



European Vertical Datum: Unification within Geopotential Space

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Various local vertical datums, as realised for particular countries or even regions, are in use around the world. These datums were typically established from sea level observations at single or multiple tide gauges. The fundamental geodetic parameter, W_0 , which represents the geopotential value at the geoid surface, can be used to unify vertical datums within geopotential space. This requires geodetic coordinates of points at mean sea level (MSL), a high resolution geopotential model and an accurate mean dynamic topography (MDT) model. In this study, the UK, German and French datums are unified within geopotential space. The tide gauge time series and co-located GPS provide the tools to connect mean sea level to the Earth's centre of mass. A mean dynamic topography model enables the reduction of MSL to the geoid surface. Referencing the geodetic coordinates of the geoid to an Earth's gravity field model yields a geopotential value which corresponds to the geoid at the TG sites which can then be used to connect the vertical datums in different regions. This study also illustrates the improvement of EGM2008 compared with EGM96 and demonstrates the influence of omission error on our work. Furthermore, to connect regional vertical datums to a world height system, W_0 is estimated globally from an altimetry-based global MSL model, a global MDT and EGM2008. Our results show that, at current accuracy of GPS and TG observations and processing strategies, unification of vertical datums is mainly influenced by the accuracy of the geopotential model and MDT.

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