METEOROLOGICAL SERVICE SINGAPORE
Centre for Climate Research Singapore

Impact of YMC datasets on the simulation of diurnal cycle of convection over the western coast of Sumatra

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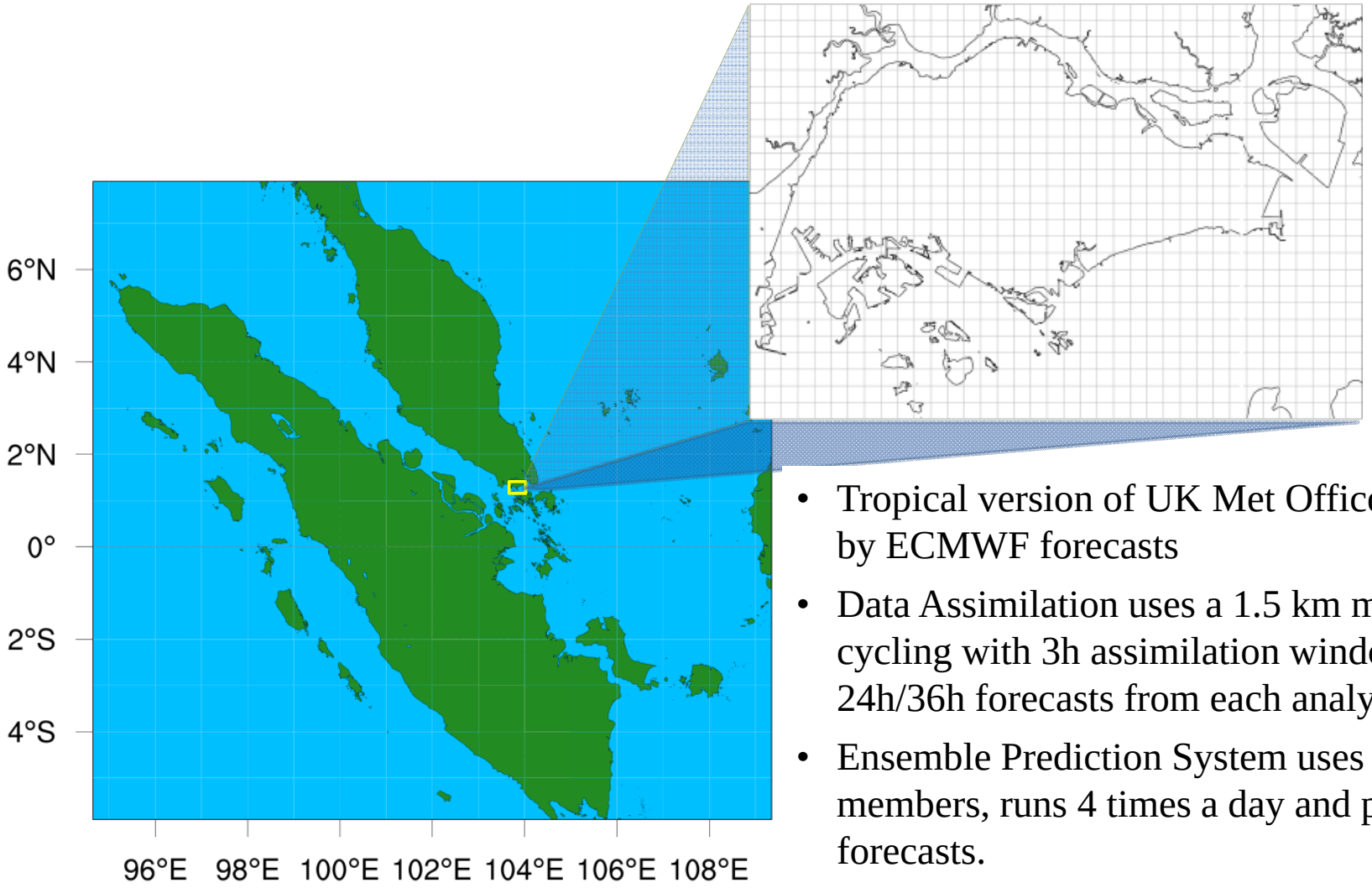
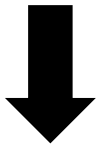
SINGV: convective scale NWP system



