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On a feasibility of vertical surface movements studies in Central Europe: Capabilities of available geodetic tools

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The Global Geodetic Observing System (GGOS) integrates the observing systems for changes in the Earth′s shape, gravity field and rotation in a global reference frame with a relative accuracy better than 10-9 and improves their internal consistency. The European Combined Geodetic Network (ECGN), which was conceived by the IAG Subcommission for Europe (EUREF) and may be considered as a regional contribution to the GGOS, is based on a combination of four geodetic techniques – continuous GNSS observations, repeated precise levellings, repeated absolute gravity measurements and continuous tide gauge records. Thus, three quantities related to the gravity domain and one related to the geometric domain enter the combination. For Central Europe, the Central European GPS Geodynamic Reference Network (CEGRN), which has been operational since 1994 and may be considered as a regional densification of the EPN contributing to the determination of the dense EPN based velocity field, forms the basis for studies towards surface kinematics and intraplate tectonics of Central Europe. Besides, a unified gravity reference frame was set up for 12 countries of Central and Eastern Europe within the UNIGRACE project based on repeated absolute gravity measurements at selected CEGRN stations. Since no special attention has up to now been paid to vertical surface movements in the countries associated in the CEGRN consortium, the first attempt is made in this study to assess capabilities of three different geodetic tools for relevant studies: continuous GNSS observations at the EPN stations and the stations of the dense continuously operated Czech national GNSS network, results of repeated levellings for several countries of Central Europe and extensive repeated absolute gravity measurements carried out during the last ten yeares at a large number of sites in the Czech Republic, Slovakia and Hungary. The results of individual techniques are superimposed and problems related to the interpretation of the repeated absolute gravity measurements are discussed in detail.