Wind resources: NWP and fine resolution models, variability and trends

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36th EWGLAM and 21st SRNWP Meeting, DWD, Offenbach, 30 September 2014

Contents

This presentation covers the following areas

- General wind resources requirements
- Benefits of limited area (mesoscale) modelling
  - Wind resources – cf global & reanalyses
- Finer-scale models (~100m)
- Prospective improved finer-scale reanalyses
- Variability and trends

Growth of wind power

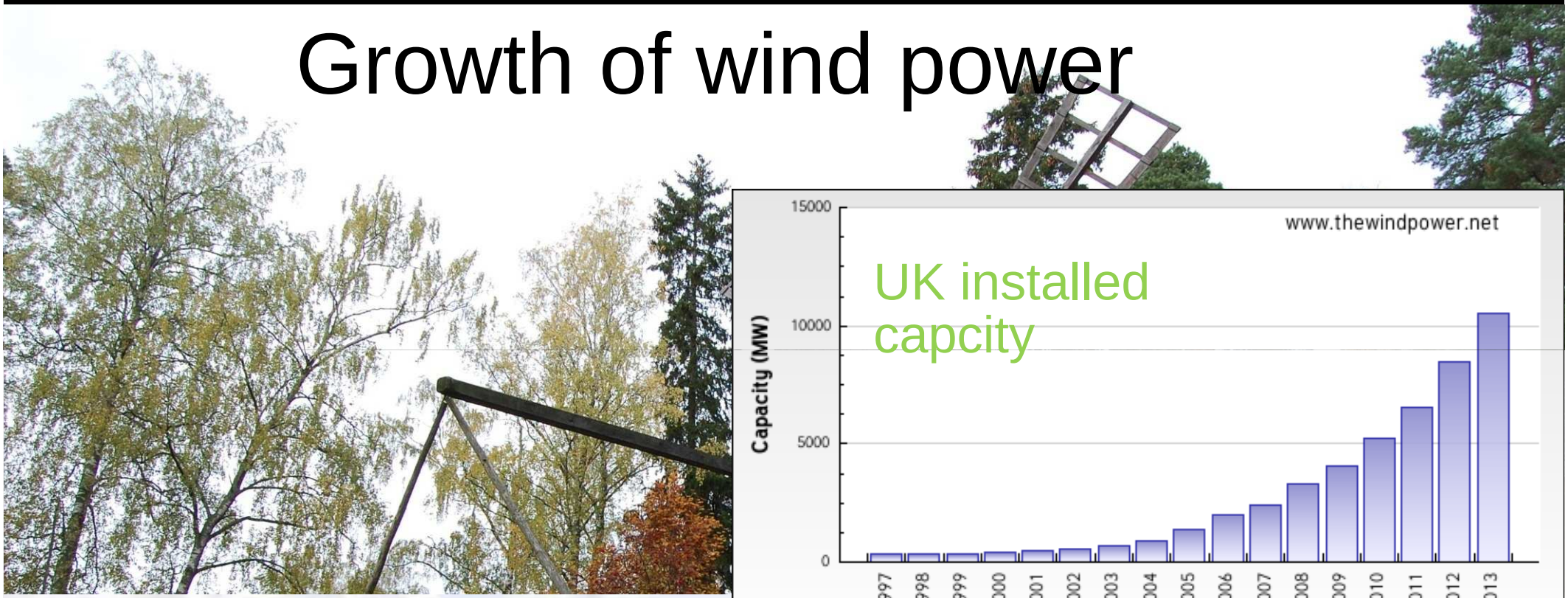
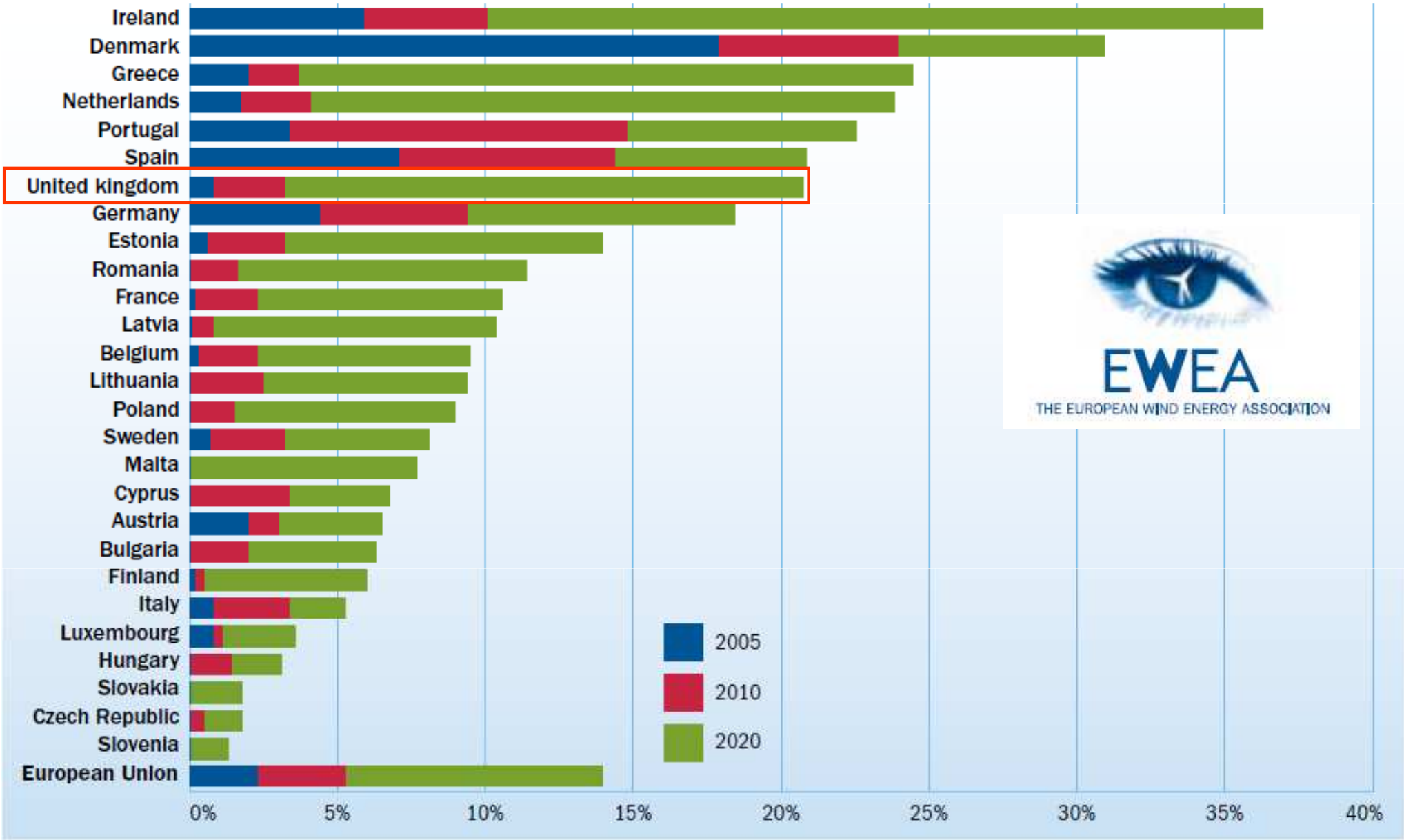


