Solar EUV Irradiance and Thermospheric Composition Trends Retrieved from FUV Dayglow Observations

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The advent of routine thermospheric/ionospheric remote sensing missions such as GUVI, and now GOLD and ICON, provide a long-term database of atmospheric composition retrieved from observed far ultraviolet (FUV) thermospheric emissions. Algorithms that extract composition from dayglow observations ingest a solar irradiance spectrum provided either from direct measurements such as those made by SORCE or EVE, or empirical models thereof that adjust for solar activity, and egest altitude-dependent thermospheric densities (Earth limb viewing) and/or the integrated column O/N_2 ratio (Earth disk and limb viewing). A product of the retrieval methodology is also information about the absolute magnitude of the solar extreme ultraviolet (EUV) irradiance required to reproduce the FUV dayglow. This quantity, designated Q_{euv} (W/m^2), is obtained by scaling the magnitude of the ingested solar spectrum to optimize the retrieval process. Q_{euv} is the integral of the scaled spectral irradiance from 0 to 45 nm, the range of photon energy that is required to produce photoelectrons with sufficient energy to collisionally excite thermosphere species to electronic states that radiate in the FUV. Following a brief review of the retrieval techniques, the Q_{euv} values derived from thermospheric FUV emissions are compared with direct measurements of this energy band, and trends are examined in both Q_{euv} and thermospheric composition.