The Annual Deformation Signals Isolation in the GNSS Time Series Analysis in CMONOC

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In order to study the spatiotemporal distribution of both tectonic and non-tectonic processes in China, a significant increasing number of GNSS stations are installed in the mainland during the last decade, which is known as the Crustal Movement Observation Network of China (CMONOC). In term of the post-processing procedure of data from a continuously operating GNSS network, plenty of information existing in GNSS time series represents both opportunities and challenges. In order to separate and recover underlying seasonal signals accurately and effectively in this investigation, we apply the independent component analysis (ICA), which is one of blind source separation technologies and based on the statistical properties of independence and non-Gaussian, to decompose the residual time series into several components of crustal displacement annual signals. Then we compare these annual signals with that from geophysical contributor, such as atmosphere, non-tidal ocean, snow, and soil moisture mass loading from National Centre for Environmental Prediction (NCEP), Global Land Data Assimilation System (GLDAS) and Jet Propulsion Laboratory (JPL). We also perform the principal component analysis (PCA) decomposition of time series for comparison in our investigation and find that ICA can achieve more appropriate representation than PCA for multivariate geophysical contributors of annual displacement in GNSS observations. Comparative analysis reveals that ICA is superior to PCA for separating source signals of continuous GNSS arrays and is a useful tool for the anatomy of apparent seasonal variation detection.