An Analysis of Strain Accumulation in the Western Part of Black Sea Region in Turkey

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SUMMARY

Turkish National Horizontal Control Network (TNHCN) based on the European Datum 1950 (ED50) was used as the principal geodetic network until 2005 in Turkey. Since 2005, Turkish Large Scale Map and Map Information Production Regulation have required that that all the densification points have been produced within the same datum of Turkish National Fundamental GPS Network (TNFGN) put into practise in 2002 and based on International Terrestrial Reference Frame (ITRF). Hence, the common points were produced in both European Datum 1950 (ED50), and TNFGN. It is known that the geological and geophysical information about the network area can be obtained by the evaluation of the coordinate and scale variations in a geodetic network. For one such evaluation, the coordinate variations and velocities of network points, and also the strains are investigated. However, the principal problem in derivation of velocities arises from two different datums. In this context, the computation of velocities using the coordinate data of the ED50 and TNFGN is not accurate and reliable. Likewise, the analysis of strain from the coordinate differences is not reliable. However, due to the fact that the scale of a geodetic network is independent from datum, the strains can be derived from scale variations accurately and reliably. In this study, a test area limited 39.5°–42.0° northern latitudes and 31.0°–37.0° eastern longitudes was chosen. The benchmarks in this test area are composed of 30 geodetic control points derived with the aim of cadastral and engineering applications. We used data mining to investigate the common benchmarks in both reference systems for this area. Accordingly, the ED50 and TNFGN coordinates refer 1954 and 2005, respectively. Thus, it has been investigated the strain accumulation of 51 years in this region. It should be also noted that since 1954, the earthquakes have not registered greater than magnitude 6.0 in the test area. It is a considerable situation for this evaluation. The finite element analysis is used in order to derive the strain accumulation and rates in the test area. The results have been indicated that the minimum and maximum strains are 17μs and 3041μs, respectively.