Saturation at the tropical tropopause

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Profiles of water vapor and ozone between the surface and the middle stratosphere have been measured at Costa Rica since 2005 and at a number of other tropical sites since 1964. These soundings provide a unique opportunity to study transport processes across the tropical tropopause, long term changes of these trace gases and atmospheric processes such as the dehydration at the tropical tropopause and the tropical tape recorder.
The majority of observations at Costa Rica have been taken as part of the routine monitoring program outside of dedicated campaigns with the goal of monthly water vapor soundings. Therefore a good coverage of all seasons has meanwhile been achieved.
In this presentation we focus on the dehydration at the tropical tropopause. The 10 year data set at Costa Rica shows the tropical tape recorder with high vertical resolution and shows when the seasonal maximum of stratospheric water vapor detaches from the local tropopause.
This data set shows that the tropical tropopause at Costa Rica is on average saturated with respect to ice with only minimal seasonal variation. This result is not necessarily to be expected, because the data set contains observations of large supersaturation as well as low subsaturation and there is no obvious reason to assume that the number of supersaturated and subsaturated observations averages out to ice saturation; however, the observations indicate that this is the case over Central America. Campaign based observations in the Western Pacific region and at San Cristobal, Galapagos indicate that this is the case there as well.
Large scale modeling efforts of stratospheric water vapor may therefore need to accurately represent the tropical tropopause temperature, but may not need to understand the details of the dehydration process, at least for the Central American region.