



Comparison of IERS Coventions 2010 and 2003 in High precision orbit model

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The geophysical and kinematic irregularities of the Earth work as dominant perturbations in satellite orbit propagation because of the facts that the Earth is not perfectly sphere and its' rotational axis is not fixed in space. The International Earth Rotation Service (IERS) provides the Conventions as guideline of using the Earth's model along with the reference time and coordinate systems defined by the International Astronomical Union (IAU). These guidelines are directly applied to model orbital dynamics of the Earth satellite. So, in here, the effects of the updated Conventions on orbit propagation are investigated by comparing with the case applying the previous conventions, namely, one with the current 'IERS Conventions 2010' and the other with the previous Conventions released at 2003. The total seven cases are tested, i.e. for the precession/nutation, the geopotential, the ocean tide, the ocean pole tide, the free core nutation, the polar motion, and the solar system ephemeris models. The resultant position differences range from tens of meters for the geopotential model change from EGM96 to EGM2008 to a few mm for the precession/nutation model change from IAU2000 to IAU2006. The along-track differences vary secularly while the cross-track components show periodic variation. However, the radial-track position differences are very small compared with the other components in all cases. This phenomenon is caused by the variation of the ascending node and the argument of latitude. The reason is that the changing the models tested in the current study can be regarded as small fluctuation of the geopotential model from orbital dynamics' point of view. The ascending node and the argument of latitude are more sensitive elements to the geopotential than the other elements. The study can give a contribution to understand the relation between the Earth's geophysical properties and orbital motion of satellites as well as satellite-based observations.