Evaluation of WRF convection-permitting model simulations over the Maritime Continent

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Convection-permitting simulations over the Maritime Continent

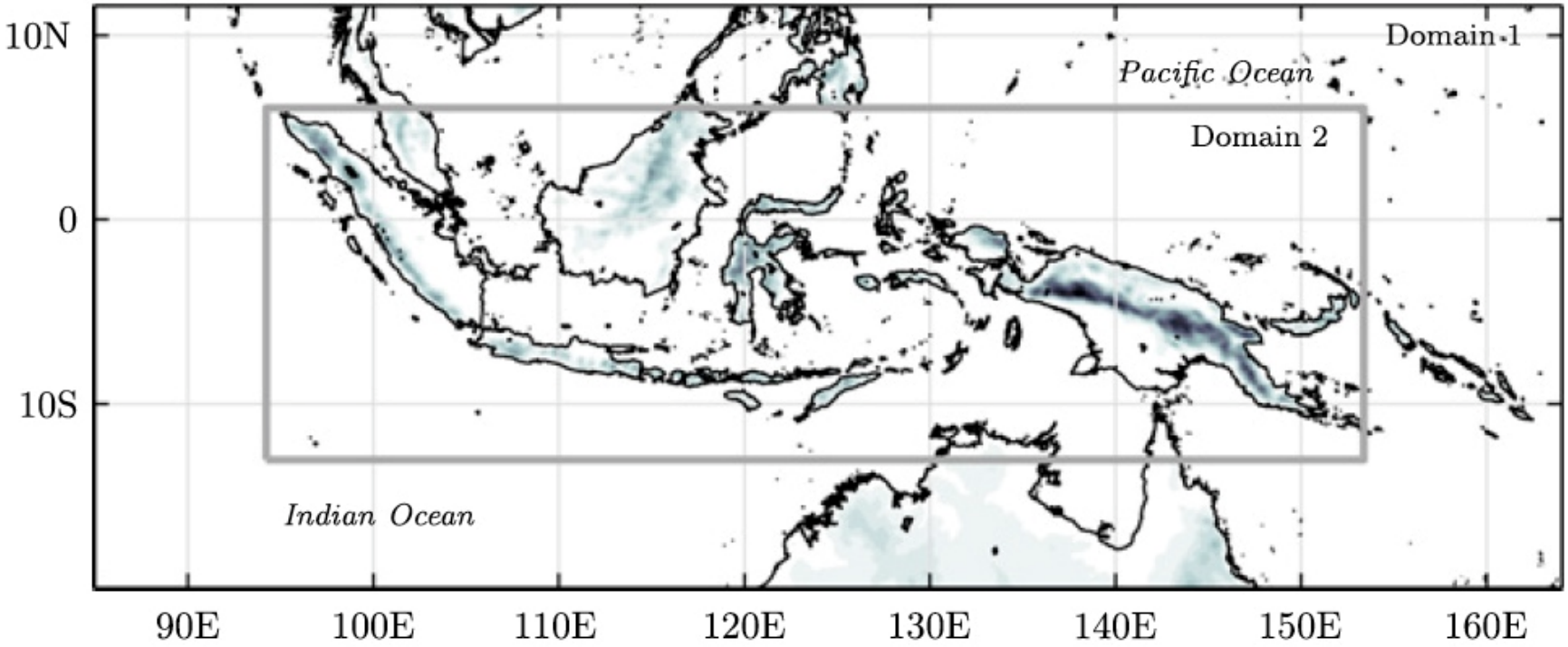


FIG. 1. Model domains. Domain 1 has 12-km horizontal grid spacing, and domain 2 has 4-km horizontal grid spacing.

