(63-240329-A) **Long Term Observations of Tropical Upper Tropospheric and Stratospheric Water Vapor at Costa Rica**

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Water vapor is one of the most important trace gases in the tropical upper troposphere and stratosphere. Only a small number of stations is routinely launching balloon borne soundings for stratospheric water vapor and ozone. The site at the University of Costa Rica is located at 10°N and the only station regularly launching water vapor soundings using Cryogenic Frostpoint Hygrometers (CFH) in the deep tropics. The data set spans 19 years and documents the dehydration processes at the tropopause with high vertical resolution. These are the only in situ observations to show the tropical tape recorder and the interannual variability of water vapor entering the tropical stratosphere. In 2022, the station detected the passage of the water vapor plume injected by the Hunga Tonga-Hunga Ha'apai (HTHH) volcanic eruption within one month after the eruption and the disruption of the regular tape recorder signature of lower stratospheric water vapor in 2022. In 2023, water vapor crossing the tropical tropopause had flushed out the additional water vapor injected by HTHH into the lower parts of the stratospheric tropical pipe.

The trends detected at that station validate those seen by the Microwave Limb Sounder (MLS) onboard the Aura satellite over the same period. This observational program has also been used to intercompare tropospheric water vapor measurements by different radiosondes and furthermore triggered several other observational activities.

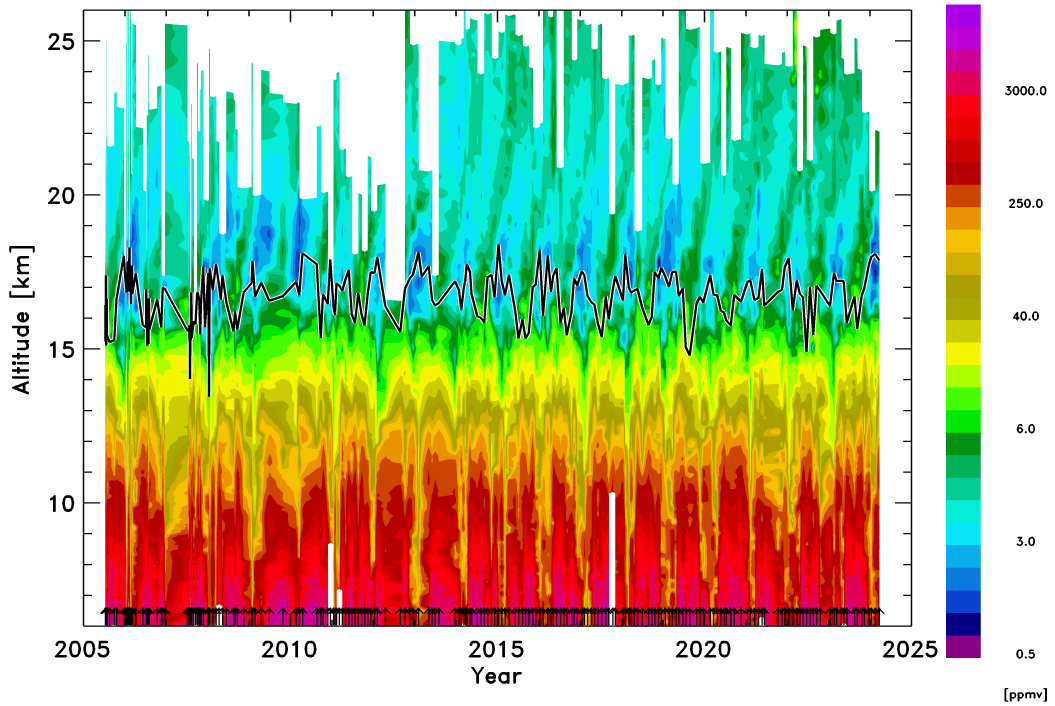

Figure 1. Time series of upper tropospheric and stratospheric water vapor at San Jose, Costa Rica.