



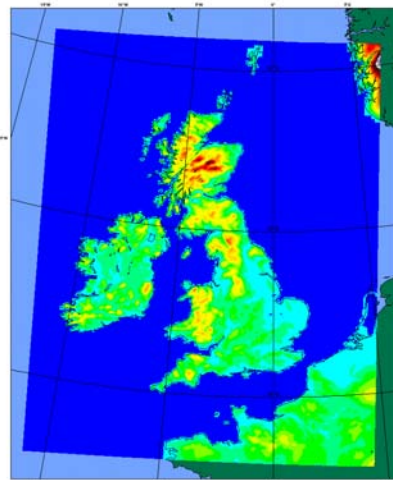
Progress and plans with convection-permitting limited area models at the Met Office

Andy Brown

© Crown copyright Met Office



UK4 Domain



- 288x360xL70
- Resolution: 0.036 degrees gridlength (4 km approx.)
- 100 seconds time step.
- Physics:
 - Standard non-local BL.
 - ∇^4 horizontal diffusion.
 - 9-tile surface exchange with anthropogenic heat flux on urban tile.
 - Prognostic water vapour, cloud water, total ice, rain.
 - Flux-limited convection scheme.
 - Edwards-Slingo radiation (every 15 min).

© Crown copyright Met Office

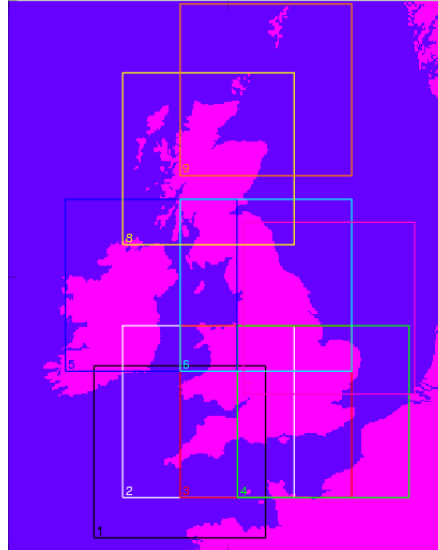


Met Office

UK 1.5 km 'On-demand'

All Domains

- 9 domains – one chosen by forecaster.
- 1.5 km 300x300xL70
- Run from UK 4 km T+1 to T+18, UK 4 LBCs
- No DA.



© Crown copyright Met Office



Met Office

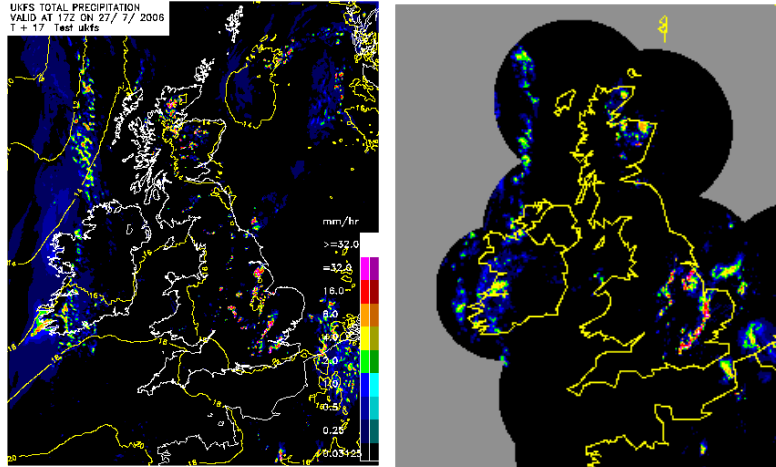
Met Office plans – UK 1.5 km model (Summer 2009)

- Fallback: Large area 1.5 km embedded in NAE (12km) – 8x nesting ratio
 - Fewer problems than anticipated – boundaries mainly sea may help.
- Preferred option: Variable resolution 1.5km-4km nested in NAE
 - Lots of experience with smaller variable resolution domains

© Crown copyright Met Office



Met Office plans – UK 1.5 km model - example



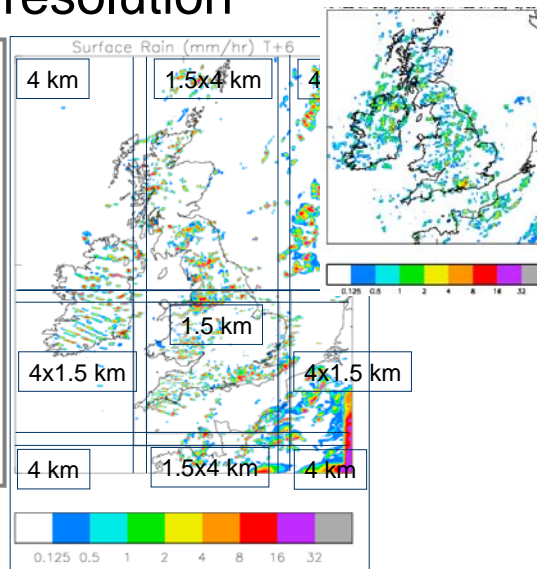
© Crown copyright Met Office



UM Developments: Variable resolution

Why?
Better than 1 or 2 way nesting:
Simpler, smooth transition means less wave reflection.
Not perfect!

