Geophysical Research Abstracts
Vol. 20, EGU2018-4230, 2018
EGU General Assembly 2018

On the applicability of E14 & E18 Galileo FOC satellites with incorrect orbits: an evaluation of the instantaneous medium range positioning

Jacek Paziewski, Rafal Sieradzki, and Pawel Wielgosz
University of Warmia and Mazury in Olsztyn, Institute of Geodesy, Olsztyn, Poland (jacek.paziewski@uwm.edu.pl)

This study was devoted to address potential contribution of the first pair of FOC satellites injected to incorrect highly eccentric orbits to geodetic and surveying applications. In specific, we analyzed the potential capability of these satellites to medium range instantaneous relative positioning. We began with the analysis of the carrier to noise density ratio and stochastic properties of GNSS measurements. The investigations revealed that the signal power of E14 & E18 satellites is higher than regular Galileo satellites, what is related to lower orbital radius. With regard to the noise of the observables, there are no significant differences between all Galileo satellites. Furthermore, the analysis confirmed that the precision of Galileo data is higher than GPS, especially in the case of code measurements. Following analysis considered three domains of precise positioning: ambiguity resolution, coordinate accuracy and observable residuals. On the basis of test solutions: with and without E14 & E18, we found that these satellites did not influence noticeably on the ambiguity resolution process. The discrepancy in ambiguity success rate between test solutions did not exceed 2%. Also, the differences between standard deviations of the fixed coordinates did not exceed 1 mm for horizontal components. The standard deviation of the L1/E1 phase residuals corresponding to regular GPS and Galileo, and E14 & E18 satellite signals were at comparable level, fitting in the range of 6.5-8.7 mm. The study revealed that the Galileo satellites with incorrect orbits were fully usable in most of geodetic, surveying and many other post processed applications and might be beneficial especially to positioning during obstructed visibility of satellites. This claim holds true providing precise ephemeris of satellites.