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Dynamically induced hemispheric differences in the seasonal cycle of the summer mesopause

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We analyze the seasonal cycle of the summer mesopause with regard to Interhemispheric and Intrahemispheric Coupling. Our basis is a long-term simulation with a new middle atmosphere GCM of intermediate complexity, including an explicit calculation of the radiation budget and the tropospheric moisture cycle. Hemispheric differences are solely induced by different tropospheric surface conditions (orography and land-sea contrasts). In particular, the prescribed stratospheric ozone and the solar insolation are assumed to be equivalent for both hemispheres. The same holds for the launch level parameters of non-orographic gravity waves. Nevertheless, we find a pronounced hemispheric asymmetry in the annual cycle of the summer mesopause. This can be traced back to hemispheric differences in tropospheric planetary-wave dynamics and its subsequent effects on the zonal wind and gravity-wave filtering in the stratosphere. The consequences are that, prior to solstice, the southern summer mesopause is higher and colder than its northern hemispheric counterpart. This is caused by Intrahemispheric Coupling. After solstice, the southern summer mesopause is warmer and at at lower altitudes when compared to the corresponding situation in the northern hemisphere. This difference results from Interhemispheric Coupling.