

Experimental Investigations on Atmospheric Turbulence from in Situ and Radar Observations

HUBERT LUCE¹, N. GAVRILOV², M. CROCHET¹, F. DALAUDIER³, S. FUKAO⁴ and M. YAMAMOTO⁴

¹*LSEET-LEPI, Toulon Var University, CNRS, La Garde France*

²*Saint Petersburg State University, Atmospheric Physics Department, Petrodvorets, Russia*

³*Serice d'Aeronomie du CNRS, Paris, France*

⁴*Research Institute for Sustainable Atmosphere, Kyoto University, Uji, Japan*

Parameters of atmospheric turbulence such as dissipation rate of turbulent kinetic energy, e , and turbulent diffusivity, K are estimated from high-resolution (10cm) balloon measurements collected during the MUTSI campaign (Japan, May 2000). Based on reasonable hypotheses, original methods of estimations using temperature profiles only are presented and compared. It is found that they provide very similar estimates giving credence to these methods. The obtained vertical profile of K at a resolution of 12.8m are strongly variable and strong maxima (up to $10^2 \text{m}^2 \text{s}^{-1}$) are found. Analyses of the available 50-m resolution wind profiles indicate that these strong peaks result from dynamic and convective instabilities, some of them produced by gravity waves. The obtained profiles are also used for exploring the characteristics of the small-scale temperature gradient sheets. It is found that they can be associated with different background dynamic conditions. They can also be weakly or strongly anisotropic and disturbed (i.e. associated with small-scale turbulent mixing inside and/or around). These observational results indicate that the physical nature of the sheets is not unique. An attempt is also made to compare the obtained turbulence parameter profiles with those deduced from the Middle and Upper atmosphere (MU) radar observations. A description of the results will be presented in this talk.

Keywords: Turbulence; dissipation rate; temperature sheets; gravity wave; instability; radar