



A New Global Vertical Land Movement Data Set from the TIGA Combined Solution

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Globally averaged sea level has been estimated from the network of tide gauges installed around the world since the 19th century. These mean sea level (MSL) records provide sea level relative to a nearby tide gauge benchmark (TGBM), which allows for the continuation of the instrumental record in time. Any changes in the benchmark levels, induced by vertical land movements (VLM) affect the MSL records and hence sea level estimates. Over the last two decades sea level has also been observed using satellite altimeters. While the satellite observations are globally more homogeneous providing a picture of sea level not confined to coastlines, they require the VLM-corrected MSL records for the bias calibration of instrumental drifts. Without this calibration altimeter instruments from different missions cannot be combined.

GPS has made it possible to obtain highly accurate estimates of VLM in a geocentric reference frame for stations at or close to tide gauges. Under the umbrella of the International GNSS Service (IGS), the Tide Gauge Benchmark Monitoring (TIGA) Working Group (WG) has been established to apply the expertise of the GNSS community to solving issues related to the accuracy and reliability of the vertical component to provide estimates of VLM in a well-defined global reference frame. To achieve this objective, five TIGA Analysis Centers (TACs) contributed re-processed global GPS network solutions to TIGA, employing the latest bias models and processing strategies in accordance with the second re-processing campaign (repro2) of the IGS. These solutions include those of the British Isles continuous GNSS Facility – University of Luxembourg consortium (BLT), the German Research Centre for Geosciences (GFZ) Potsdam, the German Geodetic Research Institute (DGF) at the Technical University of Munich, Geoscience Australia (AUT) and the University of La Rochelle (ULR).

In this study we present to the sea level community an evaluation of the VLM estimates from the first combined solution from the IGS TIGA WG. The TAC solutions include more than 700 stations and span the common period 1995-2014. The combined solution was computed by the TIGA Combination Centre (TCC) at the University of Luxembourg, which used the Combination and Analysis of Terrestrial Reference Frame (CATREF) software package for this purpose. This first solution forms Release 1.0 and further releases will be made available after further reprocessing campaigns. We evaluate the combined solution internally using the TAC solutions and externally using solutions from the IGS and the ITRF2008. The derived VLM estimates have undergone an initial evaluation and should be considered as the primary TIGA product for the sea level community to correct MSL records for land level changes.