Geophysical Research Abstracts
Vol. 20, EGU2018-9902, 2018
EGU General Assembly 2018

General relativity test during BepiColombo's cruise phase to Mercury

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The Mercury Orbiter Radio science Experiment (MORE) onboard BepiColombo consists of a radio tracking system that exploits highly stable, multi-frequency radio links in X and Ka bands. The state-of-the-art microwave equipment enables simultaneous two-way links in X/X (7.2 GHz uplink/8.4 GHz downlink), X/Ka (7.2/32.5 GHz) and Ka/Ka band (34/32.5 GHz), providing plasma-free range rate accuracies of 3 micron/s (at 1000 s integration time) at nearly all elongation angles. Range observables accurate to 20 cm (two-way) will be attained using a novel, wideband (24 Mcps) ranging system, based on a pseudo-noise modulation scheme.
MORE is designed to estimate Mercury's gravity field and rotational state and to perform a wide set of relativistic gravity tests. The first measurements will be performed during the cruise phase to Mercury. MORE may in principle exploit all spacecraft's eleven superior solar conjunctions (SSC) to determine the parametrized post-Newtonian parameter γ, controlling the amount of space curvature produced by a unit mass. MORE will exploit a precise measurement of the time (Shapiro) delay and Doppler shift generated by the Sun when the radio beam propagates in its proximity.
We present the results of numerical simulations carried out considering the latest mission scenario (launch date in October 2018 with arrival at Mercury in December 2025), the operational constraints, and dynamical noise affecting the spacecraft. We address the effects of the variability of the solar irradiance (0.1-0.01% over timescales of hours to a few days) to assess a realistic accuracy of the experiment. We present the results of the estimation of γ obtained assuming several realizations of solar irradiance fluctuations and considering the dynamical noise in the orbit determination process.