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Impact of geomagnetic activity on thermospheric composition and circulation, and their coupling to the middle and upper atmosphere

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External forcing by high-speed solar wind streams and solar coronal mass ejections (so-called geomagnetic forcing) incfluences composition and circulation of the lower thermosphere. Essential processes are photoionisation, particle ionisation and Joule heating. Hereby produced changes in the thermosphere also effect other atmospheric layers.

In a first instance, chemical composition is affected by impact ionisation, which leads to the formation of nitric oxides in the upper mesosphere and thermosphere. Nitric oxide can then be transported down into the stratosphere during polar winter, and destroy ozone there in catalytic cycles. As ozone is one of the key species of radiative heating and cooling of the middle atmosphere, this has a direct impact on temperatures and the thermal wind balance.

In this presentation we show the impact of high auroral activity compared to low auroral activity in three free running models (vertical extended EMAC (ECHAM5 MESSy Atmospheric Chemistry), standard EMAC, WACCM). We investigate the impact on atmospheric composition and dynamics from the lower thermosphere down to the lower atmosphere. Special focus is on NO_y, ozone, temperatures and zonal wind speeds in the stratosphere and below.