FIG 14: WIND ENERGY SHARE OF ELECTRICITY CONSUMPTION PER MEMBER STATE AND EU IN 2005, 2010 AND 2020



Consultancy for Wind Climatology – site-screening

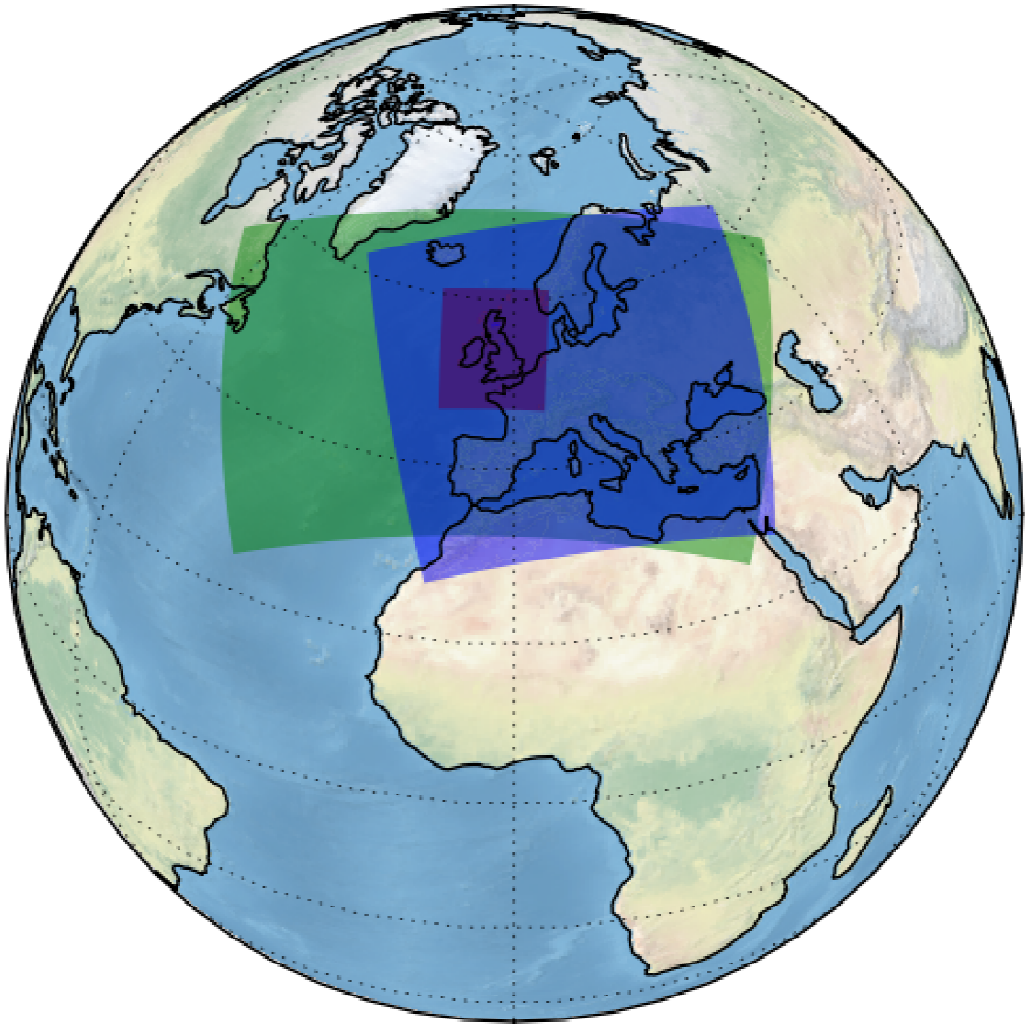
- Typical requirement :
  - mean (annual, monthly) wind speed estimates and distributions of wind speed over periods of 10-30 years, 50-100 m above the surface
- Traditionally assessment:
  - Direct measurement onsite 1-2yr : expensive and time consuming
  - Measure correlate predict (MCP) using closest long term wind station (10m wind, 20-30y) : secular trend/interannual variability
- Archived/hindcast NWP data can offer a cheaper and more representative alternative
- Very high resolution modelling to improve

