NCAS-Climate:

UK-HIGEM and UJCC: Weather and Variability in High Resolution Coupled Climate Models

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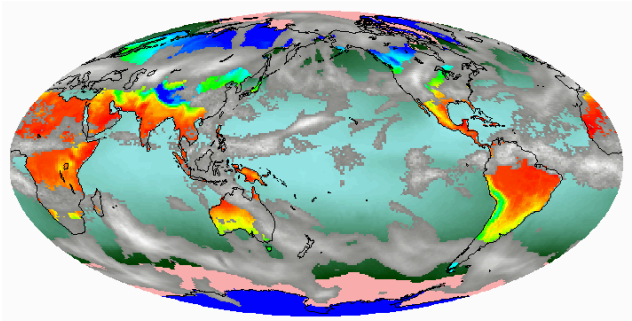
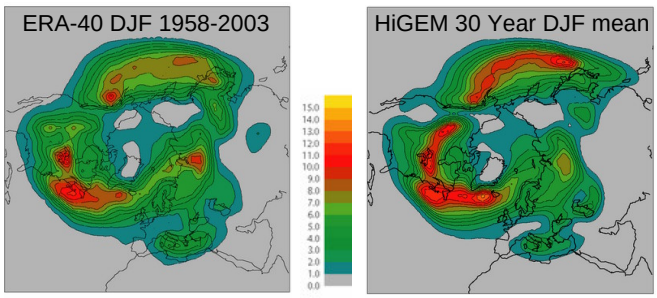
The UK-HiGEM Model

- The UK-HiGEM model is based on HadGEM1 the new Hadley Centre coupled climate model.
- The atmosphere resolution has been increased to 1.25ºx0.86º with 38 levels in the vertical.
- The ocean resolution has been increased to ⅓ºx⅓º with 40 levels in the vertical.
- Multidecadal HiGEM integrations have been done at the HPCx at Daresbury and on the Earth Simulator in Yokohama.



Snapshot of HiGEM. SSTs and land temperatures in colour. High cloud in greyscale. Sea-ice in pink.

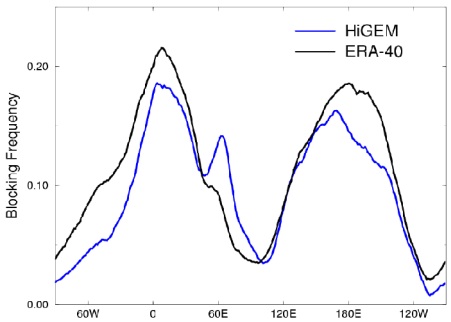
Midlatitude Weather and Blocking



Track density of negative winter Mean Sea Level Pressure anomalies from ERA-40 and from HiGEM.

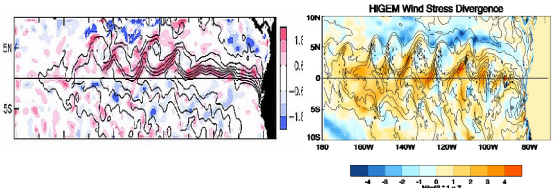
Dynamical processes in the midlatitudes should be better represented at higher resolution.

- The Atlantic, Pacific, Siberian and Mediterranean storm tracks are well represented in HiGEM.
- Blocking is also well represented in HiGEM, traditionally a difficult thing for climate models to capture.



500mb Geopotential height blocking index from HiGEM and from ERA-40 (based on Tibaldi and Molteni 1990)

Small scale coupling

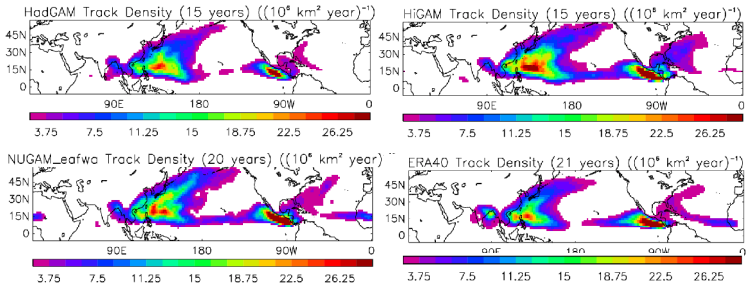


Tropical Instability Waves from satellite observations and from HiGEM.

The impact of Tropical Instability Waves on the atmosphere can be seen in HiGEM.

How might small scale coupling be parameterised?

Tropical cyclones and High Resolution

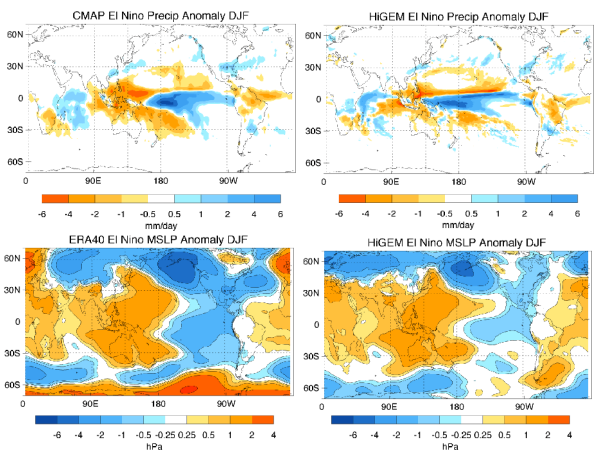


Distribution of Tropical Cyclone-like vortices in N96 HadGAM, N144 HiGAM, N216 NUGAM and ERA

Higher resolution should allow Tropical Cyclones to be better resolved

- The distribution and intensity of Tropical Cyclone-like vortices improves with higher resolution.
- The coupled impact of Tropical Cyclones on ocean mixing can be seen in HiGEM.

El Niño in HiGEM



El Niño DJF rainfall and precipitation composites from observations and HiGEM.

An accurate representation of ENSO and its global impacts is essential for climate models.

- ENSO is well represented in HiGEM
- HiGEM is also able to capture the global El Niño teleconnections with a high level of skill.