Abstract Details

Corresponding Author : Ms. So-Young Kim (soyoung@atmos.yonsei.ac.kr)

Organization: Department of Atmospheric Sciences, Yonsei University, Seoul Korea

Category: Ocean and Atmospheres

Paper ID: 57-OOA-A1205

Title: Effects of a Convectively Forced Gravity Wave Drag Parameterization
Mesoscale Convective System

Abstract:

Vertically propagating gravity waves deposit their momentum to the
scale flow at the levels where wave breaking occurs. Even though me
models are developed with high resolutions, gravity waves forced by
individual convective cloud, which is one of the important sources of
waves, cannot be entirely resolved. Therefore, convectively forced int
gravity wave drag is better to be parameterized in the mesoscale mo
this study, a parameterization of gravity wave drag by cumulus conve
(GWDC) by Chun and Baik (1998,JAS) is implemented in the PSU/NC
Mesoscale Model (MM5), and effects of the GWDC on mesoscale conv
system are investigated for a heavy rain event associated with conve
band on 4~6 August 1998. In order to investigate effects of the GWD
simulations without (CTL) and with (GWDC) the parameterization are
performed in a two-way nested grid system (45 km/15 km). Impact
GWDC is significant above convection, and it extends down to the low
atmosphere through the vertical change of horizontal
divergence/convergence pattern. Deceleration of wind above cloud in
convergence (divergence) on upstream (downstream) side of convect
and it results in convergence on downstream side of convection at the
atmosphere. As a result, convection is enhanced and rainfall increase
downstream side by the GWDC. Effect of the GWDC on mesoscale cir
is theoretically studied by considering analytic solutions of 2-D gravity
induced by specified momentum forcing. Gravity wave response to
momentum forcing can explain the enhancement of convective cell or
downstream side obtained by the simulation. GWDC affects on mesos
convective system directly by deposition of momentum forcing induce
wave breaking, and indirectly by grid resolvable gravity waves induce
momentum forcing. Therefore, impact of the GWDC is not be localize
regions where wave breaking occurs, but it is extended to the lower
atmosphere.

Presentation Mode:

Keywords: parameterization of gravity wave drag by cumulus convection, mesos
convective system, momentum forcing, convergence/divergence