Geophysical Research Abstracts
Vol. 20, EGU2018-15608, 2018
EGU General Assembly 2018

Adjusted Optical Properties for Galileo, BDS and QZSS Satellites from Precise Orbit Determination

Bingbing Duan, Urs Hugentobler, Inga Selmke, and Max Hofacker

Institut für Astronomische und Physikalische Geodäsie, Technische Universität München, Munich, Germany(bingbing.duan@tum.de, urs.hugentobler@bv.tum.de, inga.selmke@tum.de, max.hofacker@tum.de)

The physical solar radiation pressure performed on a satellite surface is determined by its dimension and optical properties, which comprises absorbed, reflected and diffusely scattered photons. To compensate the effects of solar radiation pressure, purely empirical models (Empirical CODE Orbit Model, ECOM, ECOM2) based on the behavior of the corresponding accelerations are successfully used for GPS satellites. For the new emerging constellations Galileo, BeiDou and QZSS, dimensions of individual satellite-body surfaces are different and the maintenance of the nominal attitude is not perfect. Thus, the prevailing empirical models are not as efficient as for GPS satellites. An a priori box-wing model proves to be helpful for the precise orbit determination of Galileo IOV satellites. The dimensions and optical properties for all the Galileo satellites are publicly available while for BeiDou and QZSS satellites the optical properties are not yet provided. Moreover, BeiDou and QZSS satellites maintain orbit normal attitude when the Sun elevation above the orbit plan is below a specific value. This contribution develops an adjustable method to estimate the sum of the absorbed and diffusely scattered photons and the reflected photons for the satellite-body surfaces that contribute to solar radiation pressure. Apart from the optical properties, the direct solar radiation pressure, Y-bias, and solar panel rotation lag are estimated as well. Since the optical properties are constant, we stack one-day arc normal equations of 150 days and obtain the corrections with respect to the priori values. We find that the estimated optical properties of Galileo satellites are close to the published values. We also do orbit determination by combining ECOM model and a priori box-wing model that adopts the estimated and published optical properties respectively. SLR residuals show that the difference is very small. Thus, we are applying the procedure to BeiDou and QZSS satellites and will present the corresponding results.