

The Experiment of Stratosphere Turbulence Observation with Resolution Sounding

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The stratosphere is statically stable and well-stratified typically, nevertheless, gravity waves and strong wind shear can induce instability leading to wave breaking and turbulence. Stratospheric turbulence play potentially important roles in the energy transfer from the troposphere into the mesosphere and in the vertical mixing of trace species, as well as more scientific interests. Therefor experiment of stratospheric turbulence has the scientific significance for theoretical exploration.

To evaluate the turbulence in the stratospheric wind field, balloon soundings with the constant temperature anemometer (CTA) on board will be launched and fly up to 25 km altitude at Tibetan Plateau. The CTA will sample at 2kHz, thus a vertical resolution of 2.5 mm can be reached at 5m/s ascent speed. As a consequence, smaller turbulence spatial scales of millimeters can be extracted. Meteorological factors including the wind conditions, density, temperature and humidity are obtained at the same time.

It is possible to study the entire turbulence spectrum down to the viscous subrange in the stratosphere, and the inner scale could be determined accurately to calculate the precise energy dissipation rates. These data are necessary to obtain the main characteristic parameters of the stratospheric turbulence, and to investigate the structure of turbulence. Furthermore, combined with simulations such as the WRF simulations, the experiment results are applied to validate the model simulation of the stratospheric turbulence and explore the relationship between gravity waves and turbulence.