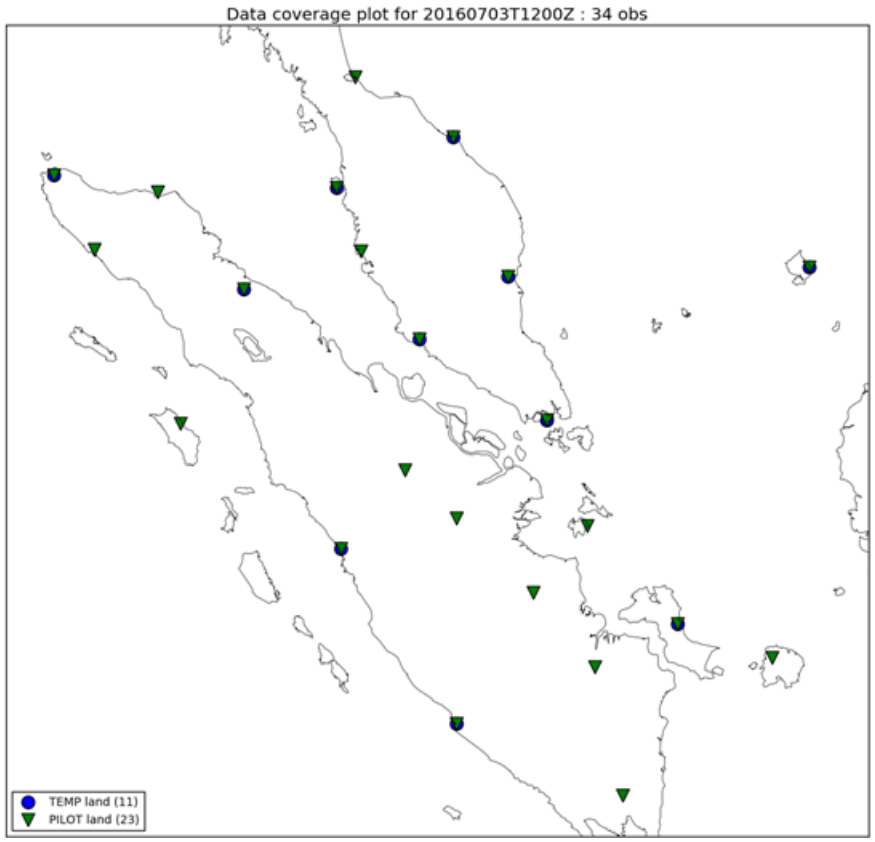
- Tropical version of UK Met Office model UM driven by ECMWF forecasts
- Data Assimilation uses a 1.5 km mesh, runs in full cycling with 3h assimilation windows and produces 24h/36h forecasts from each analysis.
- Ensemble Prediction System uses 12 4.5km DS members, runs 4 times a day and produces 36h forecasts.

SINGV-DA

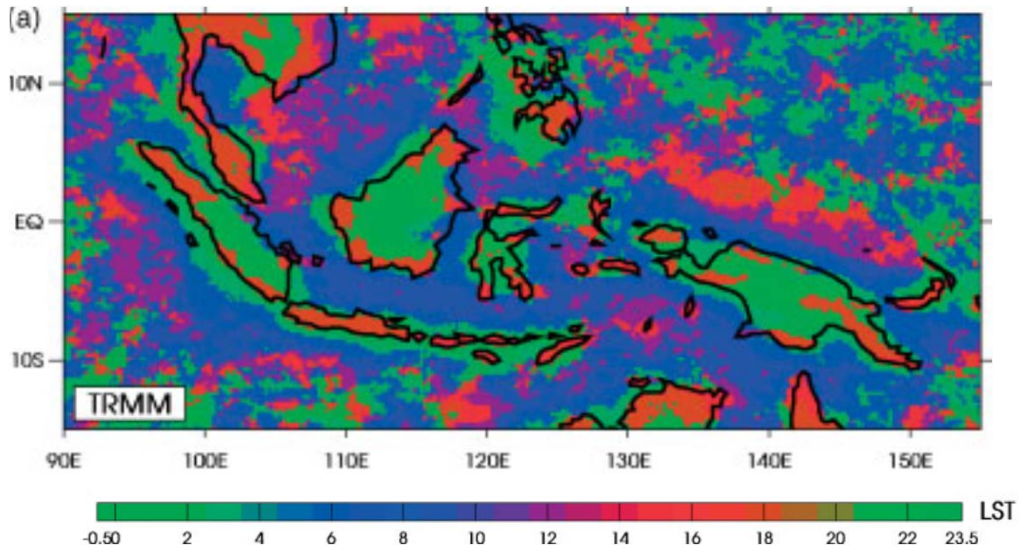
- 3DVar, 3 hourly cycling
- **conventional observations** + amsub + iasi + satwind + scatwind + airs + saphir (with SINGV specific configuration) + ahi + radar
- Limited spatial coverage
- Low temporal frequency (radiosondes only available 00Z and 12Z!)