Operational Limited area models

NAE – 12km
-retired

Euro4 -4km

UKV – 1.5km

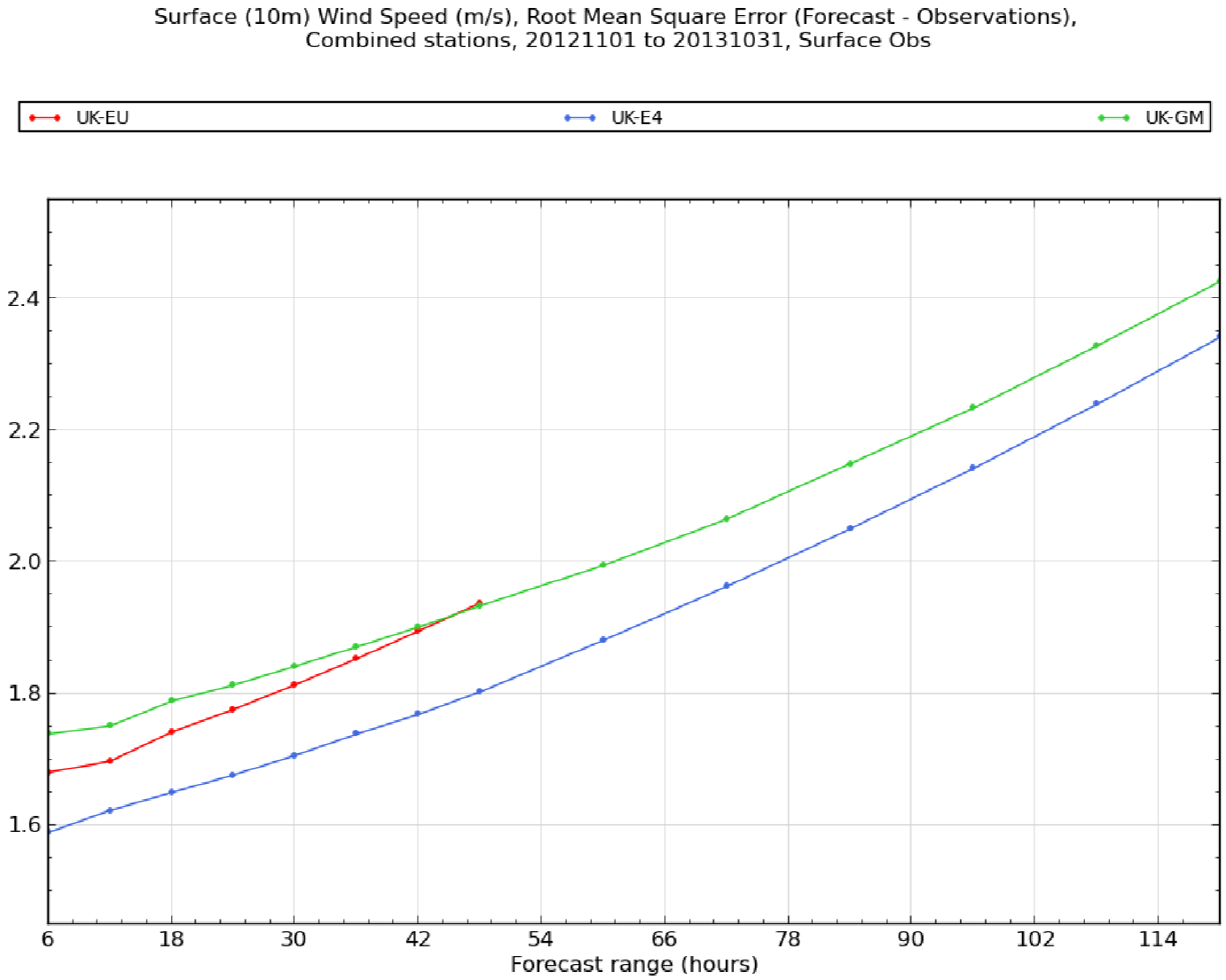


Added benefit LAMs over global – 1 year verification 10m winds

Global -25km

NAE - 12km

Euro4 -4km



Added benefit of mesoscale models + “Virtual Met Mast”

