10 Years of Water Vapor and Ozone Soundings at Costa Rica

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Regular observations of vertical profiles of water vapor and ozone between the surface and the middle stratosphere have been taking place at Costa Rica since 2005. 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.

In this talk we focus on the dehydration at the tropical tropopause. Despite extensive studies the details of the dehydration process at the tropical tropopause and in particular the relation of the tropical tropopause temperature to the amount of water vapor crossing the tropopause is quantitatively not well understood.

The 10-year data set at Costa Rica shows the tropical tape recorder with high vertical resolution and indicates when the seasonal maximum of stratospheric water vapor detaches from the local tropopause.

This data set also shows that the tropical tropopause at Costa Rica is on average saturated with respect to ice with only minimal seasonal variation. This result is surprising, 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.

This result implies, that large scale modeling efforts of stratospheric water vapor 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.

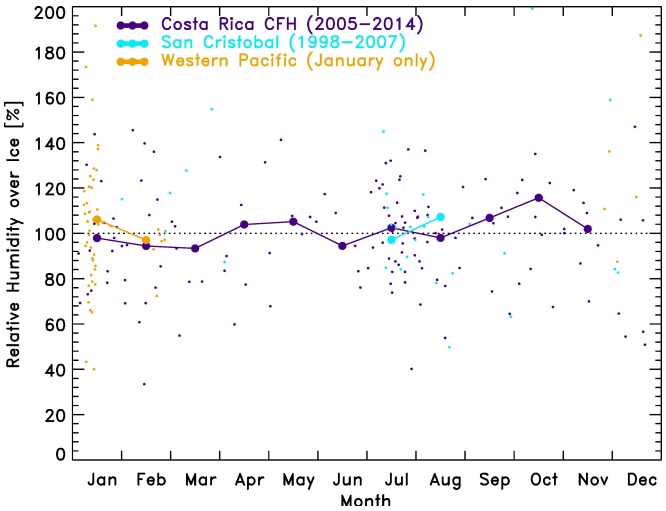

Figure 1. Relative Humidity over ice at the cold point tropopause at Cost Rica (10°N), San Cristobal, Galapagos (1°S), and Western Pacific (several sites 1°S - 7°S).