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A New Model of the Mean Albedo of the Earth: Estimation and Validation from the GRACE Mission and SLR Satellites.

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This talk provides new results of a study that we began last year, and that was the subject of an oral presentation by the same main authors presented during EGU General Assembly 2017, entitled «Effects of the Earth Albedo and Thermic Emissivity on Geodetic Satellite Trajectories: a Mean Model from 2000-2016 data sets. » The emissivity of the Earth, split into a part in the visible domain (albedo) and the infrared domain (thermic emissivity), is at the origin of non gravitational perturbations on artificial satellite trajectories. The amplitudes and periods of these perturbations can be investigated if precise orbits can be carried out, and reveal some characteristics of the space environment where the satellite is orbiting. Analyzing the perturbations is, hence, a way to characterize how the energy from the Sun is re-emitted by the Earth. When led over a long period of time, such an approach enables to quantify the variations of the global radiation budget of the Earth.

Additionally to the preliminary results presented last year, we draw an assessment of the validity of the mean model based on the orbits of the twin satellites of the GRACE mission, and, to a certain extent, of some of the SLR satellite orbits. Accelerometric data of the GRACE satellites are used to evaluate the accuracy of the models accounting for non gravitational forces, and the ones induced by the albedo and the thermic emissivity in particular. Three data sets are used to investigate the mean effects on the orbit perturbations: Stephens tables (Stephens, 1980), ECMWF (European Centre for Medium-Range Weather Forecasts) data sets and CERES (Clouds and the Earth's Radiant Energy System) data sets (publicly available). From the trajectography point of view, based on post-fit residual analysis, we analyze what is the data set leading to the lowest residual level, to define which data set appears to be the most suitable one to derive a new « mean albedo model » from accelerometric data sets of the GRACE mission. The period of investigation covers the full GRACE period, and especially the first years.