Equatorial belt vapour measurements in the upper TTL under superpressure balloon during STRATEOLE 2 pre-campaign: tape recorder effect, role of waves and deep convection.

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STRATEOLE 2 is a French-American project based on superpressure balloon borne measurements to study dynamics and processes in the TTL and the lower stratosphere of equatorial regions. One single flight of these balloons (of a duration of about 80 days) can make several turns of the Earth.

Here we present water vapour measurements by the Pico-SDLA infrared laser spectrometer on-board the TTL 2 gondola. The float altitude was of about 19 km during the technical campaign of STRATEOLE 2, providing measurements at the top of the TTL or the lower stratosphere. In this presentation, we analyse the tape recorder signal at a constant altitude during the 80 days of flight. We compute an anomaly of the in situ water vapour measurements with respect to a regional/temporal satellite-borne mean climatology from Aura MLS. It allows to analyse the local measurements by Pico-SDLA with respect to what is expected at a given position and a given time. The obtained contrast allows the positioning of observations with respect to local climatology and therefore, the identification of singular events responsible for modulation of the local water vapour content. Our analysis shows that a long wet anomaly above the Pacific Ocean is explained by the balloon “surfing” on a warm perturbation of a Kelvin wave. Concurrently, a dry anomaly is put to the fore over the Indian Ocean, associated to a packet of gravity waves cold perturbations. The balloon has flown twice above the Maritime Continent. For each passage, a short scale succession of dry and wet anomalies is shown, indicating a possible influence of local deep convection. This influence is studied further using satellite borne cloud top data.