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Combined analysis of GNSS and SLR observations for the GIOVE satellites

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The GGSP (Galileo Geodetic Service Provider) is responsible to provide the geodetic basement of the future European GNSS, the Galileo system. The AIUB is one partner of the consortium of seven institutions. In the context of this project, the data of 13 GESS (Galileo Experimental Sensor Stations) are processed together with the GPS data of about 120 IGS sites. Apart from the station coordinates also the satellite orbits, ERPs, and clock corrections are computed.

Since the 13 GESS do not only provide GPS data but also track the two first Galileo satellites (i.e., GIOVE-A and GIOVE-B), a combined processing of the GPS and Galileo data using microwave data is possible. Due to the sparse network of GESS the GPS data highly support the Galileo related products (the orbits and satellite clock corrections). Nevertheless, the quality of the GIOVE orbits is limited to about 20 cm.

As both GIOVE are equipped with retro-reflector arrays, the satellites are tracked by satellite laser ranging (SLR), as it is already done for some GLONASS satellites and those two GPS satellites equipped with retro-reflectors.

The availability of SLR data allows a validation of the satellite orbits determined from GNSS observations. The range residuals show whether there is any systematic difference between the GNSS and SLR system and, thus, may help to improve the orbit modeling for the GIOVE satellites.

Furthermore, we will include the SLR tracking data into the orbit determination in order to derive a combined GNSS+SLR orbit. It will be studied whether the inclusion of SLR data shows any significant improvement for the combined orbit compared to the GNSS-only orbit. This study can be seen as a further step toward the combined processing of GNSS and SLR observations for a fully integrated multi-technique data analysis.