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UNIVERSITÄT BERN

Seminar über Microwave Physics and Atmospheric Physics

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Titel: Ozone and water vapor variability during sudden stratospheric warming and its connection to mesospheric tides

The impact of major sudden stratospheric warming (SSW) events and early final stratospheric warming (FSW) events on ozone and water vapor variations in the middle atmosphere in the Arctic is investigated by performing microwave radiometer measurements above Ny-Ålesund, Svalbard (79° N, 12° E), with GROMOS-C (GRound-based Ozone MOnitoring System for Campaigns) and MIAWARA-C (MIddle Atmospheric WAter vapor RAdiometer for Campaigns). We analyze the vertically resolved structures of polar ozone anomalies relative to the climatologies derived from GROMOS-C, MERRA-2 (Modern-Era Retrospective Analysis for Research and Applications, version 2), and MLS (Microwave Limb Sounder). These data reveal consistent patterns in the evolution of ozone anomalies during SSW and FSW events. We further compare results by leveraging the ozone continuity equation with meteorological fields from MERRA-2 and directly using MERRA-2 ozone tendency products to quantify the impact of dynamical and chemical processes on ozone anomalies during SSW and FSW events. Moreover, we examine the variability of diurnal (DT), semidiurnal (SDT), and terdiurnal (TDT) tide amplitudes in the Arctic mesosphere and lower thermosphere (MLT) during and after SSW events using meteor radar data from three polar-latitude stations: Sodankylä (67.37°N, 26.63°E), Tromsø (69.58°N, 19.22°E), and Svalbard (78.99°N, 15.99°E). By combining tidal amplitude anomalies with trace gas variations, this study provides new insights into the radiative effects of ozone and water vapor on tidal dynamics during SSWs. Simulated short-wave (QRS) and long-wave (QRL) radiative heating and cooling rates from the WACCM-X (the Whole Atmosphere Community Climate Model with thermosphere and ionosphere extension) model clarify the roles of polar ozone and water vapor in linking mesospheric tidal variability during SSWs in the polar regions. This study enhances our understanding of the mechanisms driving changes in polar ozone and water vapor, providing a new perspective on the quantitative analysis of chemical, radiative, and dynamical processes in the middle atmosphere.

Zeit: Friday, 15.11.2024, 10:15 Uhr

Ort: Room A97
https://unibe-ch.zoom.us/j/97081325603?pwd=d0ozME5xOS9pQVNxallLem81VHQyZz09
Meeting ID: 970 8132 5603
Passcode: iapmw