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Title: Coupling solar inputs to the magnetosphere-ionosphere system down to the middle and lower atmospheres

Abstract.

The sun affects the planets via two main processes. The one with which we are most familiar is the solar insolation of e/m radiation which is the main source of warmth and produces a mainly regular and predictable input. The other process is the one mediated by the solar wind where particle injection and electric field generation provide a more intermittent and variable energy and momentum input. In the case of the Earth the solar wind input is mediated by the magnetosphere-ionosphere system. The aurorae are the most visible manifestation of this "geomagnetic" coupling while the thermospheric and ionospheric variability is easily measured. What is more controversial is whether - and if so how - these processes can affect the lower atmosphere. There is a great deal of evidence of a statistical nature that the lower atmosphere is indeed affected, and in that case the middle atmosphere has to act as the intermediary. For this reason several attempts have been made to produce models coupling the various layers of the atmosphere. There have been two approaches - adding a thermosphere-ionosphere-magnetosphere system to a troposphere-stratosphere (ie weather) model, or extending thermosphere-ionosphere models downwards. There are problems with both approaches, and current advances are concentrating on applying data assimilation techniques to get more accurate results.

All this depends on having accurate descriptions of the magnetospheric coupling and how this is controlled by the solar-terrestrial interactions. This talk will concentrate on what is needed at the various stages of the coupling chain from input to response at all levels, and ask what is needed to get a more realistic system.

Suggested structure:

Thermosphere-ionosphere models, basic description

Inputs to T-I models at the topside

Add a lower atmosphere or build up a weather model?

How the lower atmosphere can affect the upper atmosphere:

(Tides, gravity waves and wave coupling)

Chemical transport from above: atomic oxygen

Nitric Oxide and its importance

Is there coupling from above or are we just restricting the energy of the lower atmosphere from escaping?

Global Electric Circuit as a coupling mechanism

What is needed with each of these processes to improve the modelling of the effects?