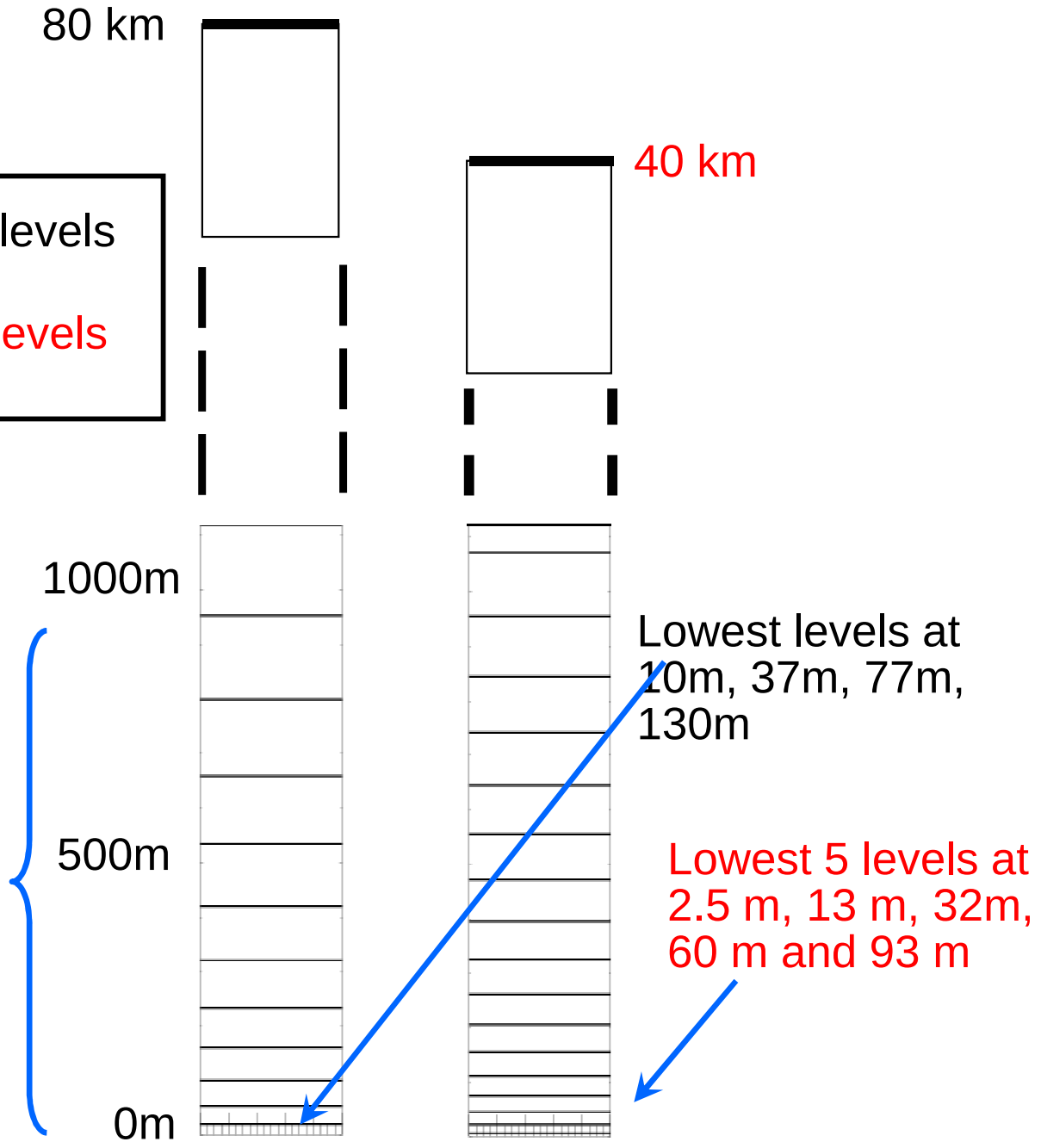
Virtual Met Mast

- Use archived and rerun Met Office mesoscale *weather forecast* models
  - Downscaled reanalyses – ERA Interim
- Local downscaling adjustments around site
- Extension to long term climatology (35+y 1979-2014)
- Local wind maps
- Verification and uncertainty estimates
- High resolution modelling to improve adjustment
- Incorporation of on-site mast observations (VMM **Plus**)

