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THERMOSPHERIC NEUTRAL DENSITY VARIABILITY

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Abstract: Orbital drag errors adversely impact many space missions including providing collision avoidance warnings for manned spaceflight, accurately cataloging of all orbiting objects, predicting reentry times and estimating satellite lifetimes, on-board fuel requirements and attitude dynamics. Uncertainties in neutral density variations are the major satellite drag limiting factor for precise low-Earth orbit determination at altitudes below about 700 km. We review current efforts in empirical and theoretical models dedicated to meeting evolving stringent operational satellite drag requirements. New data sets from orbital drag, satellite-borne accelerometers and remote sensors now provide unprecedented capabilities for modeling thermospheric variability vs altitude, latitude, day of year, local time and solar-geomagnetic conditions. Using investigations into the relationships between solar minimum, global cooling and low drag densities plus further examination of the longitudinal variations, new insights are being gained in the future direction of satellite drag modeling.