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Towards a new conventional high-frequency Earth rotation model

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Since the current high-frequency Earth rotation model based on the data-constrained ocean tide model (Egbert et al. 1994) was issued by the International Earth Rotation and Reference Systems Service (IERS), almost 20 years have passed. The operational geodetic analysis requires a new high-frequency model agreeing with the currently applied terrestrial reference frame (ITRF2014) and Earth orientation parameters time series (IERS C04 14). Over the last years, a number of numerical models and empirical solutions were published. In this work we consider the following models: Desai and Sibois' hydrodynamic approach (2016), an altimetry-based ocean tides by Madzak et al. (2016), as well as GPS-based (Steigenberger, 2009) and VLBI-based (Artz et al., 2011) solutions. For comparison, we employ the Very Long Baseline Interferometry (VLBI) analysis over 20 years (1995–2015). Differences between these models are investigated with respect to tide amplitude variations in the diurnal and semi-diurnal bands of the Earth rotation time series. In particular, smaller discrepancies in the residuals in the high-frequency band can be seen for the model by Desai and Sibois' (2016) and by Madzak et al. (2016) relatively to the results obtained for the current IERS model. Also, the empirical solution by Steigenberger (2009) reveals the expected technique-dependent weakness due to orbit resonance. The smaller residuals of the VLBI-based solution by Artz et al. (2011) are also expected because this model is evaluated again with the VLBI analysis. Moreover, the VLBI-related parameters were assessed to illustrate the reliability of the performed analysis and the impact which can be seen in the operational analysis.