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Strateole 2: a long-duration balloon campaign at the Equator

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The atmospheric region located between 14 and 20 km altitude in the tropics, called the Tropical Tropopause Layer (TTL), has intermediate properties between those of the tropical troposphere and stratosphere. Air parcels that have been rapidly lofted by deep convection to the bottom of the TTL are radiatively heated in the TTL and ascends to the stratosphere within a few weeks or months. During this timeframe, the air-parcel water vapor mixing ratio decreases to stratospheric values under the influence of a number of dynamical (e.g., planetary and gravity waves) and microphysical (e.g., nucleation) processes that cover a wide range of scales. Despite recent improvements of spaceborne sensors, an accurate global picture of these processes and their interactions is still missing.

Strateole 2 is a superpressure balloon campaign design to improve our knowledge of small and mesoscale processes in the TTL. Superpressure balloons, which have been sucessfully used in previous campaigns in Antarctica (Vorcore 2005, Concordiasi 2010), can fly for several months in the lower stratosphere (18-20 km). They move with the winds on constant-density surfaces, and thus behave as quasi-Lagrangian tracers of air-parcel motions. During Strateole 2, many in-situ and remote-sensing instruments aimed at characterizing the TTL dynamics and composition will be hosted on the balloon and perform high-resolution measurements along the flights.

Strateole 2 observations will be used to document the occurrence of subvisible cirrus clouds in the TTL, as well as the mechanisms responsible for their formation. They will also serve to quantify the momentum flux associated with gravity waves generated by deep convection, and their contribution in the driving of the stratospheric quasi-biennial oscillation. Strateole 2 observations will also be assimilated by operational numerical weather prediction system to improve their representation of the upper-tropospheric lower-stratospheric circulation.

The presentation will provide a description of Strateole 2 scientific objectives and schedule. It will also show results regarding gravity-wave activity obtained during the previous long-duration balloon campaigns.

キーワード: Troposphere-Stratosphere coupling, Equatorial atmosphere, Long-duration balloon, Gravity waves
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