



Coastal sea-level change at Cascais (Portugal) from tide gauge, GPS and satellite altimetry data

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The tide gauge record from Cascais (Portugal) is one of the world's oldest and longest records of relative sea-level height measurements. Since tide gauges measure the height of the sea surface relative to a reference on land, the resulting records are influenced by vertical land movements at the tide gauge site. Continuous GPS measurements are particularly suitable for addressing this problem and for attenuating the effect of land movements on relative sea-level records. A permanent GPS station is operating at Cascais since 1997 and has a reliable record, with few equipment changes and few data gaps. In this work sea-level variability at Cascais is examined using tide gauge, GPS and satellite altimetry data. The GPS data from Cascais covering the time span 1997.3 – 2010.0 was processed with GAMIT/GLOBK and GIPSY/OASIS II as part of large global network from the International GNSS Service, using a consistent set of orbits and coordinates expressed in the ITRF2005 reference frame, and absolute values for phase center variation, leading to a robust time series. The tide gauge and GPS daily time series are analysed in terms of low-frequency variability and linear trends for the period from May 1997 to December 2009. Both tide gauge and GPS series exhibit small trends, below 0.5 mm/year. Due to the short length of the series and the small magnitude of the slopes, statistical significance needs to be carefully assessed. A parametric approach taking into account serial correlation and a non-parametric approach of time series bootstrap are applied. The tide gauge observations are corrected for vertical land movements and further compared with absolute sea-level measurements for the same period using non-IB corrected along-track satellite altimetry observations from Jason-1 mission.