Vincent & Lane, 2017, Journal of Climate

Convection-permitting simulations over the Maritime Continent

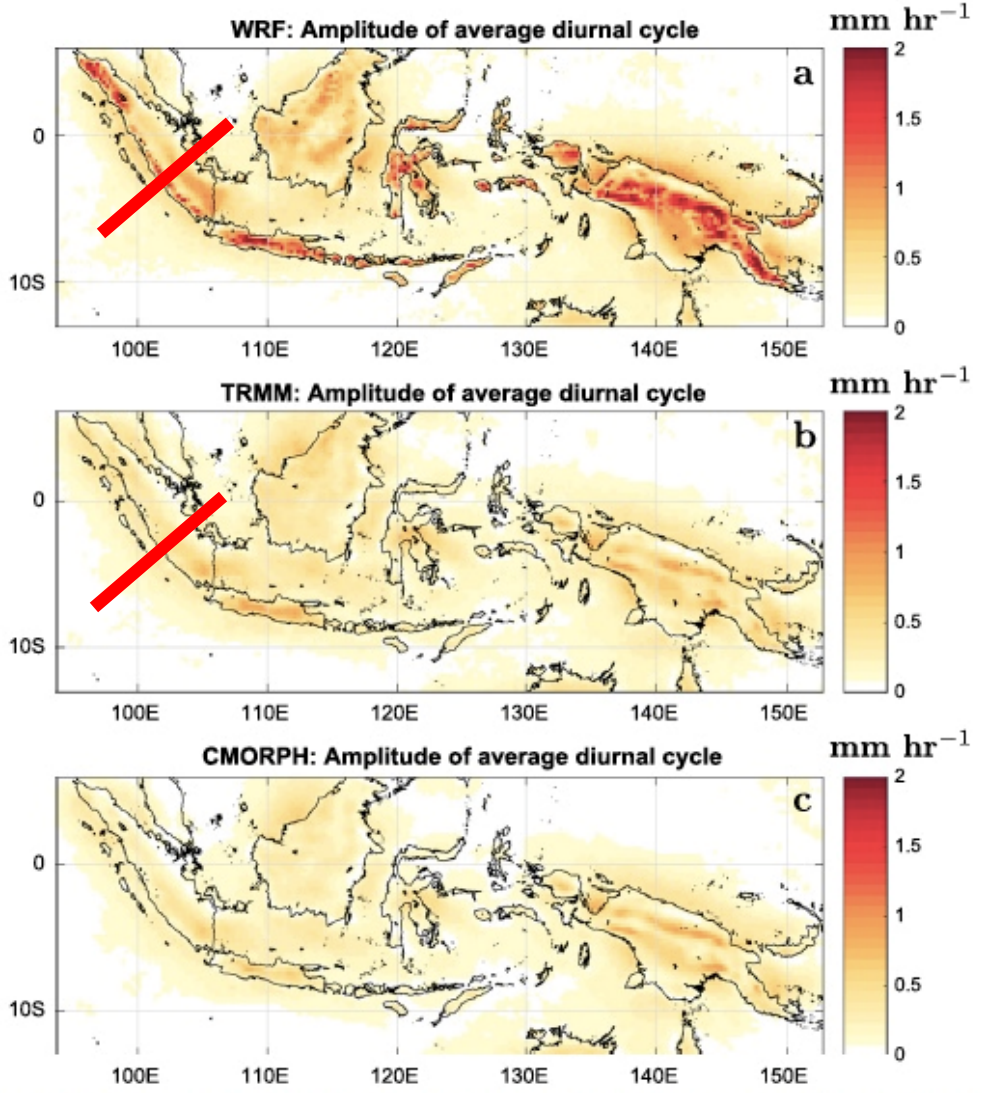
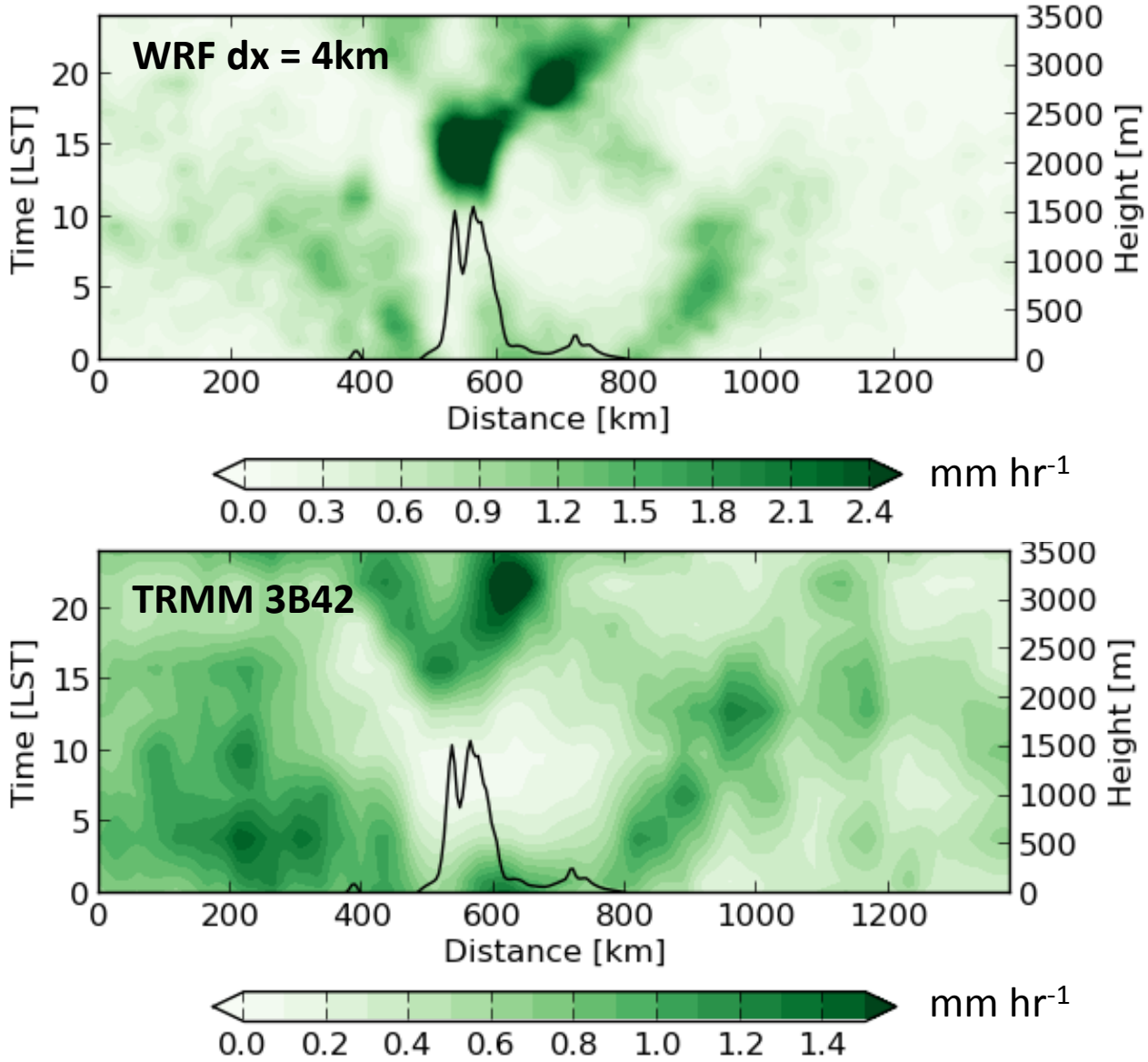


