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Atmospheric impact of the extreme geomagnetic storm of May 10/11, 2024

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On May 10-11, two CMEs arriving within few hours initiated a geomagnetic storm with a DST of around -400 nT in the main phase. With a Kp of 9 for several hours, the threshold for an "extreme"geomagnetic storm was reached for the first time since the Halloween storm in October/November 2003, and polar lights were clearly visible well into magnetic midlatitudes. Proton fluxes were enhanced for several days, reinforced by a third CME arriving on May 13; however, they were distinctly lower than for the Halloween SPE of October 2003, making this a fairly moderate solar proton event. Analyses of the still ongoing satellite data-sets MLS/AURA and ACE-FTS/SCISAT will be discussed, showing a small ozone loss in the high-latitude upper mesosphere, as well as moderate increases of NO and N_2O in the upper mesosphere. The spatial structure of the response is consistent with a small, soft-spectra solar proton event, but it appears to be weaker, and restricted to higher altitudes, than, e.g., the response to the much more moderate geomagnetic storm of April 2010. However, a direct comparison is difficult as the instruments used to assess the April 2010 storm (MIPAS/ENVISAT, SCIAMACHY/ENVISAT, SOFIE/AIM) are inoperable now. This emphasizes on the one hand the large spread of possible impacts of geomagnetic storms, on the other hand the need for continuing global observations.

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Presenting author

Miriam Sinnhuber

Author list and affiliations

Primary author: SINNHUBER, Miriam (Institut für Meteorologie und Klimaforschung, Karlsruher Institut für Technologie)

Presenter: SINNHUBER, Miriam (Institut für Meteorologie und Klimaforschung, Karlsruher Institut für Technologie)

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