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Comparison Between Mesospheric Microwave Measurements of Water Vapour and Ozone with Calculations by Means of an Advanced 3D-Model of the Dynamics and Chemistry

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Using a ground-based millimeter wave radiometer detecting the molecular transition of water vaporat 22.235 GHz and that of ozone at 142 GHz we measured mesospheric water vapour and ozonealternately at the Max-Planck-Institute for Solar System Research in Lindau (51.660 N, 10.130E) and at the Arctic Lidar Observatory for Middle Atmosphere Research (ALOMAR) (69.290N, 16.030 E). The long-term measurements of water vapour at ALOMAR since 1995 show adistinct year-to-year variability perhaps influenced by the QBO. The ozone measurements atLindau (51.660 N, 10.130 E) were analyzed and we discovered a winter anomaly of the night-todayratio within the middle mesosphere reminding of the winter anomaly of the plasmaparameters in the D-layer. The annual variations of the mixing ratios at discrete height levelscorresponds to the CIRA ozone reference model with exception of the levels around thestratopause where the measurements are smaller than the model values. This could be anindication of the ozone decline since the time of preparation of the model in the early eighties. We examine on the basis of a sophisticated 3D-model of the dynamics and chemistry of themiddle atmosphere (0-150 km) particularly designed to investigate the MLT-region(Mesosphere-Lower Thermosphere) the spatiotemporal structure of the measuredconstituents. The model reflects on the whole the observations quite good although in somedetails differences exist. We discuss the results in terms of chemistry and dynamics.