



Precise orbit determination with inter-satellite links for a future GNSS system

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The DLR and GFZ joint project ADVANTAGE (Advanced Technology for Navigation and Geodesy) aims at studying the potential of optical ranging and time transfer technology for future satellite navigation systems.

The chosen ADVANTAGE constellation consists of 24 Middle Earth Orbit (MEO) navigation satellites and 4 Low Earth Orbit (LEO) satellites devoted to generate the time scale and synchronize the clocks of the system using two-way optical links.

For this constellation we simulate both GNSS L-band ranging data (pseudorange and carrier phase) between MEOs and LEOs and between MEOs and ground, as well as highly precise optical ranges between neighboring MEO satellites.

Using the simulated data we investigate the benefits of all the links for MEO and LEO orbit determination in three different scenarios:

(1) MEOs + ground stations, (2) MEOs + LEOs + ground stations and (3) MEOs + LEOs.