Geophysical Research Abstracts, Vol. 9, 08860, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08860

The influence of aerosol on precipitation formation in deep tropical convection

P. Connolly, T.W. Choularton, K. Bower and G.Vaughan

School of Earth Atmospheric and Environmental Sciences, University of Manchester, Manchester, UK. (t.w.choularton@manchester.ac.uk)

During the winter of 2005/2006 detailed studies of aerosol and anvil microphysics were made in the HECTOR clouds forming over the TIWI islands in Northern Australia during the ACTIVE project. In this paper modelling studies of these clouds will be presented using a combination of a Cloud Resolving Model and an explicit microphysics model. Using these models the sensitivity of precipitation formation and anvil microphysics to the Cloud condensation nuclei and the Ice Nuclei entering the cloud will be explored. The sensitivity to aerosol will be explored in the context of variations in the structure of the atmosphere in which the clouds form. The relative importance of the aerosol and the atmospheric structure were investigated. It is found that changes to the aerosol input can have a significant impact on the timing of precipitation from the cloud system; however, the impact on the total amount of precipitation was small. A very important effect was found to be the position in the cloud where latent heat of freezing was released. If a substantial amount of liquid water froze homogeneously then this was able to cause a substantial increase in the up draught close to the top of the cloud. This increased both the cloud top height and the ice mass in the anvil region. Hence there was an optimum number of both CCN and IN favouring maximum cloud development.

Aspects of the vertical structure of the atmosphere in which the cloud formed substantially influenced the sensitivity of the cloud to the aerosol. For example, if dry layers were present this had a marked effect.