EGU2020-10780
https://doi.org/10.5194/egusphere-egu2020-10780
EGU General Assembly 2020

ICESat-2 Precision Orbit Determination Performance

Taylor Thomas[1], Scott Luthcke[2], Teresa Pennington[3], Joseph Nicholas[1], David Rowlands[2], and Timothy Rebold[1]

[1]Emergent Space Technologies, Inc. @ NASA GSFC Code 61A, Greenbelt, MD, USA
[2]NASA GSFC Code 61A, Greenbelt, MD, USA
[3]KBRWyle, Inc. @ NASA GSFC Code 61A, Greenbelt, MD, USA

The Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) mission launched on September 15th, 2018, with the primary goal of measuring ice sheet topographic change. The fundamental measurement used to achieve mission science objectives is the geolocation of individual photon bounce points. Geolocation is computed as a function of three complex measurements: (1) the position of the laser altimeter instrument in inertial space, (2) the pointing of each of the six individual laser beams in inertial space, and (3) the photon event round trip travel time observation measured by the Advanced Topographic Laser Altimeter System (ATLAS) instrument. ICESat-2 Precision Orbit Determination (POD) is responsible for computing the first of these; the precise position of the laser altimeter instrument.

ICESat-2 carries two identical on-board GPS receivers, both manufactured by RUAG Space. Tracking data collected by GPS receiver #1 is used as the primary data source for generating POD solutions. POD is performed using GEODYN, NASA Goddard Space Flight Center's state-of-the-art orbit determination and geodetic parameter estimation software, and a reduced-dynamic solution strategy is employed. The GPS-based POD solutions are calibrated and validated using independent Satellite Laser Ranging (SLR) data from ground-based tracking stations.

ICESat-2 mission requirements state that the POD solutions must have a one-sigma radial accuracy of 3 cm over a 24-hour time interval. Here we show that early mission ICESat-2 POD performance is exceeding mission requirements. We describe in-depth the ICESat-2 spacecraft macro-model, used for non-conservative force modeling, and the results from tuning of the associated parameters. Lastly, we show the iterated GPS receiver antenna phase center variation map solution and assess its impact on POD performance.