



## **GNSS orbit determination by precise modeling of non-gravitational forces acting on satellite's body**

Agata Wielgosz (), Maciej Kalarus (1), and Tomasz Liwosz (2)

(1) Space Research Centre of Polish Academy of Science, Warsaw, Poland, (2) Warsaw University of Technology, Warsaw, Poland

Satellites orbiting around Earth are affected by gravitational forces and non-gravitational perturbations (NGP). While the perturbations caused by gravitational forces, which are due to central body gravity (including high-precision geopotential field) and its changes (due to secular variations and tides), solar bodies attraction and relativistic effects are well-modeled, the perturbations caused by the non-gravitational forces are the most limiting factor in Precise Orbit Determination (POD). In this work we focused on very precise non-gravitational force modeling for medium Earth orbit satellites by applying the various models of solar radiation pressure including changes in solar irradiance and Earth/Moon shadow transition, Earth albedo and thermal radiation. For computing influence of aforementioned forces on spacecraft the analytical box-wing satellite model was applied. Smaller effects like antenna thrust or spacecraft thermal radiation were also included. In the process of orbit determination we compared the orbit with analytically computed NGP with the standard procedure in which CODE model is fitted for NGP recovery. We considered satellites from several systems and on different orbits and for different periods: when the satellite is all the time in full sunlight and when transits the umbra and penumbra regions.