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GOCE - Validation of last days' orbits with kinematic PPP

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After more than four years of successful operations the first ESA Earth Explorer Mission GOCE has officially ended on 21 October 2013, because the fuel for the ion engine was depleted on this day. Three weeks later on 11 November 2013 the satellite re-entered into the Earth's atmosphere over the South Atlantic.

The two onboard GPS receivers were switched on until a few hours before the re-entry and the orbit could therefore still be determined during the last days of the satellite. This is the first time that GPS measurements are available for such a low flying and descending satellite.

The AIUB has been responsible for the precise science orbit determination of the satellite, which included both a reduced-dynamic and a kinematic orbit solution. The orbit determination procedures are based on GPS zero-difference processing and follow the precise point positioning principle that the GPS orbits and clocks are used from a global network solution. Since the reduced-dynamic orbit is less sensitive to data problems and possible gaps it was used among others to validate the quality of the kinematic orbit during the nominal mission period until 21 October 2013.

During the last three weeks before re-entry it was done the other way round and the kinematic orbit has been used to validate the reduced-dynamic orbit. The drag increased significantly and the empirical parametrization of the reduced-dynamic orbit determination had to be adapted accordingly. The GPS data quality did not suffer and it was still possible to generate kinematic orbits of good quality.

Orbit results from this last mission phase will be presented with the focus on the validation of the reduced-dynamic orbit.