Gravity Recovery by Recent and Future Satellite-to-Satellite Tracking Missions

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Using the recent space-born gravity measurement techniques (microwave SST, i.e. the GRACE; SSI), the temporal gravity field can be detected with unprecedented high resolution and accuracy. In this presentation we are going to discuss generally the accuracy of different SSI (Satellite-to-Satellite Tracking Laser Interferometry) configurations, based on measurement noise error analysis. Prospective decrease of the measurement noises using new measuring techniques will be also discussed. Detectability of some geophysical processes of particular interest by SSI was modeled, and will be introduced.

The GRACE is a NASA/GFZ joint gravity mission, which will be launched in autumn of 2001. The GRACE applies satellite-to-satellite (SST) radar interferometry measurements. Its aim is to detect seasonal gravity variations.

At the NASA a SST configuration, which would use laser signal instead of the microwave, i. e. the Satellite-to-Satellite Tracking Laser Interferometry (SSI), is already on trial. The ability of the SSI would outperform the GRACE at least by one order of magnitude. This improvement should not be done without basic changes on the measurement technique of the non-gravitational acceleration.

In this presentation we are going to discuss generally the accuracy of different SSI configurations. The accuracy analysis is based on measurement noise error modeling with the following factors in consideration: background noises, thermal noises, ultra-stabile oscillator noises and non-gravitational accelerometer noises. Prospective decrease of the noises and desirable measuring technique improvements will be also analyzed.

Finally we are going to discuss some geophysical processes of particular interest, and we would like to model a reasonable state-of-the-art gravity satellite for the purpose. Detectability of these processes by SSI will be analyzed by considering the noise effect of different parallel phenomena on the detected signal.