Geophysical Research Abstracts
Vol. 12, EGU2010-10376-2, 2010
EGU General Assembly 2010

Deep convection in the tropical area: Hector a case study using TRMM data and high resolution model simulation.

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The tropics are one of the most important regions for the exchange and transport of water vapor and chemical species from the upper troposphere to the lower stratosphere; changes in emissions of chemicals at the ground or how quickly they are carried aloft could cause the chemistry of the stratosphere to change and as a consequence the net radiative balance. The tropical storms are one of the main devices for this type of interaction. In Australia, the tropical thunderstorms have different possible sources; in particular the development of equatorial events is related to convergence zones typical of the ITCZ (Intertropical Convergence Zone). One of the deepest convective systems of the globe is the tropical thunderstorm Hector that develops almost daily in the Tiwi Islands, near Darwin city (tropical northern Australia), during the pre-monsoon period and break monsoon. The thunderstorm Hector has been observed to reach to altitudes of 20 km and thus potentially in the lower stratosphere, so it represents one of processes for exchange between the troposphere and the stratosphere. Hector is the topics of numerous campaigns because of difficulties in its predictability: during the SCOUT-O3 project (Stratosphere–Climate Links with emphasis on the Upper Troposphere and Lower Stratosphere), a campaign was held on Tiwi Islands to the purposes of improving the understanding of the interaction between convection and the tropical tropopause layer. In the framework of this UE project a study of Hector tropical thunderstorm is performed to the aim of evaluating the vertical transport. The triggering factor together with the microphysical structure of this deep tropical cyclone has been investigated using MM5V3 and the new model WRF with data from the TRMM Precipitation Radar and from TRMM Microwave Imager. A comparison between the hydrometers retrieved by the TRMM Precipitation Radar (PR) and the one detected by the TRMM Microwave Imager (TMI) has been carried out. The model results confirm previous studies concerning Hector classification (type A or type B), and the associated vertical velocities. On the other hand the comparison with TRMM data allows for assessing a good agreement for both the amount and the vertical distribution of hydrometeors between model and observations. Eventually, the goodness of the vertical distribution of the hydrometeors would support the hypothesis of a correct estimation of Hector updrafts.