Geophysical Research Abstracts
Vol. 16, EGU2014-3906, 2014
EGU General Assembly 2014

A feasibility of a dense permanent GNSS networks for earth′s surface vertical deformation studies

Jan Kostelecky (1,2), Jaroslav Simek (1), and Vratislav Filler (1)

(1) Research Institute of Geodesy, Topography and Cartography, Geodetic Observatory Pecny, Ondrejov, Czech Republic (kost@fsv.cvut.cz), (2) Institute of Geodesy and Maining Surveying, HGF-VSB-TU Ostrava, Czech Republic

Tilt and strain observed on the earth′s surface indicate the response of the earth′s crust to external and internal forces such as earth tides, tectonic processes and seismic and volcanic activities. Over long time intervals (several years or decades) long-term tilt and strain can be determined from repeated observations in geodetic kontrol network. On the other hand, tiltmeters and strainmeters are used to monitor continuously local deformations. Short-term til tis dominated by tidal deformations and i sof the order of 10-8 to 10-7, which corresponds to inclinations of 0.002 to 0.02 arcseconds. Long-term effects of tectonic origin are generally much less, at the order of a few 10-7/year. Episodic effects related to seismic or volcanic events may reach the same order of magnitude and more over the time intervals of a few hours to a few months. Therefore, the outstanding feature of the tools used for the tilt and strain detection should be a sufficient sensitivity and stability. The submitted study tries to answer the question if and how the present day permanent GNSS observations, which are carried out in relatively dense national networks, can contribute to tilt observations that can be then used for further geotectonic studies. The study, which in fact is a case study for the Czech Republic, is based on the analysis of the vertical components and/or vertical differences coming from about 8-year time series of continuous GNSS observations at several tens of permanent stations distributed over the territory of the Czech Republic with the density of about 1 station/1000 km sq. The results are compared with the results obtained from quite independent studies based on the repeated levellings for indication of recent vertical earth′s surface movements. The error sources affecting the vertical component in GNSS observations are briefly discussed and some ways towards necessary improvements to comply with the requirements of tectonic investigations are indicated.