Model levels – focusing on the near surface

LEFT:- Global and 12 km model levels

RIGHT:- 4 km and 1.5 km model levels



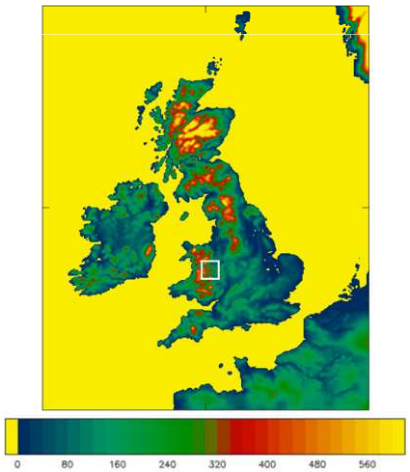
Lowest 1000m

Global +12km L70: 11 levels

4km + 1.5km L70: 16 levels

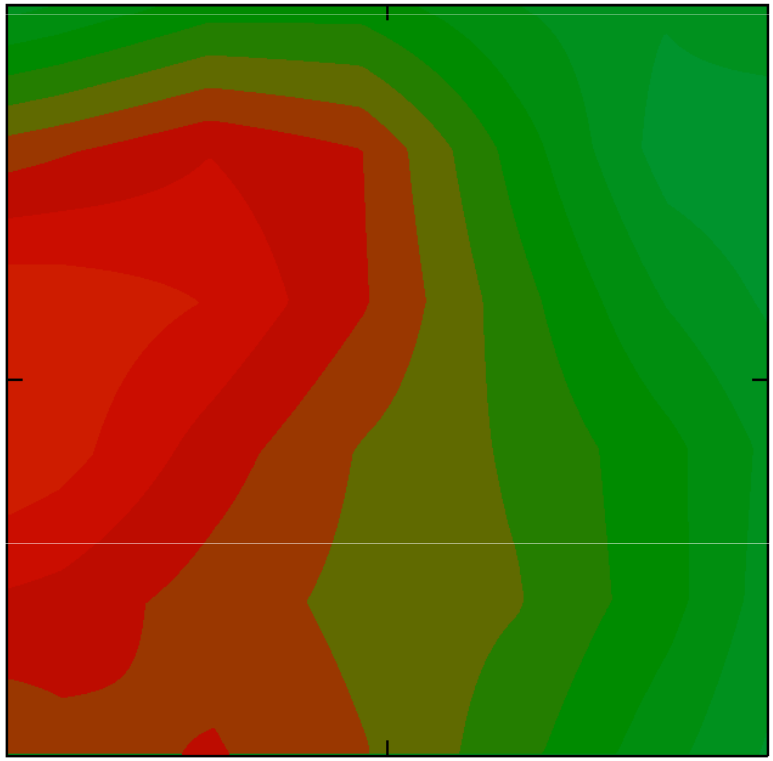
Parametrisation of effects of unresolved orography: eg over the COLPEX (Cold Air Pooling Experiment) region

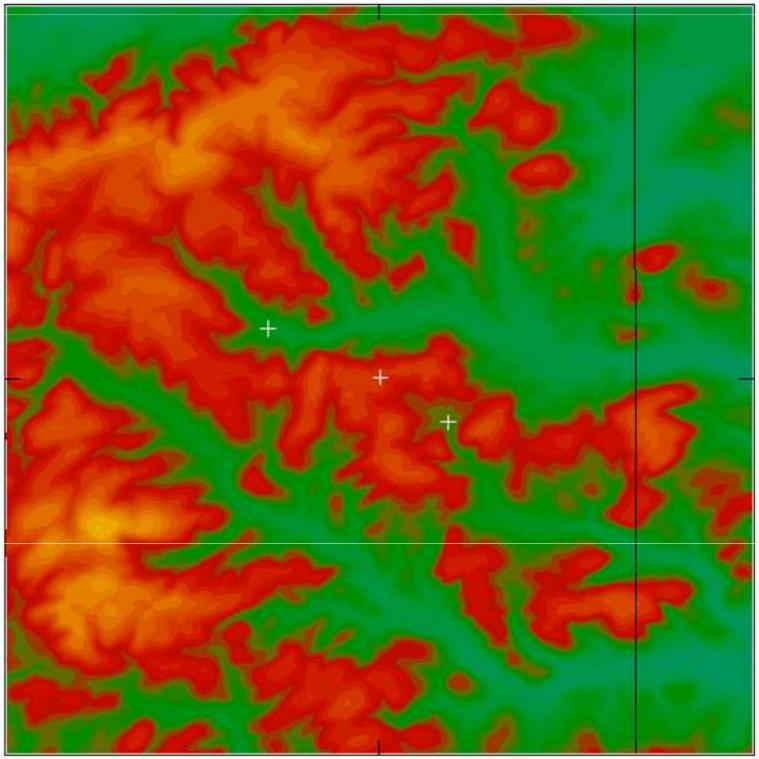
- Orographic Roughness scheme in NWP models accounts for drag due to unresolved terrain.
- Local wind predictions need to correct for this



4 km model orography

Terrain at 100 m resolution





Height in Metres

Impact of Orographic roughness in UK 4km model

wind speed (ms^{-1})