

R005-57

Zoom meeting C : 11/3 AM1 (9:00-10:30)

10:00~10:15

Revisiting models of TKE dissipation rates from UHF and VHF Doppler radar spectrum width from theory and UAV data

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Shortly after the development of Stratosphere-Troposphere VHF radars and UHF wind profilers, analytical models have been proposed to estimate turbulence kinetic energy (TKE) dissipation rate from Doppler spectrum width. TKE dissipation rate is a fundamental parameter indicative of the strength of turbulence. The commonly used models were recently assessed from comparisons with Unmanned Aerial Vehicles (UAV) data collected during Shigaraki-UAV-Radar EXperiment (ShUREX) campaigns (2016-2017) at Shigaraki MU observatory (Japan). Applied to the VHF Middle and Upper atmosphere (MU) radar and to the UHF LQ7 wind profiler, these models failed to reproduce accurately UAV-derived dissipation rates and a simple model based on dimensional analysis provided the best agreements. However, the latter raises conceptual issues and its applicability must be understood. New insights have been obtained by expending theoretical derivations based on energy budget equations for expressing the temperature structure parameter in terms of outer scales of turbulence (Basu and Holtslag, 2021). These derivations lead to a possible interpretation of the efficiency of the simple model and to a generalized expression of the dissipation rate models allowing us to identify the domain of applicability of the commonly used model for turbulence in stratified conditions.