

Small-scale wind fluctuations in the tropical tropopause layer from aircraft measurements : relationship with clouds and convection and impact on vertical mixing

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Turbulent vertical mixing in the tropical tropopause layer (TTL) is poorly known, although it could make a substantial contribution to the heat and tracer transport budgets in that part of the atmosphere. Past observations of small-scale turbulence in the TTL with Radar and radiosondes have been limited to a few tropical locations. Recently, during the ATTREX (Airborne Tropical TRopopause EXperiment) and POSIDON (Pacific Oxidants, Sulfur, Ice, Dehydration, and cONvection) campaigns, in situ measurements from scientific aircraft have provided extensive sampling of small-scale motions over the tropical Pacific, between 14 and 20 km.

In this presentation, high-frequency meteorological observations collected during those recent aircraft campaigns are used to characterize the occurrence of ‘ ‘clear air turbulence’ ’ in the TTL. Turbulent bursts are highly intermittent, and are more frequent and intense in the lower TTL and near deep convection. The relationship between turbulent bursts and cirrus clouds is quantified. Finally, the impact of "turbulent" bursts on vertical mixing is estimated and contrasted between convective and non convective regions. The estimated diffusivities are compared with those predicted by turbulent diffusion schemes used in operational analyses systems.

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