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Overview of the TRO-pico campaign aiming at studying of the impact of convective overshooting on the stratospheric water budget

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Two processes are competing in the control of water vapor concentration in the tropical stratosphere: i) The so-called cold trap that is the slow ascent of water vapour in the TTL followed by ice crystal freezing and sedimentation leading to the drying of air entering the stratosphere and ii) convective overshooting that injects ice crystals sublimating in the stratosphere, eventually followed by further condensation and sedimentation. In contrast with the large-scale cold trap mechanism, overshooting towers are small-size and fast, but relatively frequent processes. Even if the first is frequently thought to be the main process controlling the amount of water in the stratosphere, the importance of overshooting, highly dependent on the frequency of the events, is still unknown. The aim of the TRO-pico project, supported by the French ANR, is to characterize the variability and frequency of convective water injections, its contribution at the regional wet season timescale, and to improve the understanding of their role with respect to the cold trap at a wider scale. The project is based on a small balloon campaign in Bauru (22.3°S) in S-E Brazil, including different phases during the wet season : March 2012 at the end of the most active convective season, a transition phase in November-December 2012 before the most active season, and January-February 2013, which corresponds to the peak of the convective activity. The campaign involves a series of light-weight payloads, including Pico-SDLA laser (H_2O, CO_2 or CH4) and FLASH Lyman alpha hygrometers, a mini-SOAZ spectrometer for O_3, NO_2, H_2O and BrO, an AICEP (Electric field and Lightning) sensor, and COBALD, LOAC and micro-lidar aerosol instruments, combined with ground based radar and lidar measurements, satellite observations from CALIPSO, MLS and adequate modeling tools, that is to say all parameters that are sensitive to convective intensity. TRO-pico is a two time-scale campaign: i) a Six Month Observation Period (SMOP) covering one complete wet season during which water vapour profiles are measured regularly for studying their seasonal variability, and ii) an intensive observation period (IOP) during the most convectively intense summer period when measurements of all above parameters are performed close to or above thunderstorms. After a short presentation of objectives and instrumentation involved, the main results from the complete TRO-pico campaign will be shown, including the most intense period of convection and the transition period between the dry and the wet seasons.