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## Simulation studies on single-satellite space ties and their potential to achieve the Global Geodetic Observing System goals.

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The German Research Foundation (DFG) project GGOS-SIM-2, successor of project GGOS-SIM, is a collaboration between the Helmholtz Center Potsdam - German Research Center for Geosciences (GFZ) and the Technische Universität Berlin (TUB). The project aims at investigating the feasibility of meeting the requirements specified by the Global Geodetic Observing System (GGOS) for a global terrestrial reference frame (TRF) with the help of simulations. In GGOS-SIM-2 the potential of so-called space ties is examined in relation to the GGOS targets, 1 mm accuracy in position and 1 mm / decade long-term stability, which have not yet been achieved by the recent International Terrestrial Reference Frame (ITRF). Space ties are provided by a satellite that carries two, three or all the four main space-geodetic techniques, i.e. DORIS, GPS, SLR and VLBI. This allows for a quantification of the impact of systematic errors on the derived orbits and subsequent results of the dynamic method as the TRF. Proposed co-location in space missions such as GRASP and E-GRASP anticipate such a scenario. We therefore simulate the space-geodetic observations based on Precise Orbit Determination (POD) with real observations from various missions and evaluate their potential for determining a TRF. So far, we simulated DORIS and SLR observations to six orbit scenarios, including a GRASP-like and an E-GRASP-like one, and generated TRFs based on each scenario either technique-wise or combined via the space-ties or in combination with ground data. We quantify the effect on the TRF in terms of changes of origin and scale and of formal errors of the ground station coordinates and of the Earth rotation parameters.