Seminar at Juelich
9/29, Juelich, Germany

Title
View-angle dependent AIRS cloud radiances: Implication for tropical gravity waves and anvil structures

Dong L. Wu, NASA Goddard Space Flight Center, Code 613.2, Greenbelt, MD
Jie Gong, Jet Propulsion Laboratory, California Institute of Tech., Pasadena, CA

Abstract

Tropical anvil clouds play important roles in redistributing energy, water in the troposphere. Interacting with dynamics at a wide range of spatial and temporal scales, they can become organized internally and form structured cells, transporting momentum vertically and laterally. To quantify small-scale structures inside cirrus and anvils, we study view-dependence of the cloud-induced radiance from Atmospheric Infrared Sounder (AIRS) using channels near CO$_2$ absorption line. The analysis of tropical eight-year (30°S–30°N, 2003–2010) data suggests that AIRS east-views observe 10% more anvil clouds than west-views during day (13:30 LST), whereas east-views and west-views observe equally amount of clouds at midnight (1:30 LST). For entire tropical averages, AIRS oblique views observe more anvils than the nadir views, while the opposite is true for deep convective clouds. The dominance of cloudiness in the east-view cannot be explained by AIRS sampling and cloud microphysical differences. Tilted and banded anvil structures from convective scale to mesoscale are likely the cause of the observed view-dependent cloudiness, and gravity wave-cloud interaction is a plausible explanation for the observed structures. Effects of the tilted and banded cloud features need to be further evaluated and taken into account potentially in large-scale model parameterizations because of the vertical momentum transport through cloud wave breaking.