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The simulation of thermospheric nitrogen intrusions with the extended EMAC model.

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The coupling of MLT-region to the middle atmosphere is still not well described in most of state-of-the-art climate models as their upper boundary does not cover the mesopause region. This coupling is known to be important for example in the context of energetic particle precepitation and related reactive nitrogen intrusions: such intrusions have been observed to affect the ozone budget in the stratosphere and could have an impact on the earth's climate. In order to simulate these coupled processes a climate-chemistry model spanning from the ground up to the lower thermosphere is required.
Here we analyse results of runs with a vertically extended version of the climate chemistry model EMAC. At the moment, it covers the altitude range from the surface up to $\sim$170 km by using parameterization for MLT-relevant radiation and molecular diffusion. First we compare the results of a multi-year run in the nudged to ERA-Interim analyses below 1 mb with climatologies. The particular focus is on the analysis of the Transformed Eulerian Mean circulation.The strong NO_x intrusions observed after SSWs are studied in the model using tracer release experiments where tracers have been initialized at different altitudes both in thermosphere and in the middle atmosphere.The model shows cross-mesopause transport for several mid winter SSWs in the period studied in agreement with observations. Parameters as descent rate, the total displacement height etc. are determined for different strengths of nuding parameters and the parameters of the gravity wave drag scheme.