

Model Uncertainty – MIP

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and the wider MU-MIP consortium:

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Model Uncertainty - MIP

- Aim: intercomparison of random, parametric, and systematic model errors across many models
- Will provide new database of model error
- Contributions from 14 centers worldwide



https://mumip.web.ox.ac.uk



MU-MIP: Use a high resolution simulation as 'truth'



MU-MIP: Examples motivation

1. Constrain stochastic perturbations (e.g. of parameters or tendencies – see Christensen, 2020)

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MU-MIP: Examples motivation

- 1. Constrain stochastic perturbations (e.g. of parameters or tendencies see Christensen, 2020)
- 2. Understand, predict and model sub-grid variability
- 3. Understand model uncertainty from a physical point of view
- → Here: analyse tendency of convective instability in MUMIP!

Convective diagnostics



Convective diagnostics



Convective diagnostics



Principal component analysis

Of accumulated tendencies (tropical band)

- Precipitation rate
- DCAPE
- Total physics tendencies T, q_v
- Total dynamics tendencies T, q_v
- Specific tendencies deep convection/boundary layer scheme T, qv

Italic: separated into two layers: mixed-layer (ML, < 500m), free troposphere (FT, 500m to 16.500m)





- PC1: many tendencies
- PC2: vertical redistribution of water vapor & CAPE change
 - > Shares between GFS & IFS!

Bias +6h temperature & water vapour



• PC2: vertical redistribution of water vapor & CAPE change

> Broadly shared between GFS & IFS!



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Conclusions

- Physical tendencies: consistent low-level drying during spin-up, reducing CAPE
- Temperature profile's effect on CAPE change small and similar across models



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Vertical profile of qv tendencies and its biases are likely a big issue in NWP and play a significant role in model physics!

Conclusions

- Physical tendencies: consistent low-level drying during spin-up, reducing CAPE, CIN
- Temperature profile's effect on CAPE/CIN change small and similar across models



Thank you

Interested? Contact Hannah Christensen/Edward Groot

Spin-up?



Map of monthly mean CAPE



Map of monthly mean CAPE



Take Difference CAPE

Map of monthly means



