



Grace3D - exploiting LISA Pathfinder technology for gravity field recovery

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GRACE-type satellite missions provide along-track inter-satellite ranging information. Evaluating the variations in the ranging information allows to recover the gravity field and its temporal variations. Due to its orbit configuration and along-track observation, the satellites are orbiting the Earth nearly in North-South direction resulting in nearly no sensitivity in the East-West and radial direction. However, the acceleration approach builds a theoretical framework which allows to retrieve information in the radial and cross-track direction. By utilizing the baseline (LOS) angular velocity the gravity observation equation can be expressed in the inertial frame as a full three-dimensional quantity. Practically it requires the observation of the baseline angular velocity vector with nano- to picoradian per second precision which cannot be achieved with star cameras onboard GRACE and GRACE-FO. However utilizing LISA Pathfinder technology, it is possible to provide three angular accelerations by a gravitational reference sensor which describes the rotation of the satellite frame w.r.t. the inertial space. The benefit of the approach is a strongly reduced striping and improved overall performance of a GRACE-type mission.