



## **Vertical land motion trends from GNSS and altimetry at tide gauge stations**

Marcel Kleinherenbrink, Riccardo Riva, and Thomas Frederikse

Geoscience and Remote Sensing, Delft University of Technology, The Netherlands (m.kleinherenbrink@tudelft.nl)

This study compares eight weighting techniques for Global Navigation Satellite System (GNSS)-derived Vertical Land Motion (VLM) trends at 570 tide gauge (TG) stations. The spread between the methods has a comparable size as the formal uncertainties of the GNSS trends. Taking the median of the surrounding GNSS trends shows the best agreement with differenced altimetry - tide gauge (ALT-TG) trends. An attempt is also made to improve VLM trends from ALT-TG time series. Only using highly correlated along-track altimetry and TG time series, reduces the standard deviation of ALT-TG time series up to 10%. As a result, there are spatially coherent changes in the trends, but the reduction in the RMS of differences between ALT-TG and GNSS trends is insignificant. However, setting correlation thresholds also acts like a filter to remove problematic TG stations. This results in sets of ALT-TG VLM trends at 344-663 TG locations, depending on the correlation threshold. Compared to other studies, we decrease the RMS of differences between GNSS and ALT-TG trends (from 1.47 to 1.22 mm/yr), while we increase the number of locations (from 109 to 155). Depending on the weighting methods the mean of differences between ALT-TG and GNSS trends varies between 0.1-0.2 mm/yr. We reduce the mean of differences by taking into account the effect of elastic deformation due to present-day mass redistribution into account.