1. Introduction to DYMECS
- Convection-resolving forecast models are the new frontier in operational regional forecasting, but how realistic are the simulated clouds? Does higher resolution always improve the realism?
- In the Dynamical and Microphysical Evolution of Convective Storms project we evaluate the Met Office forecast model via a statistical analysis of thousands of storms on many days.
- Test impact of model resolutions from 1.5 km to 100 m as well as mixing length and microphysics.
- Three dimensional cloud structures and estimates of updraft intensity & width are derived from the high-resolution Chilbolton radar using automated storm tracking to scan the 25-m dish.
- Lifecycles of surface rainfall features compared to UK radar network (5-min and 1-2 km resolution).

2. Surface rainfall comparison
- Surface rain rate snapshots (mm h⁻¹) from radar and two model resolutions for two contrasting cases:
  - Showers: 20 Apr 2012
  - Thunderstorms: 25 Aug 2012
- 1.5-km model
- 500-m model
- 200-m model

3. Effect of mixing length
- Model uses LES-type Smagorinsky mixing length normally 0.2 times horizontal grid-length.
- More mixing kills small storms; little effect on large
- No one value works well for all cases
- Storms in the 1.5-km model evolve too slowly,
- 200-m model clouds evolve well, are around right size, but can produce too much rain for their size.
- Models exaggerate difference between growing and decaying part of the lifecycle.

4. Updrafts
- Estimate vertical velocity by applying continuity equation to radial winds from single RHIs.
- Not perfect but sufficient to characterize mean updraft behaviour when applied to many cases.
- 1.5-km model over-predicts per-updraft mass flux by at least an order of magnitude.
- Updraft size increases steadily with grid size.
- 200-m model has updrafts of around the right width, but intensity not always right.
- Increased mixing-length widens updrafts.

5. Storm lifecycles
- Compare storms tracked in 5-min rainfall data.
- Characterize the lifecycle in terms of the Area Integrated Rainfall (AIR) with \( \tau = 208 s \).
- Storms tracked in 5-min rainfall data
- Prioritize them...
- Instruct high-resolution Chilbolton radar to do RHIs through storm cores...
- ...and stacked PPIs to retrieve three-dimensional structure of storms.

DYMECS References