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Seasonal modulation in the horizontal components of GPS station positions

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Geodetic time series of GPS horizontal position components show, in general, seasonal variability in addition to long-term signals of mainly tectonic nature. While the seasonality of the vertical component has been widely studied and associated to the superposition of multiple loading effects on the Earth's crust, the horizontal seasonal variability still requires in-depth studies to identify and explain the responsible physical mechanisms. We have analyzed the time series of the east and north components of GPS station positions by using the Empirical Orthogonal Functions (EOF) technique. This is being done in order to identify the main variability modes common to a selected ensemble of stations. We have investigated first a small GPS network, consisting of eight stations, located in northeastern Italy where observations started in 1996. The first principal component shows that a seasonal signal is present both in the East and North time series of station positions. The East component is characterized by winter maxima while the North one shows minima. All stations in the network behave coherently. This analysis is being extended to a larger network of stations located in Europe and the Mediterranean region.