



Long and short-term variations in the energy balance of the thermosphere from TIMED and SORCE

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Energy balance in the Earth's upper atmosphere remains a frontier of scientific inquiry. Measurements provided by the NASA TIMED and SORCE satellite provide detailed insight into the magnitude and variability of key terms in the heat balance. We examine infrared cooling due to emission from nitric oxide at $5.3 \mu\text{m}$ and from carbon dioxide at $15 \mu\text{m}$ derived from measurements of the SABER instrument on the TIMED satellite. Similarly we examine heating due to the absorption of solar ultraviolet radiation in the thermosphere from measurements made by the SEE and SORCE instruments. These datasets now exceed 6 years in length. Variations in both heating and cooling are observed on scales ranging from days to years. Short-term periodic effects associated with the occurrence of coronal holes on the Sun are evident in the radiative cooling of the thermosphere. Long-term effects of the 11-year solar cycle are also evident. These results will be presented along with estimates of the global energy balance.