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Impact of solar radiation pressure modeling on GNSS-derived geocenter motion

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The geocenter motion, i.e. the variations of the Earth's center of mass with respect to a crust-based reference frame, derived from GPS measurements shows apparent displacements at orbit related frequencies. In previous studies, harmonics of the GPS draconitic period (the repeat period of the Sun with respect to. the satellite constellation) have been identified in the Z-component of the geocenter. The acceleration and orbit perturbations caused by solar radiation pressure (SRP) have a strong dependency on the relative position of satellite, Earth and Sun, and therefore they exhibit a long-term draconitic periodicity. Mismodeling of this perturbing acceleration is a potential cause for the observed anomalous frequencies in the geocenter motion. In this study, we compute two multi-year GPS/GLONASS solutions. The first one uses an empirical parameterization of the SRP widely used within the IGS (International GNSS Service), namely the CODE (Center for Orbit Determination in Europe) empirical model. The second one uses a recently developed SRP model based on the physical interaction between solar radiation and satellite, capable of fitting the GNSS tracking data, called adjustable box-wing model. These two multi-year solutions allow studying the impact of solar radiation pressure modeling on the GNSS-derived geocenter motion and indicate the potential for reduction of technique-specific artifacts in the geodetic time series.