



GRACE accelerometer calibration by precise orbit determination

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The GRACE satellites, like other already flying and planned Earth observation missions, are equipped with highly sensitive accelerometers. Scale and bias calibration parameters for each instrument axis are determined to support atmospheric density studies, and accurate values are also important for gravity retrieval. The accelerometer measurements are used in a GPS-based reduced-dynamic orbit determination approach, replacing the non-gravitational force models, and daily calibration parameters are estimated. The resulting orbit precision is at the level of a few centimeters, indicating the correctness of this method. Furthermore, KBR range residuals are computed with the orbits determined using the accelerometer measurements for validation purposes.

A second method is applied as well, where no empirical accelerations are estimated in the orbit determination process. The calibration factors in flight direction are almost not affected in this case, but in radial and cross-track direction they show a larger deviation.

A long time series is analysed, covering the period from January 2003 to September 2007. The stability of the calibration parameters is discussed, and the calibrated accelerometer measurements are compared with accelerations determined from force models and from the GPS observations.