-seated geodynamic processes must be used to explain our observations. Excluding areas where more localized processes are likely, or where subduction processes may be active, mantle dynamics is the most likely process, but regional mantle modeling is required for a better understanding.