Oceanic Excitations on Polar Motion: A Cross Comparison Among Models

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Abstract. Recent studies based on various oceanic general circulation models (OGCMs) demonstrated that the oceans are a major contributor to polar motion excitations. In this paper, we analyze and compare observed non-atmospheric polar motion excitations with oceanic angular momentum (OAM) variations determined from four OGCMs, which include the parallel ocean climate model (POCM), an barotropic ocean model (BOM), the ECCO non-data-assimilating model (ECCO-NDA), and the ECCO data-assimilating model (ECCO-DA). The data to analyzed span a 5-year's overlapped period from 1993-1997. At annual time scale, none of the four OAM estimates agree well with observed excitations, while POCM shows relatively larger discrepancies than other three models. At intraseasonal time scales, ECCO-DA yields the best agreement with observations, and reduces the variance of non-atmospheric excitations by ~ 60%, 10-20% more than those explained by other three models. However, at the very short periods of 4-20 days, the BOM estimates could explain about half of the observed variance, twice as much as that by ECCO-NDA, and also shows considerably better correlation with observations. Due to

differences in modeling schemes and methods, significant discrepancies could arise with respect to the quantity of modeling large-scale oceanic mass redistribution and current variation. A clear understanding of global oceanic contributions to polar motion excitation still remains a challenge.