

Constraining Stochastic Parametrisation Schemes using High-Resolution Model Simulations

Hannah Christensen

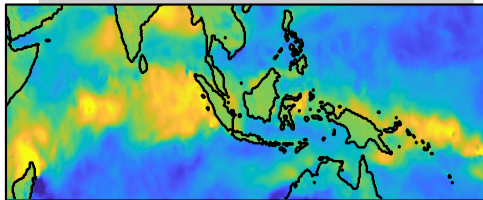
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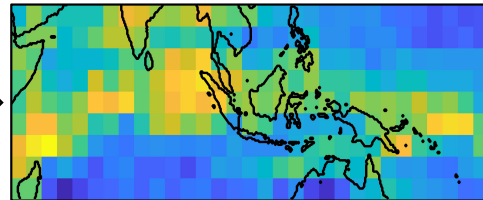
Use existing high resolution simulation as 'truth'

1. Long, free-running, high resolution simulation

t

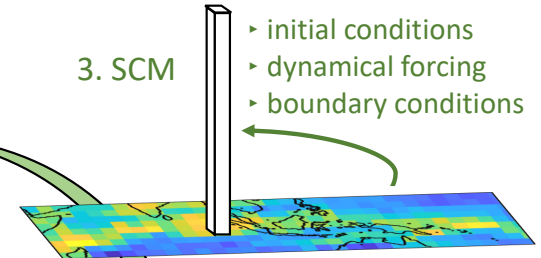


2. coarse grain

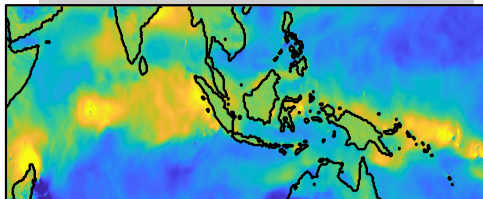


3. SCM

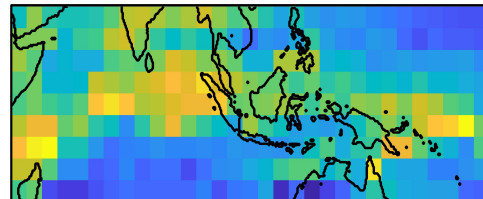
- initial conditions
- dynamical forcing
- boundary conditions



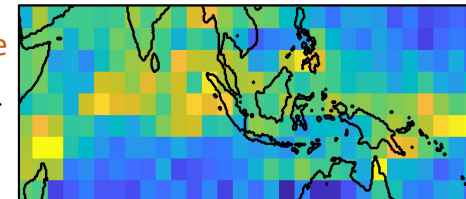
$t + \Delta t$



2. coarse grain



4. compare

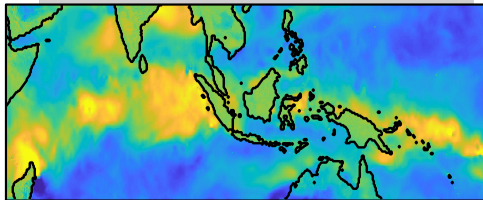


Use existing high resolution simulation as 'truth'

UKMO 4km 'Cascade' simulation

1. Long, free-running, high resolution simulation

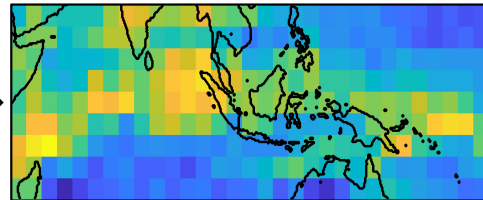
t



2. coarse grain

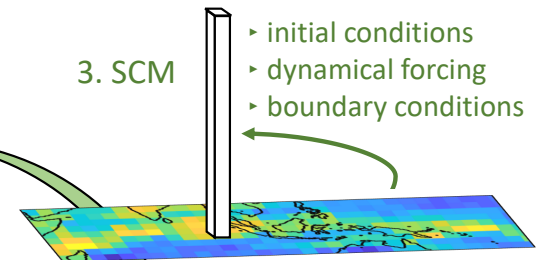


Coarse resolution: 30 km



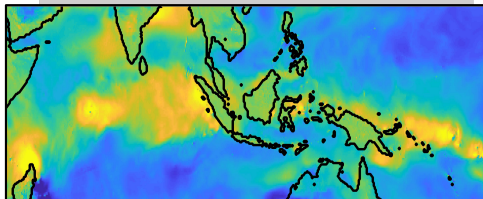
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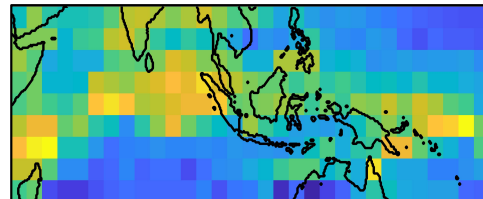
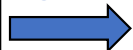