It limits accuracy of the diurnal cycle of convection



Diurnal interaction between land and sea in the region (Oct-Apr 2008-2009)



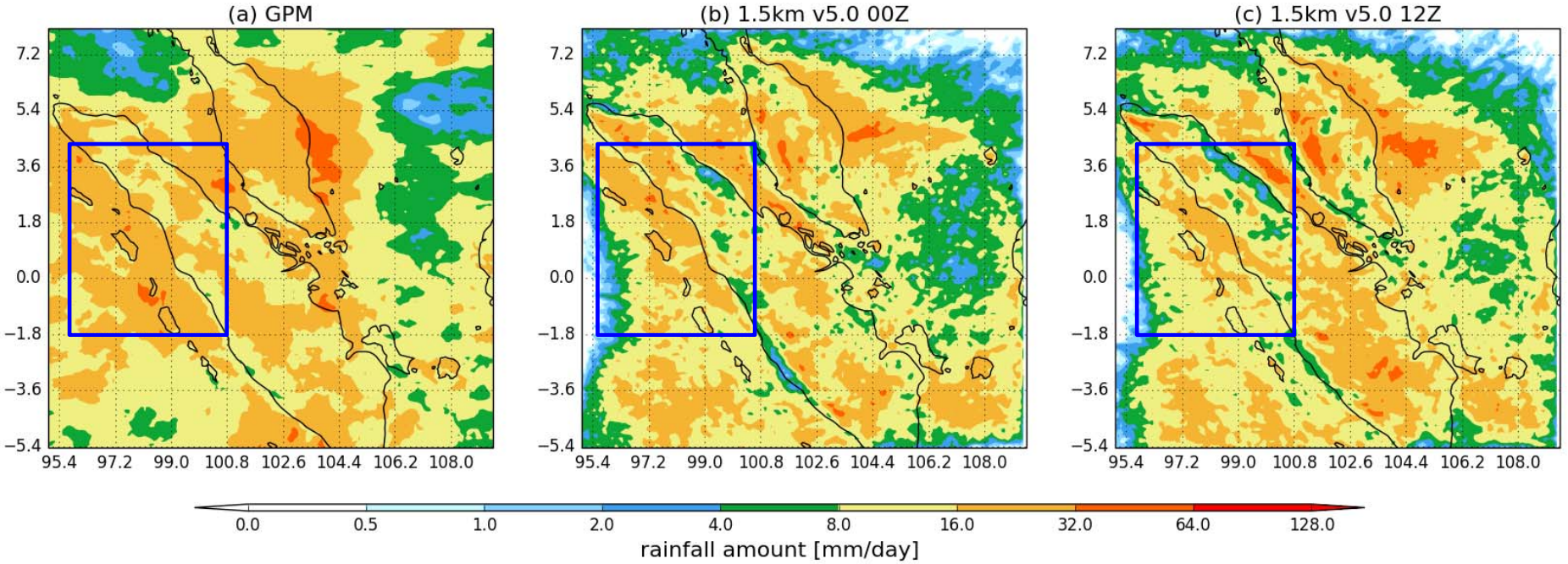
Time of maximum precipitation

- Heavy rainfall over land in the afternoon and in the neighbouring sea later in the night from migrating convective systems generated over land

Love et al. (2011)

Possible impact of improper diurnal cycle

(November 2016 accumulated rainfall)