FIG. 3. Average amplitude of the austral summer diurnal precipitation cycle (mm h^{-1}) for (a) WRF, (b) TRMM, and (c) CMORPH. WRF and CMORPH data are averaged onto the TRMM grid.

Vincent & Lane, 2017, Journal of Climate

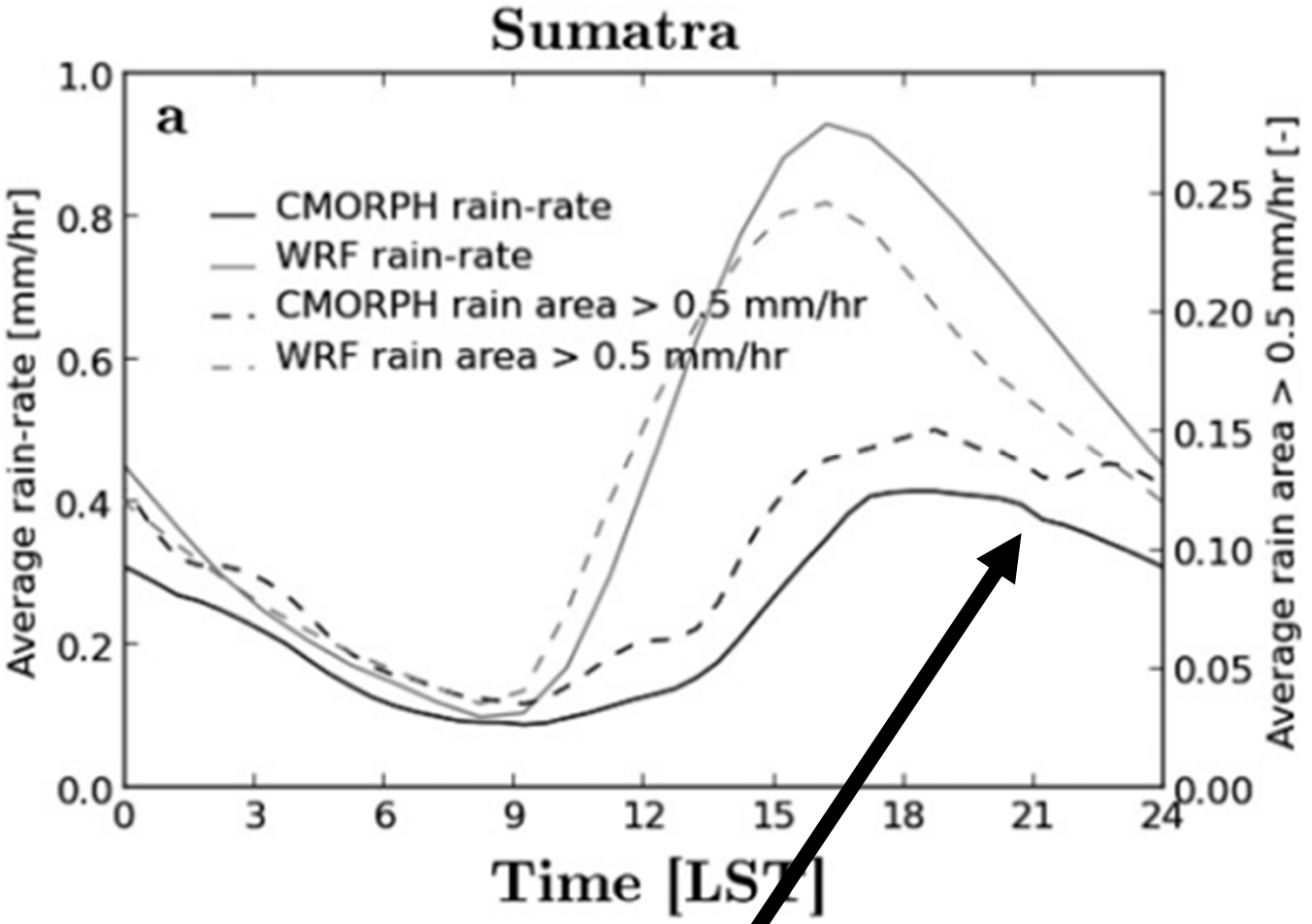
Simulated and Observed Diurnal Precipitation Cycle: Sumatra



