Observations of Record-Low Thermospheric Density During the Current Minimum
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We use global-average thermospheric total mass density, derived from the drag effect on the orbits of many space objects, to study the behavior of the thermosphere during the prolonged cycle 23/24 solar minimum. At an altitude of 400 km, thermospheric densities during 2007–2009 were the lowest observed in over 40 years of measurements, and were anomalously low (by 10–30%) compared to levels expected from past behavior during the previous two minima. These anomalies appear to have started in 2005, when solar extreme ultraviolet (EUV) irradiance was well above the prolonged low levels of the cycle 23/24 minimum. We estimate the contributions of thermospheric temperature and composition perturbations to the observed density anomalies, and discuss potential solar and geo-atmospheric causes.