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AISstorm 2.1 - Modeling Particle induced atmospheric Ionization

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AISstorm (Atmospheric Ionization during Substorms Model) derives the global atmospheric ionization due to particle precipitation based on in-situ particle measurements. The model covers auroral precipitation as well as solar particle events on an altitude range of about 250km down to 16km for protons and down to 70km for electrons.
The ionization of alpha particles is also included, but in a smaller height range.
The overall structure is divided into an empirical model, which determines the 2D flux of the precipitating particles, and a numerical model, which determines the ionization profile of the individual particles. The combination of these two models results in a high-resolution 3D particle ionization rate pattern.
AISstorm is the successor to the Atmospheric Ionization Module Osnabrück (AIMOS).

The main advantage of the updated ionization rates is a wider dynamic range during substorms and during the onset of geomagnetic storms, especially in the mesosphere - in agreement with observations.

The internal structure of the model has been completely revised in AISstorm. The main aspects are: a) an internal magnetic coordinate system, b) the inclusion of substorm properties, c) a higher temporal resolution, d) a higher spatial resolution, e) an energy-specific, separate treatment of auroral precipitation, polar cap precipitation and crosstalk-affected areas, f) a better MLT resolution.

We compare the new ionization rates to AIMOS 1.6, AISstorm 2.0 and the HEPPA III multi-model study.

Solicited or Contributed

Contributed

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