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GRGS simulations for a GRASP-like satellite

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GRASP (Geodetic Reference Antenna in SPace) is a spacecraft system designed to provide the needed data for an enduring and stable TRF (Terrestrial Reference Frame) for accurately measuring and understanding changes in global and regional sea levels, ice sheets and other elements of the dynamic Earth system. To reach the goals for the TRF realization of 1 mm accuracy and 0.1 mm/yr stability (GGOS, Meeting the Requirements of a Global Society on a Changing Planet in 2020, Plag and Pearlman, eds., 2009), GRASP would carry very precise sensor systems for all the key geodetic techniques used to define and monitor the TRF (DORIS, GNSS, SLR, and VLBI).

In this study, we present the results obtained regarding the simulations carried out by the French GRGS (Groupe de Recherche de Géodésie Spatiale) for a GRASP-like satellite. First, we searched for the optimal orbit for such a geodetic mission with Genetic Algorithms (stochastic optimization). Then, with the best found orbit, we simulated the measurements of the four geodetic techniques (DORIS and SLR measurements to GRASP, VLBI PPP or interferometric measurements to GRASP, and GNSS measurements received from ground stations and from GRASP) over three years, and we evaluated the expected accuracy and stability of the TRF obtained with the processing of these measurements. Finally, we also investigated the expected impact of the on-board instrument calibration on the quality of the TRF.