

Challenges and opportunities in analyzing Genesis data

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Recommendations

The Genesis mission by the European Space Agency (ESA) is dedicated to the improvement of the terrestrial reference frame, and it is a great opportunity for the geodetic community. The Preliminary Design Review (PDR) has been finalized at the end of 2025, and the satellite will be launched in 2028. With just two years before launch, preparations must be accelerated to be able to fully exploit the mission once data is available. These preparations concern the software packages as well as analysis and combination scenarios.

Joint pilot projects have been set up by the IAG Working Group on Genesis (joint with GGOS and the IERS) and ESA Working Group 1. The plan is to use real orbits from Sentinel 6A and LAGEOS 1, and a simulated Genesis orbit to use real and simulated data for analysis as anticipated for Genesis. Action Items are identified on compiling detailed specifications describing the exact plans and timeline for the pilot projects. In particular, a realistic orbit (attitude model, solar radiation pressure corresponding to the shape of the satellite, ..) is needed for the pilot project on Genesis.

One strategy is to determine orbits by combination of all four space geodetic techniques at the normal equation level, as suggested by Urs Hugentobler. For that purpose, the SINEX format must be extended to allow for all necessary transformations, plus auxiliary information will be useful. Of course, other orbit determination strategies are possible as well and should be considered. It will be important to account for the different time systems used by the four space geodetic techniques. This was not an issue for the determination of the terrestrial reference frames, but it will be critical with the estimation of orbits.

Finally, it has been recognized that a clear recommendation is needed concerning the near-field delay model for VLBI observations to satellites.