Most aspects of the diurnal cycle represented (albeit with some biases)

Vincent & Lane, 2017, Journal of Climate

Simulated and Observed Diurnal Precipitation Cycle: Sumatra



Rain-rate decreases while rain-area flattens out

Vincent & Lane, 2017, Journal of Climate

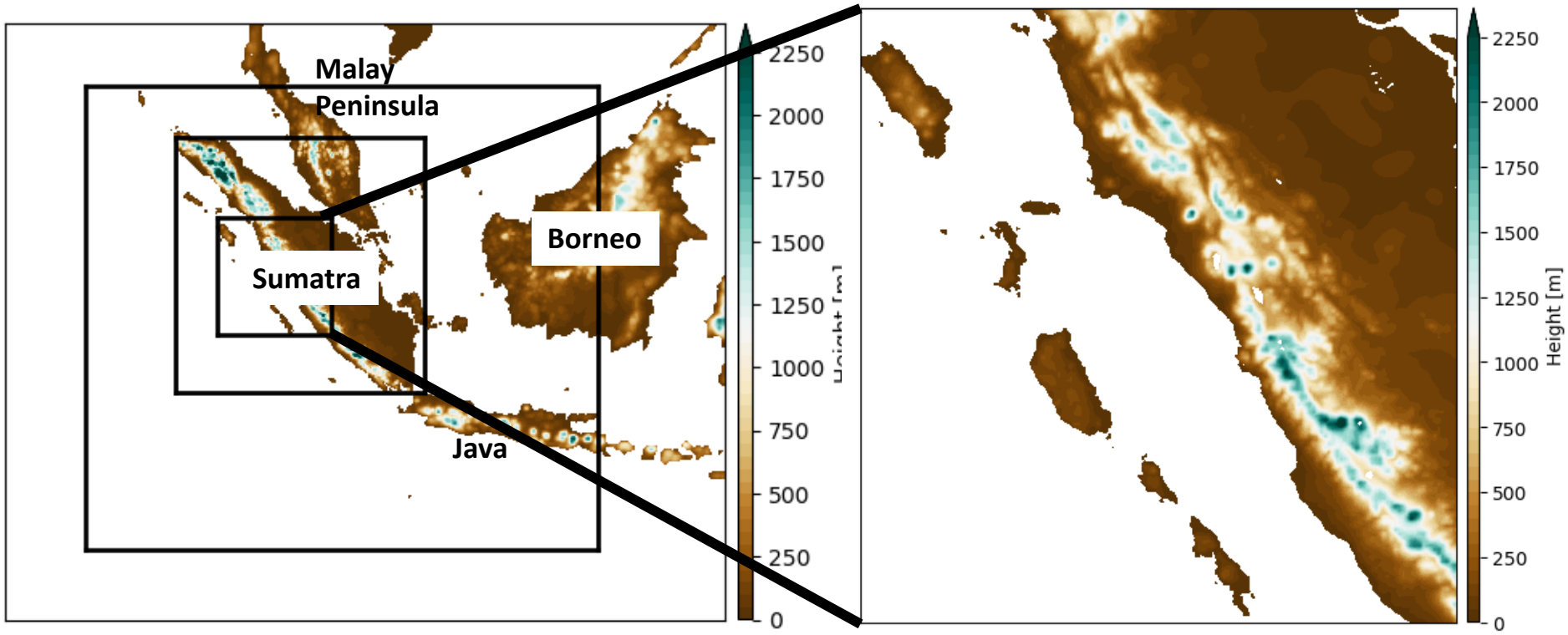
Resolution dependence of convective-stratiform evolution