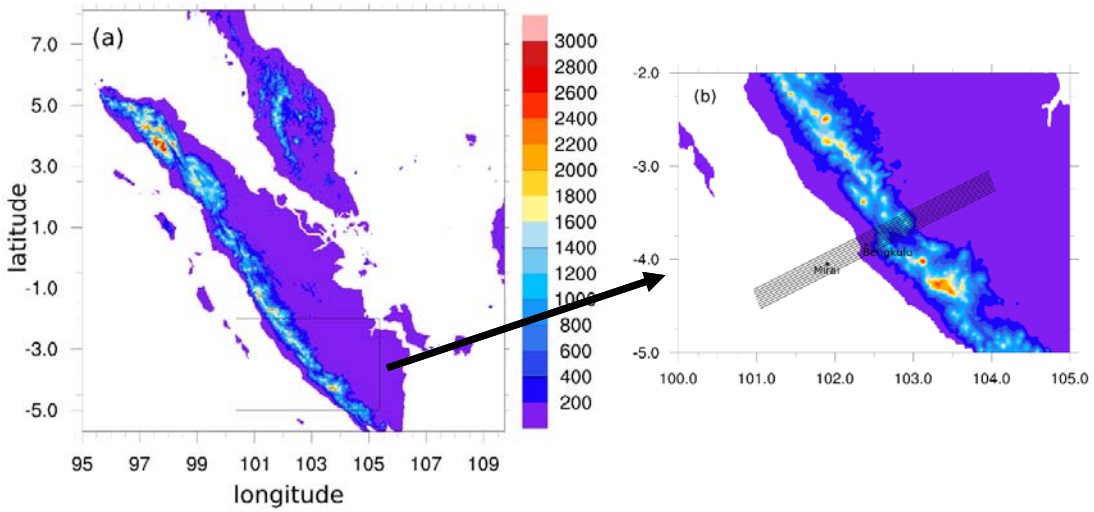


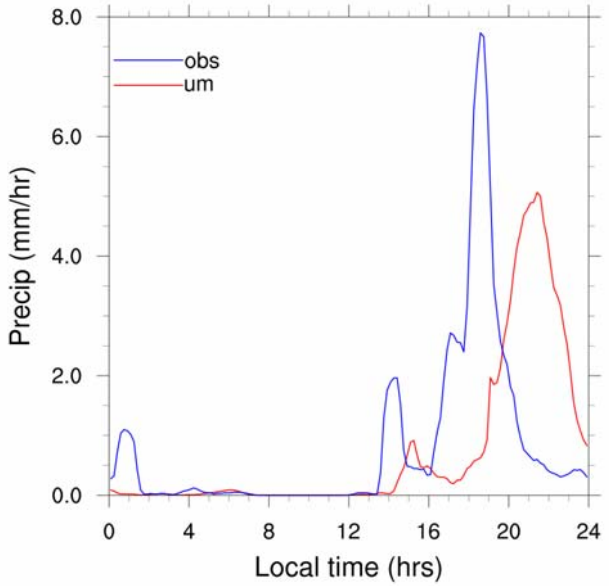
Dry bias over sea close to western Sumatran coast

Reasons for improper diurnal cycle in a LAM

- Model physics, dynamics
- Grid resolution
- Initial conditions
- Lateral boundary conditions for LAMs
- Surface boundary conditions
- ……..

Benefits of the YMC campaign

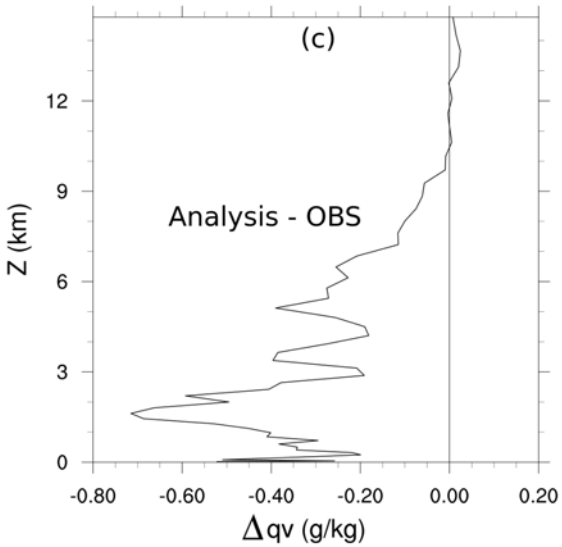




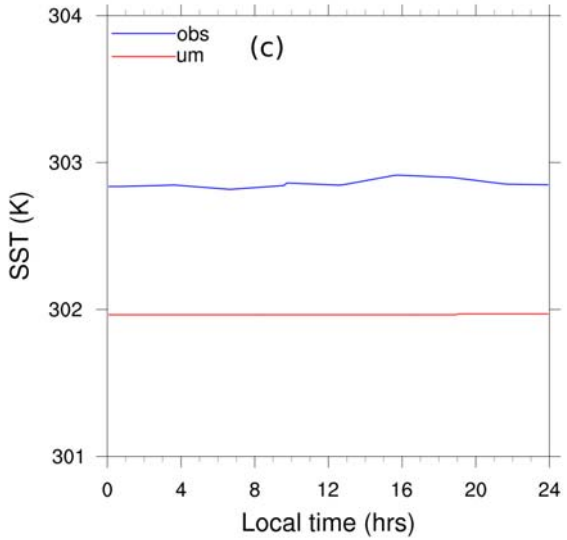
- Simulation performed using SINGV from 22 Nov – 12 Dec 2015
- Grid resolution 1.5 km forced by ECMWF HIRES analysis and forecasts
- Used Pre-YMC campaign to evaluate model
- Found weaker and delayed precipitation at Bengkulu

