Two Years of Water Vapor Observations Using New Cryogenic Frost point Hygrometer (CFH)

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The Cryogenic Frost point Hygrometer (CFH), which has been developed at the Cooperative Institute for Research in Environmental Sciences of the University of Colorado, allows a high density of observations with significantly improved accuracy in the extremely difficult to probe tropical upper troposphere and lower stratosphere. Of 150 soundings, which have been launched over the past 2.5 years, more than 60 have been launched by the Universidad Nacional at Heredia, Costa Rica. The first intensive campaign showed the importance of Rossby gravity wave events for dehydration in the tropical tropopause layer (TTL) during the boreal summer months. The same data set provides important observations for the validation of AURA MLS and HIRDLS stratospheric and upper tropospheric water vapor retrievals and identified a serious dry bias of the Vaisala RS92 in the upper troposphere. The second intensive campaign in Costa Rica, together with the CFH/lidar campaign at Biak, Indonesia, provided important information about the dehydration in the TTL during the boreal winter. In addition, this campaign quantified the disagreement with the WB-57 instruments measuring water vapor. A higher density of observations combined with a significantly improved accuracy is able to extend trend observations from the lower stratosphere into the upper troposphere, which has been previously out of reach for trend observations.

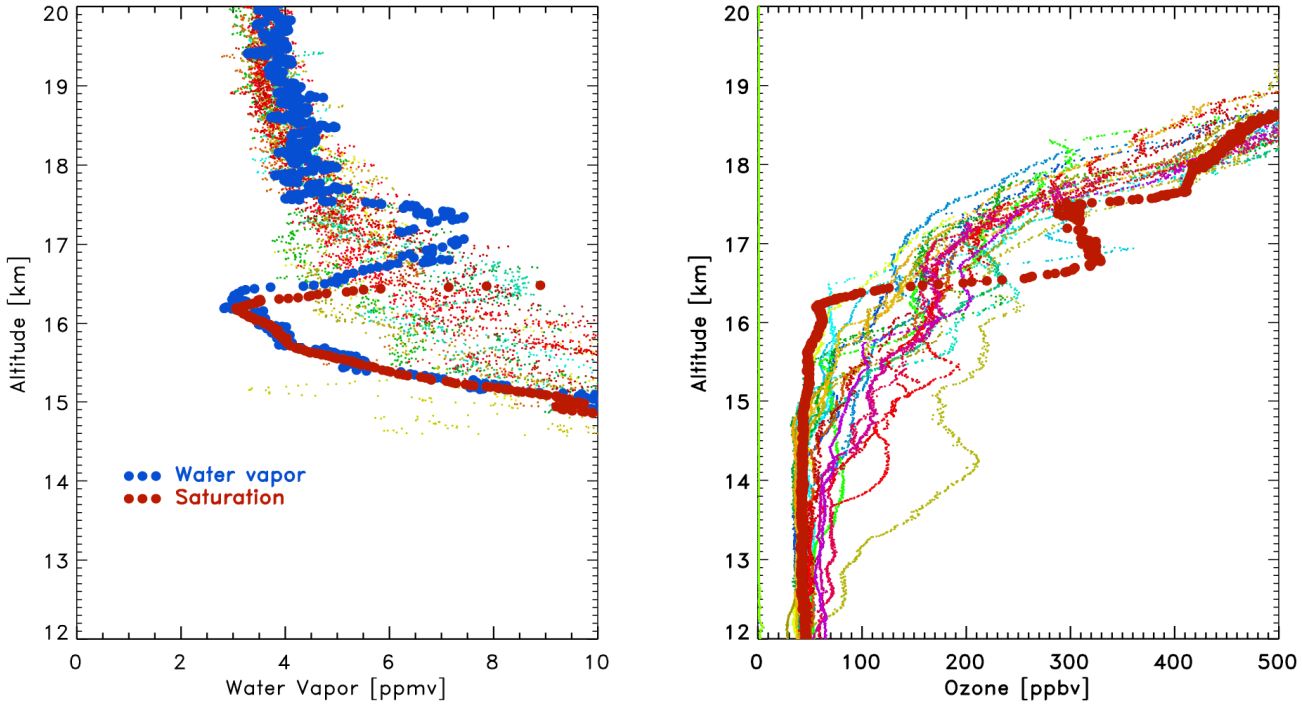

Figure 1. Water vapor and ozone profiles of 16 soundings between 8 July and 25 July 2005. The highlighted profile (thick dots) was obtained on 19 July. The cold temperatures (low saturation mixing ratio), low water vapor and low ozone concentrations at the tropopause are the result of a Rossby gravity wave event that propagated downward over the previous days and ultimately caused local dehydration during the warm tropopause season.