

## Tropical Tropopause Dynamics (TTD) Campaigns under CAWSES India Phase II over Indian region: Overview and Scientific Accomplishments

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In recent years the ‘Tropical Tropopause’ has received immense scientific attention because of its sensitivity to anthropogenic activities leading to climate change. Several campaigns have already been conducted and also are being planned to address various issues related to it. Despite many campaigns, several scientific issues still remain unexplained. In order to address some of the issues, particularly over the Indian region, intensive observational campaigns named as the ‘Tropical Tropopause Dynamics (TTD)’ have been conducted between December 2010 and March 2014 at two stations namely Gadanki(13.5°N, 79.2°E) and Trivandrum(8.5°N, 76.9°E). This work is aimed at bringing out the importance of a sustained study on the tropical tropopause, using collocated instruments as well as complementary data from the satellites. In general, a prominent updraft prevails below and above the TTL, suggesting that deep convection is not essential for the transport of minor species across the tropopause. Sub-daily variations are observed at both the stations and the amplitude of this variation is small at Gadanki. The behavior of the cold point tropopause (CPT) at Gadanki and Trivandrum revealed that there are important differences in the CPT characteristics even within the monsoon region. Significant modulation in the tropical tropopause parameters by the prevailing tides and planetary waves is noticed. The vertical temperature gradient in the tropical tropopause layer (TTL) is related to the presence of tropical cirrus. Altitude structure of tropical cirrus in the upper troposphere is clearly associated with that of turbulence. This Indian Program is expected to provide important contributions to the international campaigns planned over Pacific and Asian region on the TTL.

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