Geophysical Research Abstracts
Vol. 12, EGU2010-6559, 2010
EGU General Assembly 2010

Non-linear motions of VLBI stations with interannual and decadal periods and their connection with ENSO and sunspot cycles

Yavor Chapanov (1), Harald Schuh (2), Robert Weber (2), and Johannes Böhm (2)

(1) Central Laboratory of Geodesy, Bulgarian Academi of Sciences, Sofia, Bulgaria (astro@bas.bg), (2) Institute of Geodesy and Geophysics, Vienna University of Technology, Vienna, Austria

The individual solutions for VLBI station coordinates provide time series of site displacements with high accuracy for a time interval of more than 25 years for some stations. These time series contain wide-spectrum signals from various local and global sources as well as some systematic errors and uncertainties of the used mathematical models. A part of the interannual and decadal natural signals in Earth surface systems can be related to the well known El-Niño/Southern Oscillation (ENSO) and to decadal cycles of the solar activity due to solar-terrestrial influences and the interconnection between the climatic and weather variations, atmosphere and ocean conditions, hydrological and underground water cycles and others. The interannual and decadal signals in VLBI site displacements are investigated using the VLBI solution from Paris Observatory IVS Analysis Center (OPAR). The variations of the smoothed time series of several VLBI sites (East, North and Up directions) are compared with the corresponding variations of the ENSO Index and Wolf sunspot numbers. The 22-year solar magnetic cycles are represented by extended time series, determined by sign alternation of the even 11-year cycles of the Wolf numbers. The interconnection between solar cycles and site displacements is investigated by least-squares estimation of the oscillations with periods of 10.5 and 21 years, which are the mean periods of the Schwabe and Hale Sun cycles for the last 30 years. These oscillations of the VLBI sites have amplitudes between 0.2 mm and 1.5 mm and part of them are with phases close to the corresponding oscillations of the sunspot indices. The spectrum of the site displacements contains various signals with frequencies which can also be seen in the ENSO frequency band with periods between 2 and 5 years. All time series of station coordinates variations show correlation with the ENSO Index for some time intervals.