Dynamically Downscaling Precipitation from Extra-Tropical Cyclones

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Extra-Tropical Cyclones

Champion et al., 2011, *Tellus* 63A, 893-905
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Dynamical Downscaling

Global Model
- ECMWF Operational Analysis
  - 25km resolution
  - June and July 2007
- ECHAM 5 GCM
  - 60km resolution
  - 4 events from each climate

Nested Model
- Met Office Unified Model
  - vn6.1, non-hydrostatic
  - UK and Western Europe
  - 12km, 4km and 1.5 km resolutions
  - 48 hour forecasts
  - 12, 24, 36 and 48 hour lead times
Observational Datasets

- **MIDAS Raingauge Data**
  - ~140 raingauges UK wide
  - Hourly data
  - Non-gridded

- **Environment Agency Raingauges**
  - Regional data
  - Time-of-tip
  - Non-gridded

- **NIMROD Radar Data**
Area Averaged Total Precipitation Rate

West Midlands Area

- Met Office rain gauges
- EA rain gauges
- 4km 12 hour lead time (makebc)
- 4km 12 hour lead time (nested)
- 4km 36 hour lead time (makebc)
- 4km 36 hour lead time (nested)
- 12km 36 hour lead time
- 12km 12 hour lead time
- NIMROD Radar
- 1.5km 12 hour lead time (makebc)
- 1.5km 12 hour lead time (nested)
June 2007

Area Averaged Total Precipitation Rate
North East England Area

Graph shows the area-averaged total precipitation rate over North East England from June 2007. The y-axis represents intensity (mm/hr) and the x-axis represents dates (June 2007). Different lines represent various lead times and model configurations.
GCM Downscaling

Area Averaged Total Precipitation Rate

- 12km 12 hour lead time
- 4km 12 hour lead time (nested)
- 4km 12 hour lead time (makebc)
- 12km 36 hour lead time
- 4km 36 hour lead time (nested)
- 4km 36 hour lead time (makebc)

Date (August 1988)

Intensity (mm/hr)

Area Averaged Total Precipitation Rate

- 12 km 12 hour lead time
- 4km 12 hour lead time (nested)
- 4km 12 hour lead time (makebc)
- 12km 36 hour lead time
- 4km 36 hour lead time (nested)
- 4km 36 hour lead time (makebc)

Date (July 2099)

Intensity (mm/hr)
Further Work

- Using ECMWF Ensemble System to drive LAM
  - June and July 2007 events
  - 12km, 4km and 1.5km

- Expand sample size of GCM events

- Use WRF as nested model
  - Compare to UM results

http://www.nerc-essc.ac.uk/~ajc