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IERS Rapid Service/Prediction Center Use of Atmospheric and Ocean Angular Momentum for Earth Orientation

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The accuracy of near real-time estimates and short-term predictions of Earth orientation parameters (EOPs) can be enhanced by the use of Atmospheric Angular Momentum (AAM) and Ocean Angular Momentum (OAM) information, by accounting for the global conservation of angular momentum in the Earth system. The US Navy analysis and forecast scheme is named the Navy Earth System Prediction Capability (NAVY ESPC) and is comprised of the Navy Global Environmental Model (NAVGEM) atmospheric and Hybrid Coordinate Ocean Model (HYCOM) ocean systems (along with ice forecasts). GOFS is being improved continually, and the resultant motion and mass fields are potentially useful for operational Earth orientation applications. Consistency between the NAVGEM and HYCOM fields is required for calculations of the total angular momentum of the combined system of geophysical fluids. However, they might not include land-based Hydrological Angular Momentum functions (HAM) and the additional amount due to sea-level variability, the Sea-Level Angular Momentum (SLAM), both of which may be accounted for separately. We investigate various combination and optimal estimation processes using these data series, in conjunction with existing EOP observations to improve accuracy and robustness of short-term EOP predictions. Results are compared with those from other fluid models, particularly from those of the GeoForschungsZentrum (GFZ), the German Research Center for Geosciences. We also estimate power spectral density as a measure of error, for NAVGEM and HYCOM-based AAM/OAM series and similar series from other centers, comparing them to equivalent measures calculated from Earth orientation parameters.