Dipankar et al. (2019)

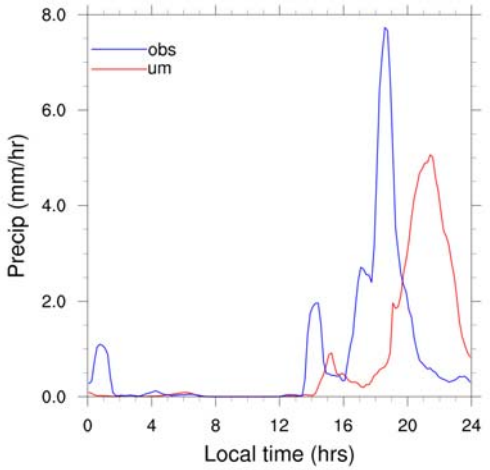
Benefits of the YMC campaign



Dry humidity bias in model IC

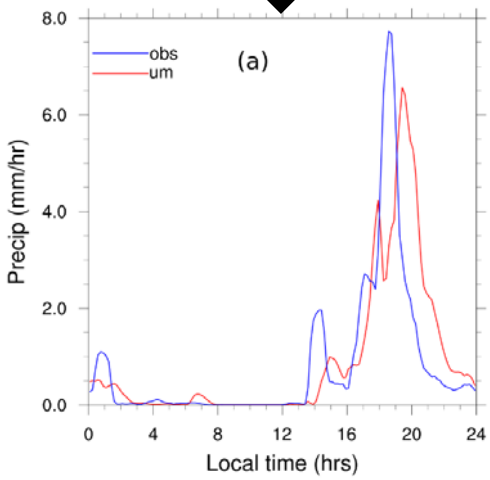


Cold SST bias in the model



CTRL

SST+2K, need DA to analyse impact of dry humidity bias



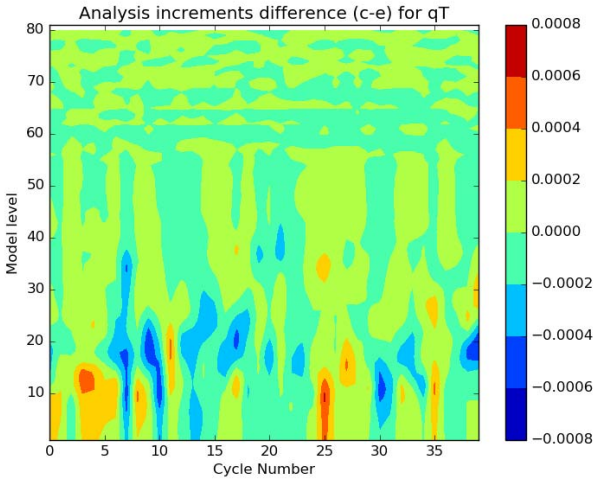
Dipankar et al. (2019)

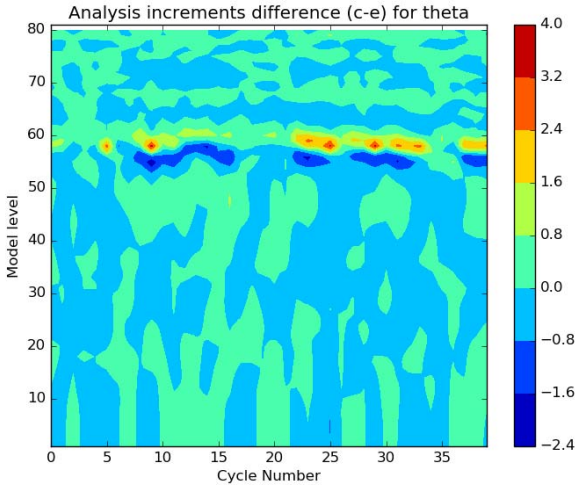
DA trials underway

- CTRL = Default DA
- EXPT = CTRL + YMC sonde

- 4.5 km grid resolution ran for 20 days with 3 hourly cycling
- Showing difference in analysis increments (C-E)

Only Bengkulu radiosonde is available to us for now. More is needed for a meaningful study





Summary

- Accurate representation of the diurnal cycle of convection is crucial for regional NWP
- Of course model improvement is needed
- High frequency DA can help also in that direction- this is what we wanted to test
- Hope to get more YMC datasets (including radar) soon!

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