

## **Coupling convection and large scale dynamics in numerical weather prediction models**

### **Workshop Report**

#### **Organisers**

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#### **Participants**

John Thuburn (Exeter), Mike Whittall (Met Office), Sylvie Malardel (ECMWF), Ben Shipway (Met Office), Gavin Esler (UCL), Colin Cotter (Imperial), Martin Willett (Met Office), Bob Kerr (Warwick), Onno Bokhove (Leeds).

The aim of this workshop was to investigate mathematical models which can accurately model the convection process in the atmosphere. This workshop was motivated by the Met Office recognition that atmospheric weather modelling on fine scale grids, due to more powerful computers (e.g. at the Met Office), may only partially resolve convection. Therefore we require more accurate convection parameterization schemes to fully resolve the convection, as well as improved fully parameterized convection schemes to use in global models where resolution is lower. These parameterization schemes need to correctly couple to resolved large scale dynamics in the atmosphere.

The workshop consisted of a series of talks by leading players in convection coupled with interactive break-out sessions to identify approaches to address the above challenges.

The talks covered a range of issues from how the current Met Office convection parameterization scheme works, to the effectiveness of columnar convection models and simulations of columnar plumes from the Met Office large eddy code.

The main conclusion was that there is no one correct approach to tackle this problem, but there are many avenues which might bear fruit. It was acknowledged that simpler mathematical models with as much of the 'redundant' physics stripped away, together with fully physical simulations from the Met Office's Unified Model would be a good starting point. The simpler models would allow for greater understanding of what is going on in the model, while comparisons with the UM keep the results relevant for Met Office implementation. Some existing scaling assumptions and asymptotic analysis that current models rely on will also need to be re-examined in order for future models to agree with a plethora of recent numerical experiments and observations.

It was agreed that further consultation with the Met Office and participation in NERC's 'Convection Across Scales' programme would be scheduled for June 2016. As this NERC programme was in the process of deciding on projects at the time of the workshop, it was felt that the workshop organisers should wait until these had been decided before agreeing on a parallel set of projects to work on/apply for funding for (these would likely be EPSRC funded applications). A number of fundamental project areas that would be suitable for PhD students were identified. Some novel code developed at the Met Office several years ago to study convection in a balanced model will be reviewed, and this could provide the framework for bench-marking numerical experiments.