ATMOSPHERIC EXCITATION OF EARTH ROTATION: STUDIES FROM AN EARTH SYSTEM SCIENCE PERSPECTIVE

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Changes in Earth orientation are caused by the mass displacement of the solid Earth and by exchanges of angular momentum between the solid and fluid parts of the Earth, as well as by angular momentum associated with extraterrestrial objects. Earth rotation, when studied in combination with complementary geophysical data such as atmospheric angular momentum (AAM) and torque, allows new and unique insights into dynamical processes associated with angular momentum generation, transport and dissipation. Earth rotation variations over timescales of days to interannual periods are dominated by atmospheric excitation, with a robust seasonal cycle arising from annual harmonics of solar radiative forcing. Significant variability appears at shorter periods in the intraseasonal band, and has been linked to episodes of the tropical Madden-Julian oscillation as well as to extratropical, dynamically-induced flow anomalies. At longer periods, interannual oscillations have been linked to the El Nino/Southern Oscillation phenomenon and to Quasi-Biennial Oscillations arising in the tropical troposphere as well as the stratosphere. Findings from a joint analysis of Earth rotation and AAM from the NCEP reanalysis will be featured; robust techniques such as singular spectrum analysis (SSA) and multi-channel SSA are utilized.