Time stability of SG instrumental scale factor versus time stability of tidal parameters at the J9 Gravimetric Observatory of Strasbourg (1987 – 2016)

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When dealing with long gravity records, time stability is very important because temporal changes of the instrumental sensitivity may introduce a related systematic error in tidal analysis. The long-term tidal stability is directly dependent on the stability of the scale factor of the relative gravimeters.

We use the longest (1987-2016) superconducting gravity record available at the J9 Gravimetric Observatory of Strasbourg, to study the time stability of the response (instrument + Earth) to tidal forcing. The stability is investigated using the temporal variations of the tidal parameters (amplitude factor and phase difference) for the main diurnal and semidiurnal tidal waves as well as for the M2/O1 delta factor ratio. To check the stability of the instrumental sensitivity we use numerous calibration experiments of different durations (from 2 to 10 consecutive days) carried out by colocated AG measurements. We calculate the scale factors considering two different kinds of AG raw measurements: the individual drop gravity values and the set gravity values of the AG.

It turns out that the internal SG C026 stability we derived by averaging the values obtained for the diurnal and semidiurnal tidal bands is much better than the one that can be achieved by SG calibration repetitions using AG data.

Besides the calibration experiments, the long-term behavior of the SG is also constrained by regular absolute gravity measurements, which are performed in parallel since 1989, first with a JILAg-5 instrument and later on with one of the new generation of ballistic gravimeters, FG5#206.

Finally, the seasonal behavior is also compared with hydrological models.