Determining Turbulence and Turbulent Mixing in the Free Atmosphere

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Background

Observation of the earth's atmosphere, important for purposes of weather prediction and other purposes, is hindered by the turbulent mixing of hot and cold air in the troposphere. Currently the atmospheric science community has no routine method of determining atmospheric mixing rates, and the ad-hoc parameterizations of mixing included in current models almost certainly have an impact on their prediction skill. Special instruments (radars) have been built to perform these measurements, but the data from these are extremely limited in time and space, and unreliable in the troposphere. The ability to retrieve mixing properties in the atmospheric column routinely and operationally around the globe could revolutionize this field. Values determined from measuring the atmospheric mixing rate could be used for more accurate numerical weather prediction (NWP) and global climate prediction modeling, and to improve the accuracy of clear air turbulence (CAT) measurements important to civilian and military aircraft operations.

Technology

Dr. Kantha of the University of Colorado (in partnership with Dr. Clayson of Florida State University) has developed a novel method for determining turbulent mixing characteristics in the atmosphere. The method uses high-resolution radiosondes to not only monitor turbulence in the free atmosphere in near-real time, but also to study the spatio-temporal characteristics of turbulent mixing in the troposphere and stratosphere from the abundant archives of high resolution sondes from around the world. Through assessment, refinement and assimilation, such knowledge and routine monitoring could help improve the skill of NWP and climate models. Synergistic use of sondes with radars is also possible since the radars are reliable in the lower stratosphere, but need calibration/validation in the troposphere.

Summary of Information:

- New method for measuring turbulent mixing in the atmosphere, using high-res radiosondes
- Allows for more accurate numerical weather and global climate predictions
- Can be used for measurements important to civilian and military aircraft operations
- Works synergistically with radar to provide complete data