Geophysical Research Abstracts
Vol. 20, EGU2018-7608, 2018
EGU General Assembly 2018

An LES based investigation on the higher order moments of moisture budgets in precipitating shallow cumulus convection

Anurose Theethai Jacob, Juerg Schmidli, and Ivan Bastak Duran

Goethe University Frankfurt, Institute for Atmospheric and Environmental Sciences , Geoscience, Germany (anurostj@gmail.com)

Precipitation from shallow cumulus clouds often leads to cloud organization on larger scales (e.g. clusters or mesoscale arcs). The precipitation and the associated organized motions influence the second order moments, especially the variances and covariances of moisture and heat. The present work addresses the increase in variability associated with cloud organization and precipitation for shallow cumulus convection with a special focus on the higher oder moments of moisture. The study is based on idealized large-eddy simulations using the Rain in Cumulus over the Ocean (RICO) field experiment data. We examine the evolution of the variance of total water, the physical mechanisms behind the increase in variance and its link to the dynamics. The budget analysis provides detailed information on the source and sink terms associated with the moisture variance. The results reveal the importance of microphysical effects on the variance and covariance terms especially in the cloud layer. The budget terms also highlight the role of pressure redistribution term in maintaining the scalar flux and third order budgets. The quantification of vertical distribution of moisture variance shows the importance of the inversion region near the cloud top and its link to the cloud organization is further examined. Overall, the present work provides significant details on the statistical moments of moisture, relevant for probability distribution functions (PDF) based higher-order closure models which rely on parameterized equations for total water variance and skewness.