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Coupling processes of minor constituents in the MLT-region and the OH-layer calculated by means of advanced 3D-models

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A significant role in the chemistry of the mesopause region plays the hydroxyl and hydroperoxy radicals. We calculated the spatio-temporary behavior of the minor constituents of the MLT-region (Mesosphere-Lower Thermosphere) by means of our new global 3D-model LIMA (Leibniz-Institute Middle Atmosphere model) of the dynamics and chemistry of the middle atmosphere. This model assimilates temperature and wind data provided by the European Centre for Medium-Range Weather Forecast (ECMWF) up to 35 km. It is able to compute the propagation of planetary waves and stratospheric warmings and to calculate their impact on the distribution of the minor constituents. The diurnal and annual variations of the OH- and HO2-layers will be discussed. As water vapor and ozone are the chemically key constituents of the middle atmosphere we will also show calculations of their annual variations. The calculated water vapor concentrations will be compared with mesospheric microwave water vapor measurements carried out at ALOMAR, Norway (69.29 N, 16.03 E). Additionally, we also calculated the variation of the chemical heating rate. Using our old version of the global 3D-model, COMMA-IAP (Cologne Model of the Middle Atmosphere of the Institute of Atmospheric Physics in Kühlungsborn), we calculated the OH trend for a century model run. For these calculations we used the sunspot number as a proxy for the Lyman-alfa radiation. As one result among others, the peak altitude of the OH-layer increased by approximately 1 kilometer and the OH concentration by more than 40 %.