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- ensemble techniques
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Intra-seasonal variability of tropical upwelling linked to fluctuations of tracers in the TTL

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The tropical upwelling constitutes the ascending branch of the global stratospheric Brewer-Dobson circulation. This upward mass flux controls the tropical tropopause temperature and the chemical composition of the lower stratosphere. Despite its relevance in stratospheric dynamics and chemistry, the variability and forcing mechanisms of the tropical upwelling are currently not well understood. In this work the temporal variability of zonal mean tropical upwelling is investigated, focusing on intra-seasonal time scales.

It has been previously shown that the seasonal cycles observed in ozone and carbon monoxide (CO) above the tropical tropopause are linked to the seasonal cycle in tropical upwelling. This coupling is based on the strong vertical tracer gradients in the tropical lower stratosphere, so that changes in the ascent rates are reflected on their concentration. In the present work the intra-seasonal variability of ozone and CO near the tropical tropopause is studied using satellite observations. Three different zonal mean tropical upwelling estimates are computed using data from the ERA-Interim reanalysis (from thermodynamic balance, momentum balance and as output from the reanalysis), and the level of agreement among them at intra-seasonal time scales is also analyzed. Finally, the ozone and CO observations are used to evaluate the tropical upwelling estimates at different pressure levels within the tropical tropopause layer.