Geophysical Research Abstracts
Vol. 16, EGU2014-6148, 2014
EGU General Assembly 2014

Multi-scale analysis of heavy rainfall systems

Chi Yan TSUI and Yaping Shao
Institute for Geophysics and Meteorology (IGM), University of Cologne, Germany

The aim of this work is to study the cross-scale interactions with focus on mesoscale convective system. A multi-scale analysis of a heavy rainfall event is carried out by dividing the responsible systems into large, middle and small scales. The three distinctive scales correspond respectively to upper- and low-level jets, meso-scale convective systems and convective cells.

The governing equations for the three scales are derived and then simplified to their bare essence to illustrate the cross-scale interactions. In particular, the cross-scale transfers of momentum and heat are retained in the equations to illustrate the interactions between the large and small scale motions with the mesoscale system.

WRF has been used to simulate a heavy rainfall event in southeast China and the model results are used to test the theory of the multi-scale interactions. Overall, the theory shows a plausible mechanism that the meso-scale convective system is responsible for the vertical momentum transfer from the upper level jet to the lower level jet which maintains the low-level positive vorticity of the convective system. The low-level jet also carries large quantities of moisture from the South China Sea to Southeast China, which are necessary for small scale convections.