



## Secular Change of the Geoid Geopotential Value, $W_0$ , from Sea Level Measurements and GRACE

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Current accuracy of satellite geodetic techniques enables investigation of the time variation of the fundamental geodetic parameter  $W_0$  as a response to sea level change and mass redistribution etc. In this study, we use two approaches to estimate the temporal variability of  $W_0$ : (i) a regional approach which utilizes tide gauge (TG) and co-located continuous GPS data to recover the annual geodetic coordinates of mean sea level at TG sites. By referencing these coordinates to a high resolution geopotential model such as EGM2008, the annual geopotential values are recovered, from which the secular trend of  $W_0$  is estimated. We use a minimum of 30 years of TG records and around 10 years of CGPS observations from nine sites in the UK and one in France. The CGPS time series enable estimation of the GIA and other geological signals at the TG sites and therefore an absolute sea level trend can be estimated. (ii) A global approach, in which radar altimetry provides a direct measure of the sea surface on a sub-monthly basis, for example, approximately every 10 days from TOPEX/Poseidon. Accordingly, a time series of global sea level measurements can be established. In addition, the GRACE mission is sensing the variation within the Earth's gravity field up to degree 60 in terms of spherical harmonics. Herein, data between 2002 and 2008 are used from JASON-1 and GRACE to recover monthly values of  $W_0$  which are used to infer the secular trend of the geoid geopotential. The influence of geocenter variation on  $W_0$  is also investigated.

**Keywords:** *Tide gauge, continuous GPS, JASON-1, GRACE*