dx = 12 km, 4km, 1.33 km, 444 m

Inner three domains are convective-permitting

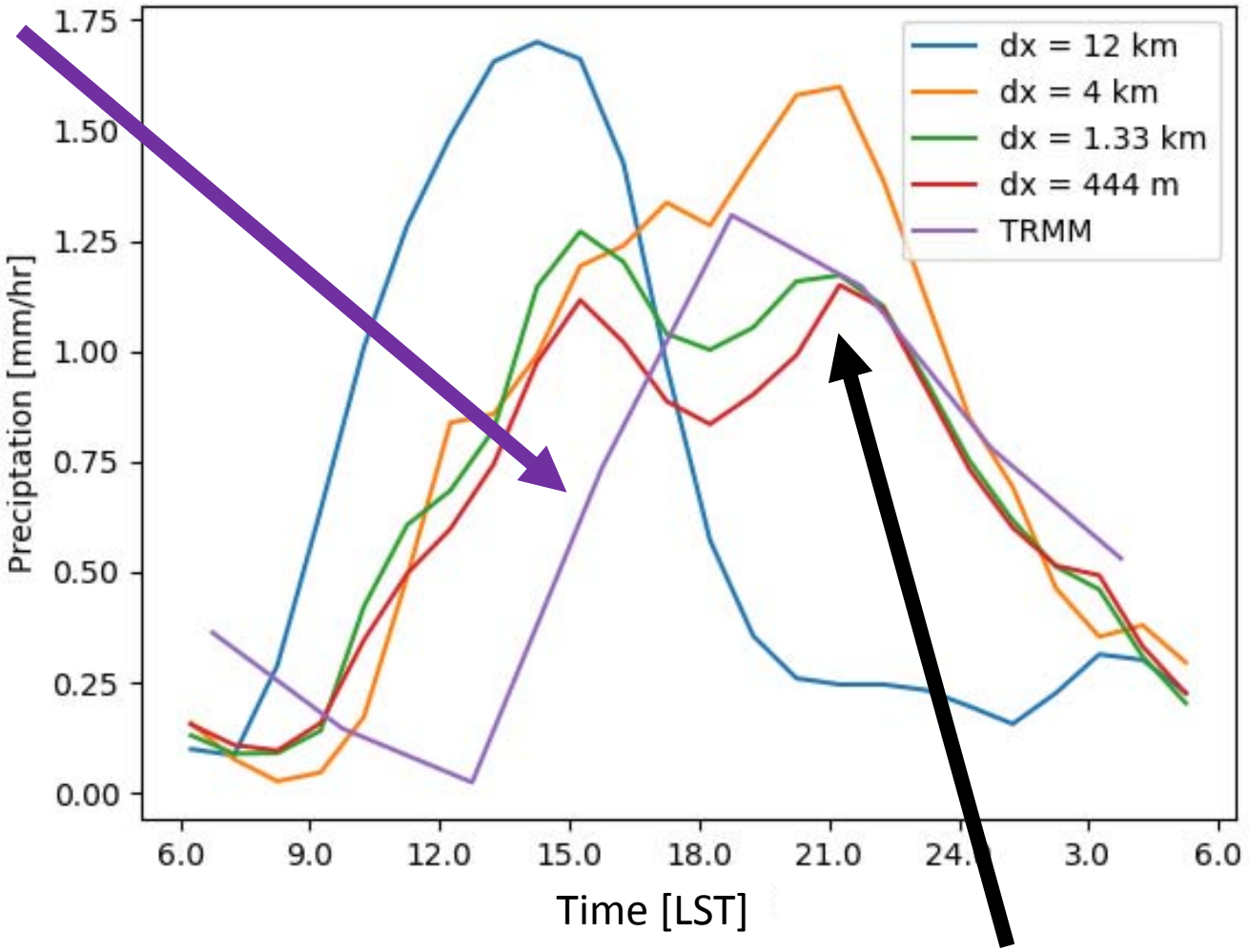
2 days simulation (so far) during MJO active period in November 2017

MYJ PBL Scheme
WSM6 MP Scheme
BM Cu scheme (12km only)
NOAH LS Scheme
RRTM / Goddard radiation



