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Influence of vertically distributed emissions on tropospheric chemistry

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The EMAC (ECHAM/MESSy Atmospheric Chemistry) model was used to study the effect of different vertical emission distributions on the tropospheric chemistry. Two simulations were performed, covering two years each (1999 and 2000), with realistic representations of the observed meteorology by nudging ECMWF operational analysis data. In one case the emissions were distributed vertically as effective emissions, , while in the second simulation all emissions were prescribed at the surface, i.e. put into the lowest model layer. The results were analyzed and compared to observations from aircraft campaigns and measurement stations . While the difference between the resulting vertical profiles of constituents is rather small, at the surface the two simulations differ considerably. This effect can be explained by the role of the simulated planetary boundary layer. The comparison with observations shows that the simulation with vertically distributed emissions yields around 20 % better agreement (based on correlation calculations) than the simulation with only surface emissions. The differences between the two simulations will be analyzed and discussed, with a special focus on organic compounds, ozone and the hydroxyl radical.