



## **Contribution of Inter-Satellite Range Measurements to the Inner Precision of GNSS Orbits**

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Today's precise orbit determination is exclusively based on observations taken from ground, for instance GNSS- or SLR- observations. Measuring GNSS satellites from the surface of the Earth results in a poor observation geometry. In addition, ground-based observations are affected by tropospheric delay errors. GNSS Inter-satellite range measurements, on the other hand, provide a much better observation geometry for precise orbit determination. In addition they are not affected by tropospheric errors.

A network of inter-satellite measurements can be used to tightly interlink the orbits in the GNSS constellation. The resulting satellite orbits can be considered a realization of a dynamic reference system. This reference frame can be connected with the ITRF introducing additional observations from GNSS ground stations. Alternatively, the link to a quasi-inertial reference frame is given through perturbing forces only, such as radiation pressure and gravitational force of moon and sun, acting on the satellite. The resulting orientation stability of the satellite orbit constellation is assessed in the absence of ground-based observations and as a function of the number of ground-based observing stations.