Influence of mountain waves on the stratospheric chemistry

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Mountain waves (atmospheric gravity waves generated by mountains) are known to play a major role in driving the Brewer-Dobson circulation in the stratosphere and mesosphere and are usually accounted for by parameterizations in atmospheric models to enable them to simulate the dynamics in the middle atmosphere. On the other hand, it is also known that mountain waves impact the chemistry via temperature perturbations generated by these waves. Locally formed polar stratospheric clouds in mountain waves have been shown to affect chlorine activation and large-scale ozone depletion. Accounting for this process in chemistry-climate models, however, has been a challenge because many gravity waves have scales smaller than the typical model resolution. This talk will provide a general introduction to atmospheric mountain waves and discuss two methods to approach the mentioned challenge in global chemistry-climate models: (1) by increasing the resolution locally around specific hot spots of mountain waves using the Icosahedral Non-hydrostatic modeling framework with its extension for Aerosols and Reactive Trace gases (ICON-ART) and (2) by adding temperature perturbations calculated from the model's gravity wave parameterization using the Whole Atmosphere Community Climate Model (WACCM). Their impact on the global chemistry of the models will be discussed.