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Using CRM to develop a parametrization of cumulus congestus

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A new parametrization scheme representing the effects of cumulus convection is sought using a turbulence based approach with ideas having roots in boundary layer theory. Fundamental to the development of such a scheme is the use of a Cloud resolving Model(CRM) to provide an accurate representation of the turbulent processes and their statistics of interest.

Initial investigations have been carried out by Alan Grant and focus on the parametrization of shallow non-precipitating convection. These show that the proposed parametrization is feasible and work is currently underway to test this in a General Circulation Models(GCM). Further work by Grant and Stirling has also been started and looks at tropical and mid-latitude deep convection.

The proposed parametrization will also provide for a third mode of cumulus convection, namely cumulus congestus, and it is this that will provide the basis for the work presented. While cumulus congestus is thought to play an important role in tropical systems - Johnson et al. (1999) observe that congestus were the most abundant of all precipitating cumulus during TOGA-COARE - investigation of the behaviour of these warm-precipitating clouds also provides a slightly simpler intermediary step on the way to parametrizing the deeper glaciated clouds.

A number of simulations are carried out using the Met Office Large Eddy Model(LEM). These simulations are set up with idealised initial conditions and forcings chosen such that a quasi-steady state is achieved, from which statistics of importance may be diagnosed. Details of the choice of these idealised conditions as well as an initial inspection of the validity of the proposed parametrization will be presented.