Average diurnal precipitation cycle over land

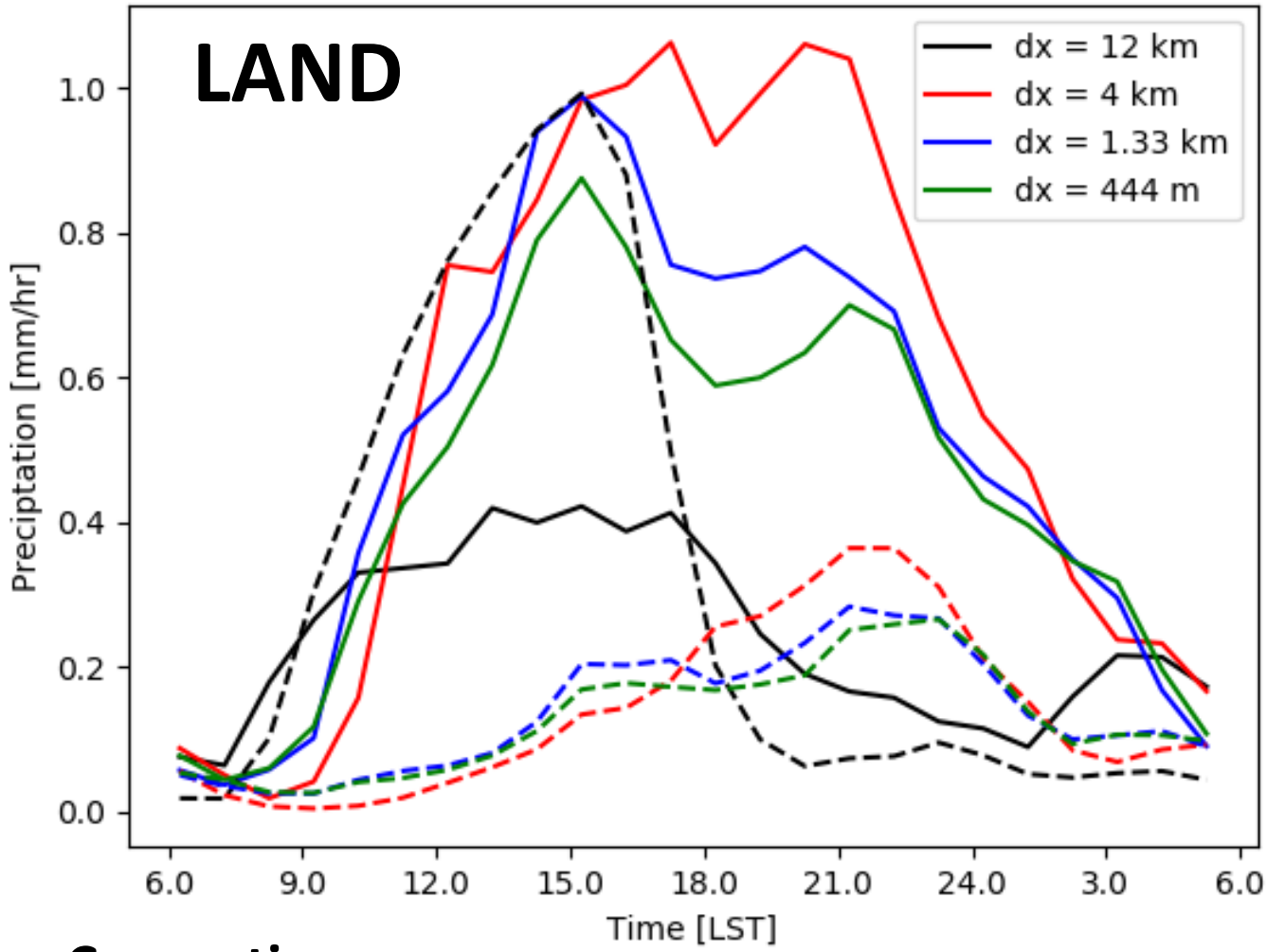
TRMM
3B42



Double peak in two finest resolutions

* Based on 48 hour simulation

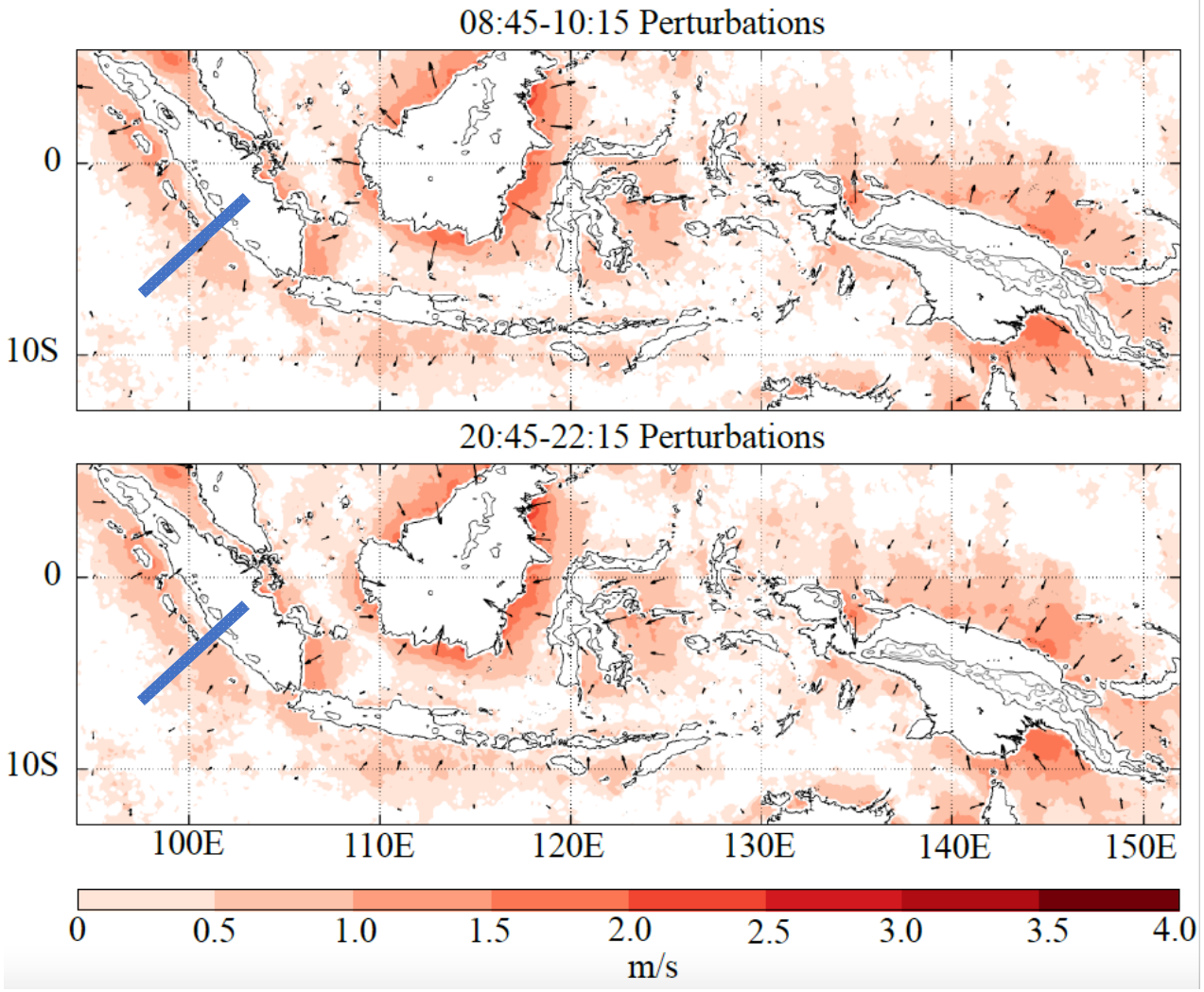
Convective and stratiform contributions to average precipitation cycle



