

Extensometric observation of Earth tides and local tectonic processes at the Vyhne station, Slovakia

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Abstract

The Vyhne Tidal Station of the Earth Science Institute of the Slovak Academy of Sciences is located in the former mining gallery of St. Anthony of Padua in the Vyhne valley, Štiavnické vrchy Mts., Central Slovakia. It is equipped with a 20 metre long quartz-tube extensometer measuring Earth's tides, and long-term tectonic deformations of the Earth's crust. Data between 2001 and 2015 with some diverse gaps were digitally collected processed and analysed. The effect of the local conditions, such as structure of the observatory, cavity effect, topography and geologic features of the surrounding rocks, was investigated in detail and these effects were taken into consideration during the interpretation of the results of the data analysis. Tidal analysis of the extensometric data between 2005 and 2015 revealed that the measured tidal amplitudes are close to the theoretical values. The tidal transfer of the observatory was also investigated by coherence analysis between the theoretical and the measured extensometric data. The coherence is better than 0.9 both in the diurnal and semidiurnal band. The effect of the free core nutation resonance was also investigated in the case of the K1 and P1 tidal components. Since the K1/O1 ratio was about the theoretical value 0.8, than the P1/O1 was between 1.0 and 1.15 instead the theoretical value of 0.9. The rate of the long-term strain rate was also investigated and the obtained $-0.05 \mu\text{str/y}$ shows a good agreement with the strain rate inferred from GPS measurements in the Central European GPS Reference Network.

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