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## Impact of a-priori SRP models and ECOM models on GNSS precise orbit determination

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As one of the products of the International GNSS Service (IGS), precise orbits for Global Navigation Satellite Systems (GNSS) play an important role in many geoscientific applications. Currently, the precision and consistency of GNSS orbits are still limited by insufficient knowledge of spacecraft response to non-conservative perturbations, of which the solar radiation pressure (SRP) has the strongest influence. SRP modeling strategies adopted by IGS Analysis Centers (ACs) can be categorized: 1) analytical SRP model like the ROCK models (Fliegel et al. 1992), 2) empirical representation, for example by estimating ECOM parameters (Beutler et al. 1994, Springer et al. 1999a, and Arnold et al. 2015), and 3) the combination of both, hybrid empirical-physical SRP model such as adjustable box-wing model (e.g. Rodriguez-Solano et al. 2012). While empirical models fit the observations well, the loss of physical explanation may cause unexpected systematic errors. Uncertainties in the a-priori SRP models, which rely on the optical coefficients and surface structure of the satellites, can also degrade the determined orbit systematically. Using a hybrid model, i.e. estimation of empirical parameters on top of a-priori model, is expected to take the advantage of the existing satellite properties and to compensate for the inaccuracy related to the satellite properties based on observations. Thus, different hybrid models have to be tested for each constellation and block type.

In this study, we assess the GNSS precise orbit determination (POD) based on different setups of a-priori models and ECOM parametrization. The results will be presented as follows: 1) first, the orbits difference introduced by a-priori model is analyzed by comparing orbit with the one based on pure ECOM models. 2) Second, the effect of a-priori models will be discussed by assessing the estimated ECOM parameters. 3) Third, the derived orbit will be compared with the final orbits of selected IGS ACs. 4) The effect of the selected SRP modeling strategy on geodetic parameters will be discussed with special focus on the estimated station coordinates.