



## **GOCE-based height system unification between Greece and Turkey. First considerations over marine and land areas**

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The unification of local vertical Datums (LVDs) at a country-wide scale has gained significant attention lately, due to the availability of GOCE-based Global Geopotential Models (GGMs). The latter, offer unprecedented geoid height accuracies at the 1-1.5 cm level for spherical harmonic expansions to d/o 225-230. Within a single country, several LVDs may be used, especially in the event of islandic nations, therefore the unification of all of them to a single nation-wide LVD is of utmost importance. The same holds for neighboring countries, where the unification of their vertical datums is necessary as a tool of engineering, cross-border collaboration and environmental and risk management projects. The aforementioned set the main scope of the work carried out in the frame of the present study, which referred to the use of GOCE and GOCE/GRACE GGMs in order to unify the LVDs of Greece and Turkey. It is well-known that the two countries share common borders and are a path for large-scale engineering projects in the energy sector. Therefore, the availability of a common reference for orthometric heights in both countries and/or the determination of the relative offset of their individual zero-level geopotential value poses an emerging issue. The determination of the geopotential value  $W_0(\text{LVD})$  for the Greek and Turkish LVDs was first carried out separately for each region performing as well different estimates for the marine area of the Aegean Sea and the terrestrial border-region along eastern Thrace. From that, possible biases of the Hellenic and Turkish LVDs themselves have been drawn and analyzed to determine spatial correlations. Then, the relative offset between the two LVDs was determined employing GPS/Levelling data for both areas and the latest GO-DIR-R5, GO-TIM-R5 and GOCO05s models as well as EGM2008. The estimation of the mean offset was used to provide as well a direct link between the Greek and Turkish LVDs with the IAG conventional value recently proposed as a  $W_0$  for a global WHS.