

Can the reference system be defined based on the LEO/GPS bi-constellation?

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The Taiwan-US mission FORMOSAT3/COSMIC will be the first mission at LEO altitudes with 6 satellites flying in a constellation making use of onboard GPS receivers. By forming GPS baselines between these 6 LEO satellites and by fixing ambiguities, a unique bi-constellation POD network in space can be formed. Based on the COSMIC constellation, orbits of the GPS satellites can be estimated simultaneously with the orbits of the LEO satellites without using measurements from the ground GPS network. However, as our simulation study shows, the orbit of one reference LEO satellite has to be kept fixed. In the same way as the ground stations form terrestrial earth-fixed system, satellites forming LEO/GPS bi-constellation defines dynamic inertial system tied to gravity field of the Earth. By adding GPS data from the ground IGS network, the strength of the whole system is considerably increased and the impact of a LEO constellation on the determination of global IGS parameters like Earth rotation, station coordinates, troposphere zenith delays and the orbits of the GPS satellites can be demonstrated. The simulation shows that FORMOSAT3/COSMIC satellites may have great impact on the IGS processing.