Solid lines: Convective

Dashed lines: Stratiform (determined using Shige et al. 2004)

Composite Maritime Continent land/sea breeze perturbations from scatterometer



From ASCAT (2 satellites)

Oct 2012 onwards

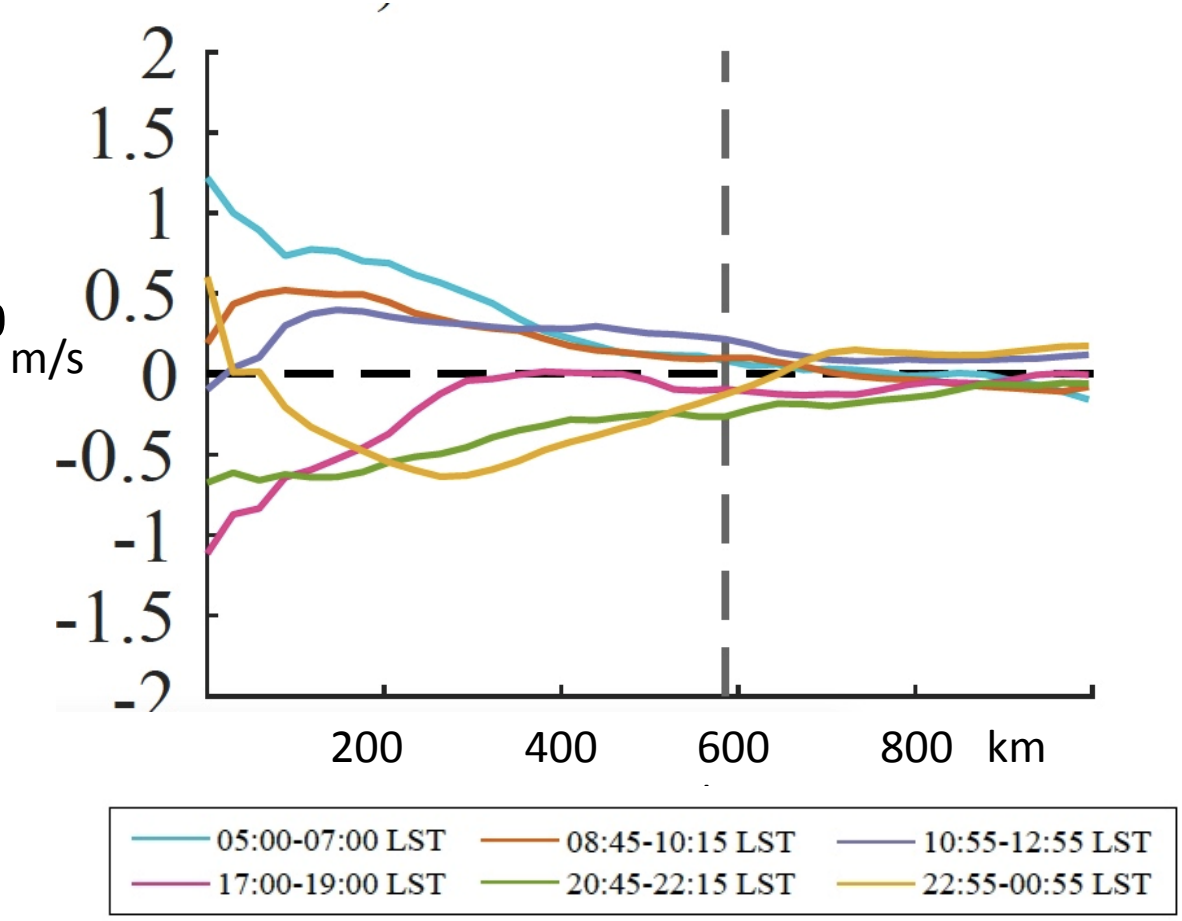
[See poster upstairs by Jimmy Corong]

Short, E., C.L. Vincent, and T.P. Lane, Diurnal Cycle of SurfaceWinds in the Maritime Continent observed through Satellite Scatterometry. *Mon. Wea. Rev.*, submitted.

