A new empirical thermospheric density model JB2008 using new solar and geomagnetic indices

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Abstract: A new empirical atmospheric density model, Jacchia-Bowman 2008, is developed as an improved revision to the Jacchia-Bowman 2006 model which is based on Jacchia's diffusion equations. Driving solar indices are computed from on-orbit sensor data are used for the solar irradiances in the extreme through far ultraviolet, including x-ray and Lyman-α wavelengths. New exospheric temperature equations are developed to represent the thermospheric EUV and FUV heating. New semiannual density equations based on multiple 81-day average solar indices are used to represent the variations in the semiannual density cycle that result from EUV heating. Geomagnetic storm effects are modeled using the Dst index as the driver of global density changes. The model is validated through comparisons with accurate daily density drag data previously computed for numerous satellites in the altitude range of 175 to 1000 km. Model comparisons are computed for the JB2008, JB2006, Jacchia 1970, and NRLMSIS 2000 models. Accelerometer measurements from the CHAMP and GRACE satellites are also used to validate the new geomagnetic storm equations.

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