

Water vapour transport to the stratosphere driven by thunderstorm activity

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Stratospheric water vapour content varies on annual, inter-annual and decadal time scales. Enhanced water vapour mixing ratio in the lowest stratosphere appears to have a large impact on the radiative balance of the atmosphere[1]. Consequently it is important to understand the cause of variations of water vapour mixing ratios in the stratosphere. Air enters the stratosphere mainly through the tropical tropopause, and here there are at least three distinctive modes of water transportation: 1) Through methane being transported to the stratosphere and converted to water and CO₂ by photolysis, 2) through slow ascending tropical air masses, and 3) through ice particles brought into the stratosphere by very deep convective thunderstorms[2]. The mutual strength of these three modes is being debated, and especially the last "deep convective" mode is subject for controversy because it is hard to quantify its contribution to stratospheric water.

References

[1] S. Solomon et al., Science, 327 (5970): 1219-1223 (2010).

[2] J. K. Nielsen, M. Foster, and A. Heidinger, GRL, 38, L18801, 5 PP., (2011).
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