OpenIFS SCM
1 hr forecast

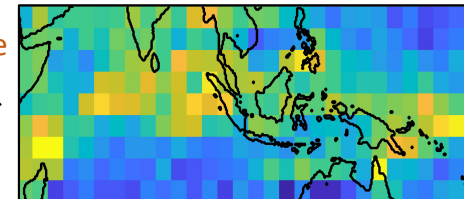
$t + \Delta t$



2. coarse grain



4. compare

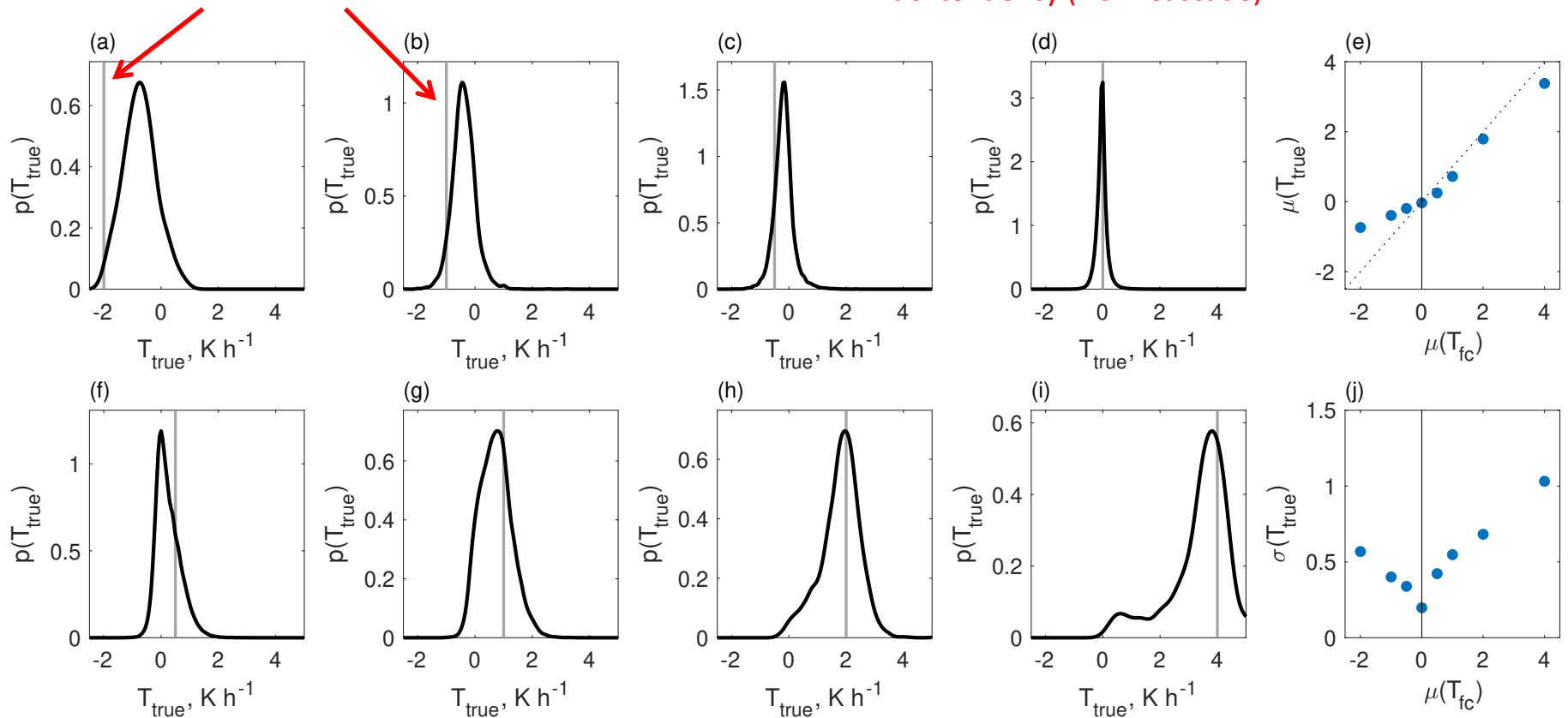


The need for stochastic parametrisations errors in T tendency at 850hPa

→ Characterise random error associated with deterministic prediction

Grey bar: SCM forecast tendency

PDF: 'True' tendency (from Cascade)



Increasing uncertainty with mean tendency provides support for SPPT approach

Model Uncertainty - MIP

- Joint initiative of WWRP's PDEF and WCRP's WGNE
 - Primary joint interest of the two working groups is model error identification
 - Aim: intercomparison of random error characteristics across models
 - Use Coarse-graining / SCM approach from Christensen 2020
 - Participants from NOAA, NCAR, ECMWF, UK Met Office, Meteo France
- Some key questions:
 - How should we best represent model uncertainty/random error using stochastic approaches?
 - To what extent should this representation be model specific or a fundamental property of atmospheric models?
 - Are current approaches justified? How can they be improved?

Still time to get involved!

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Christensen, Dawson and Holloway, 2018, JAMES, 10(8) 1833-1857

Christensen, 2020, QJRMets, 146(727), 938-962

Coarse-grained Cascade data published on UK CEDA archive

NCL coarse graining scripts, and python SCM deployment scripts published on github