Variable resolution is available in UM 6.6, and substantial efficiencies have been made. VR code now as fast as (or faster than) original fixed res.
New preconditioner from UM 7.0. (Tang, Ishida, Davies)



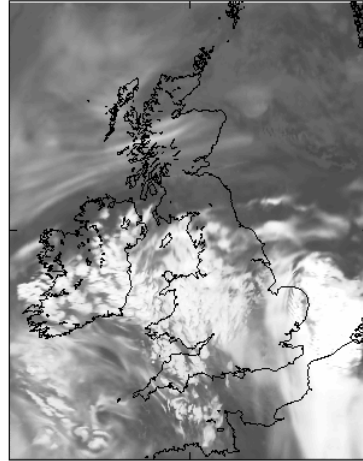
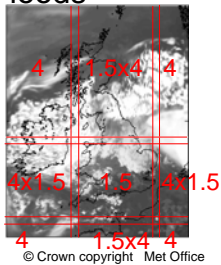
© Crown copyright Met Office



SAIJA Top of atmosphere Atmos outgoing lw rad flux (toa)
At 06Z on 20/ 7/2007, from 03Z on 20/ 7/2007

Variable
Resolution
1.5-4 km.

20/07/2007
Gloucestershire
Floods



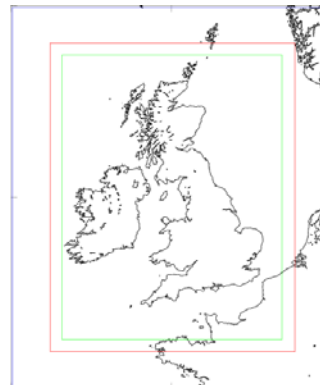
222 229 236 243 250 257 264 271 278



Planned operational UK variable resolution domain



1.5 km fixed
768x960



1.5-4 km variable
4-5% stretch factor
742x928

© Crown copyright Met Office



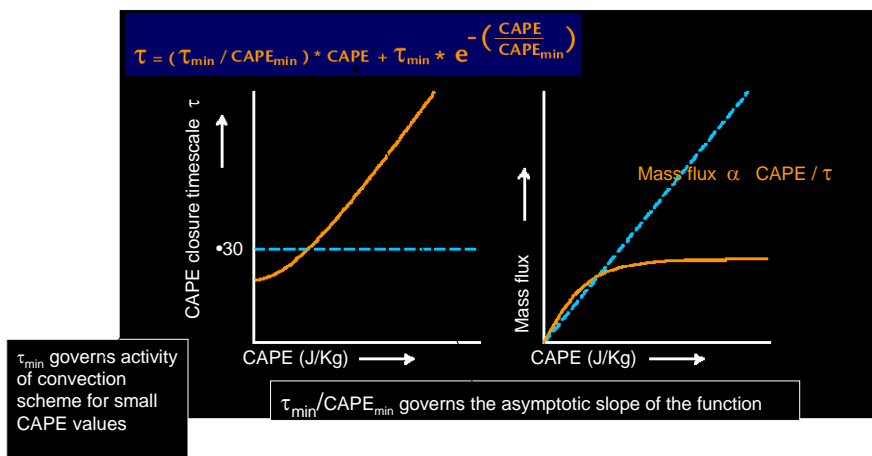
Issues for variable resolution

- Variable resolution code on NEC is as fast (CPU/point/timestep) as original fixed-res code.
- We have little experience 1.5-12 km – transition from parametrized to resolved is more of an issue. We have methods which work reasonably well in idealised studies, but no proof that they work in real cases. Hence choice of 1.5-4km variable.
- 1.5-4 km runs have always been at least as good as 4 km in variable zone, 1.5 in fixed.
- Variable resolution model will use fixed resolution 3DVAR – only reconfiguration of background and increments need changing.

© Crown copyright Met Office



Flux-limited-convection: CAPE dependent CAPE closure



© Crown copyright Met Office