Identifying the diurnal cycle by combining scatterometer products

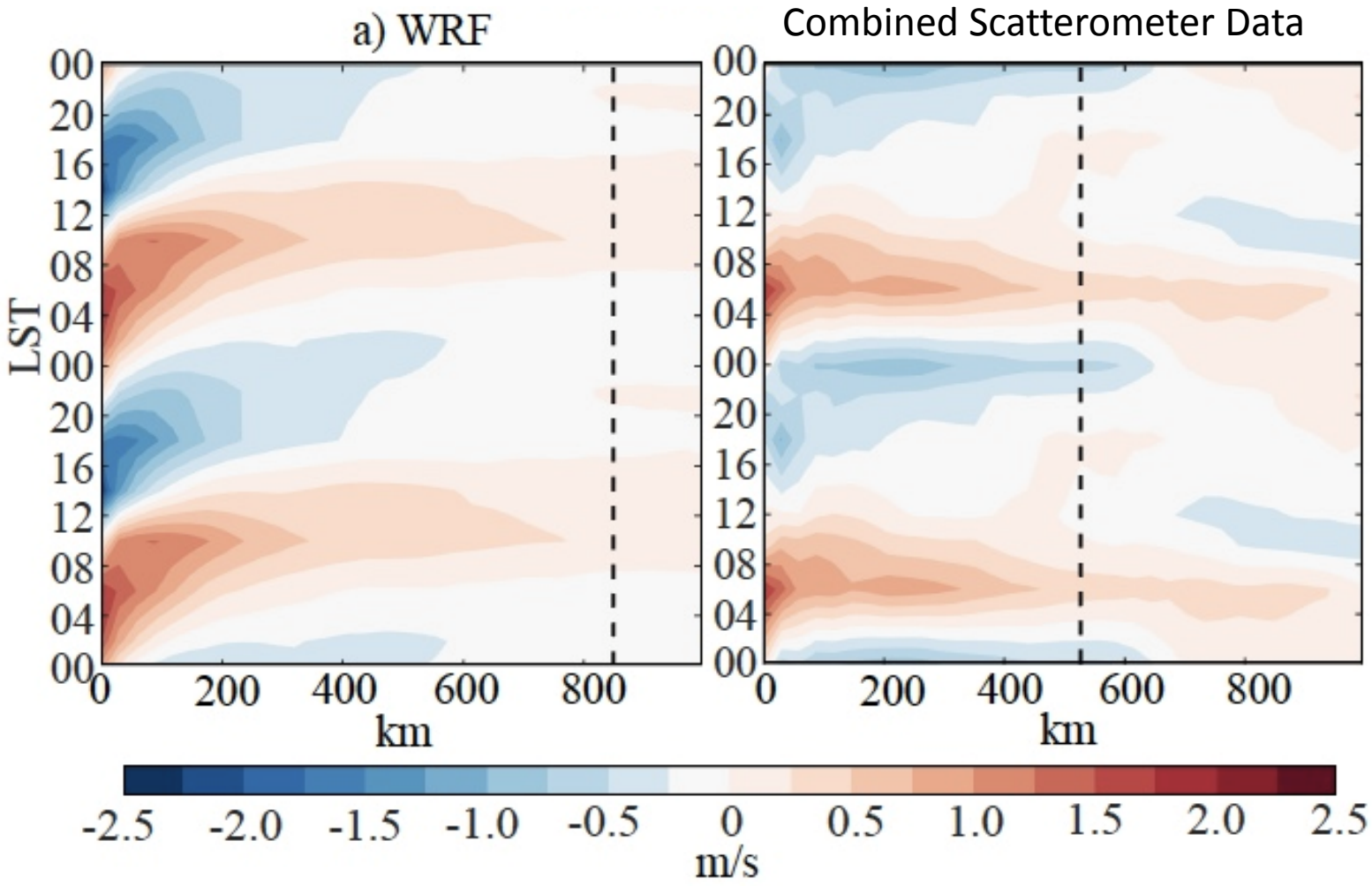
ASCAT/A 0845-1015, 2045-2215
ASCAT/B 0845-1015, 2045-2215
OCSCAT 1055-1255, 2255-0055
HY2SCAT 0500-0700, 1700-1900

Combined Scatterometer Data (10/12-02/14)



Short, E., C.L. Vincent, and T.P. Lane, Diurnal Cycle of Surface Winds in the Maritime Continent observed through Satellite Scatterometry. *Mon. Wea. Rev.*, submitted.

Comparison of WRF and scatterometer land/seabreeze composite perturbations



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Conclusions

1. Convection-permitting model (4 km grid spacing) over-emphasizes diurnal cycle of precipitation over land

2. Errors are associated with too much convective rainfall vs stratiform rainfall

3. Some improvement at sub-km grid spacings, but not perfect

4. Near-shore timing of sea/land breeze is represented well in the model, but timing errors offshore (hope to resolve this with IOP observations off shore)

Plans / Opportunities

Simulations focused on Sumatra for Australian YMC IOP (Nov / Dec 19)

Complete simulations during YMC-Sumatra (Nov 2017)

Opportunities for multi-model evaluations