Some current work using ERB data at the Met Office

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- Model evaluation & metrics
- A specific example: SST & cloud biases in the Southern Ocean
- Radiative feedback on the annual variation in global surface temperature
Why are we interested in using ERB data?

- Evaluate the physical processes most relevant to reducing uncertainty in climate predictions, e.g. clouds
- Inform & prioritise key areas for developing and improving climate models
- Constrain climate change predictions – or at least try and determine if this is possible
- Detection & attribution of observed variations to natural and anthropogenic forcings..?
Model evaluation & metrics
Biases compared to CERES – Annual Mean

New Cloud Scheme

Old Cloud Scheme

SW CRF

LW CRF

Area-weighted rms diff = 10.85

Area-weighted rms diff = 10.97

Area-weighted rms diff = 5.54

Area-weighted rms diff = 8.11

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Biases compared to ISCCP – Annual Mean

New Scheme

High/Medium

Old Scheme

High/Thick
Development of a set of metrics to assess model performance
SST and cloud biases over the Southern Ocean
Cloud Amount

Reflected SW
Global NWP Model

- Clear-sky
- Shallow Cu.
- Transition
- Stratocu.
- Mid-level
- Thin Cirrus
- Cirrus
- Frontal
Comparison with CloudSat using COSP
\[ Q = \lambda \cdot \Delta T_s \]

\[ \lambda = \lambda_0 \cdot (1 - g) \]

Use annual variation of net TOA fluxes and surface temperature to try and estimate “gain factor”, \( g \)

*Tsushima & Manabe 2010*
**Cloud radiative forcing gain factors**

**ERBE/CERES**
- \( \text{NET} = -0.03/0.04 \)
- \( \text{SW} = 0.04/0.07 \)
- \( \text{LW} = -0.07/-0.04 \)

**MODELS**
- \( \text{NET} = -0.02 \pm 0.18 \)
- \( \text{SW} = -0.11 \pm 0.19 \)
- \( \text{LW} = 0.09 \pm 0.10 \)

**ERBE/CERES:** SW, LW & NET gain factors are all small

**MODELS:** SW & LW gain factors vary considerably across models, particularly the SW.
ERB data are used...

• For basic model evaluation as part of the model development process
• As part of a wider effort to define a set of metrics for model assessment
• In combination with other data to address specific model errors
• To examine if observational constraints can be placed on radiative feedbacks