TWP-ICE NWP Intercomparison: Dry Intrusion and Resolution Impact

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ASR meeting

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Participating models and related physics

Table 1: Participating Models

Name	Deep Convection	Shallow Convection	PBL	LS CLoud
IFS(Cy35r3)	Betchold	EDMF	EDMF	Tiedtke with Tompkins subgrid
CAM4	ZM95(Neale)	Bretherton-Park	UW	Morrison Gettleman
AM2	RAS	RAS	Lock	Tiedtke-Rotstayn-Klein
AM3P5	Donner	UW	Lock	Tiedtke-Rotstayn-Klein-Ming
HIRAM	UW	UW	Lock	Tiedtke-Rotstayn-Klein-Zhao
UKMO	GR-Martin	GR-Martin	Lock	Smith(1990), Wilson-Ballard(1999)
GSM(JMA)	AS	AS	MY level-2	Prognostic qv, diagnosed qa
GME(GWS)	Tiedtke 1989)	Tiedtke(1989)	MY level-2	Kessler type BMP
IAP(China)	ZM95	Hack94	Holtslag-Boville-nonlocal	Morrison Gettleman

Model forecast setup

- Initialized from ECMWF reanalysis at 00Z each day
- No nudging
- Land spinup
- Day 2 forecast (f24-f45) at 3-h interval is used

A trend of merged climate model and global forecast model (UKMO, EC-earth, JMA?)

What do we have?

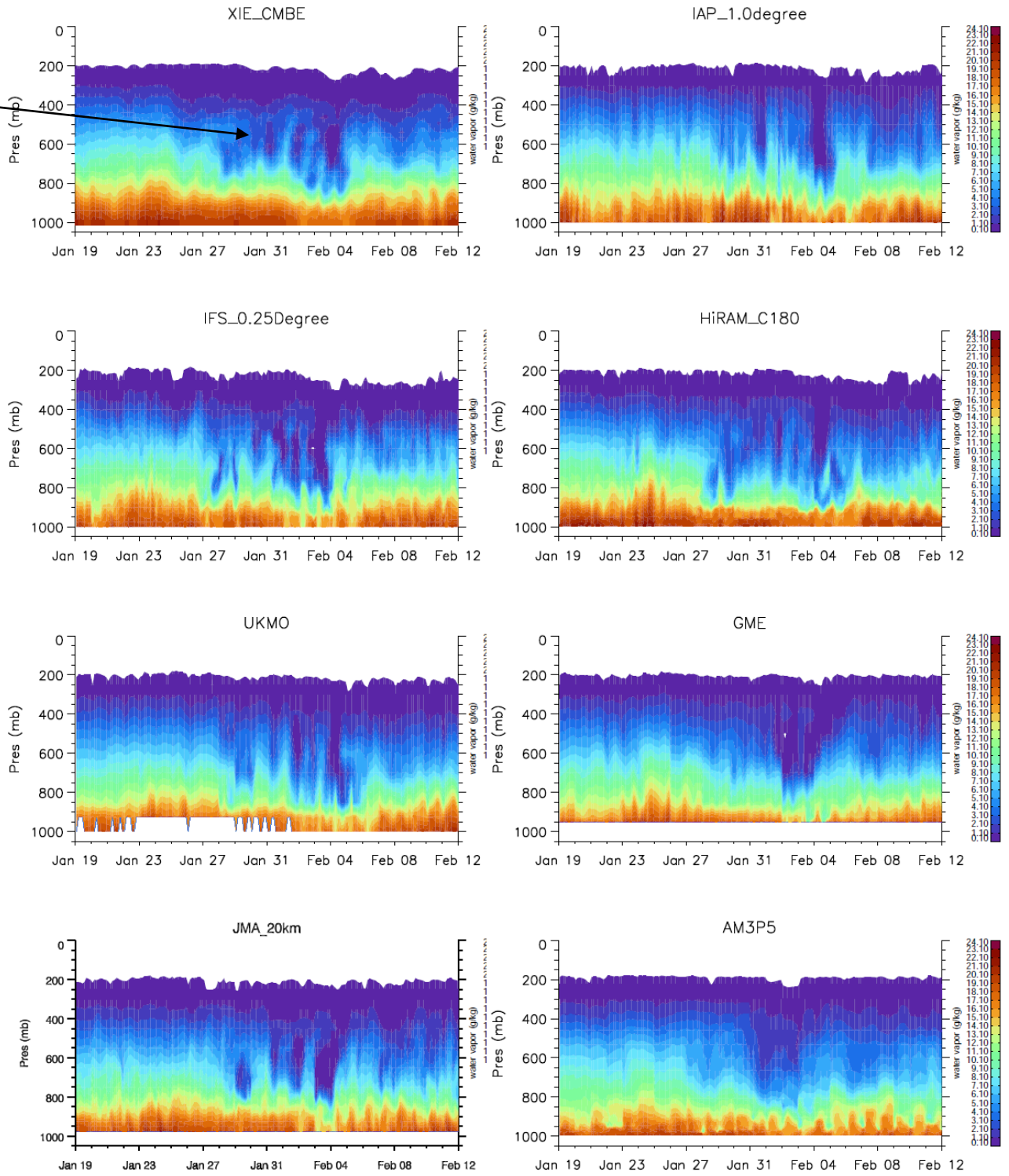
- *3-hourly model outputs over a large domain*

(25S to 0, 121-141) to check synoptic evolution

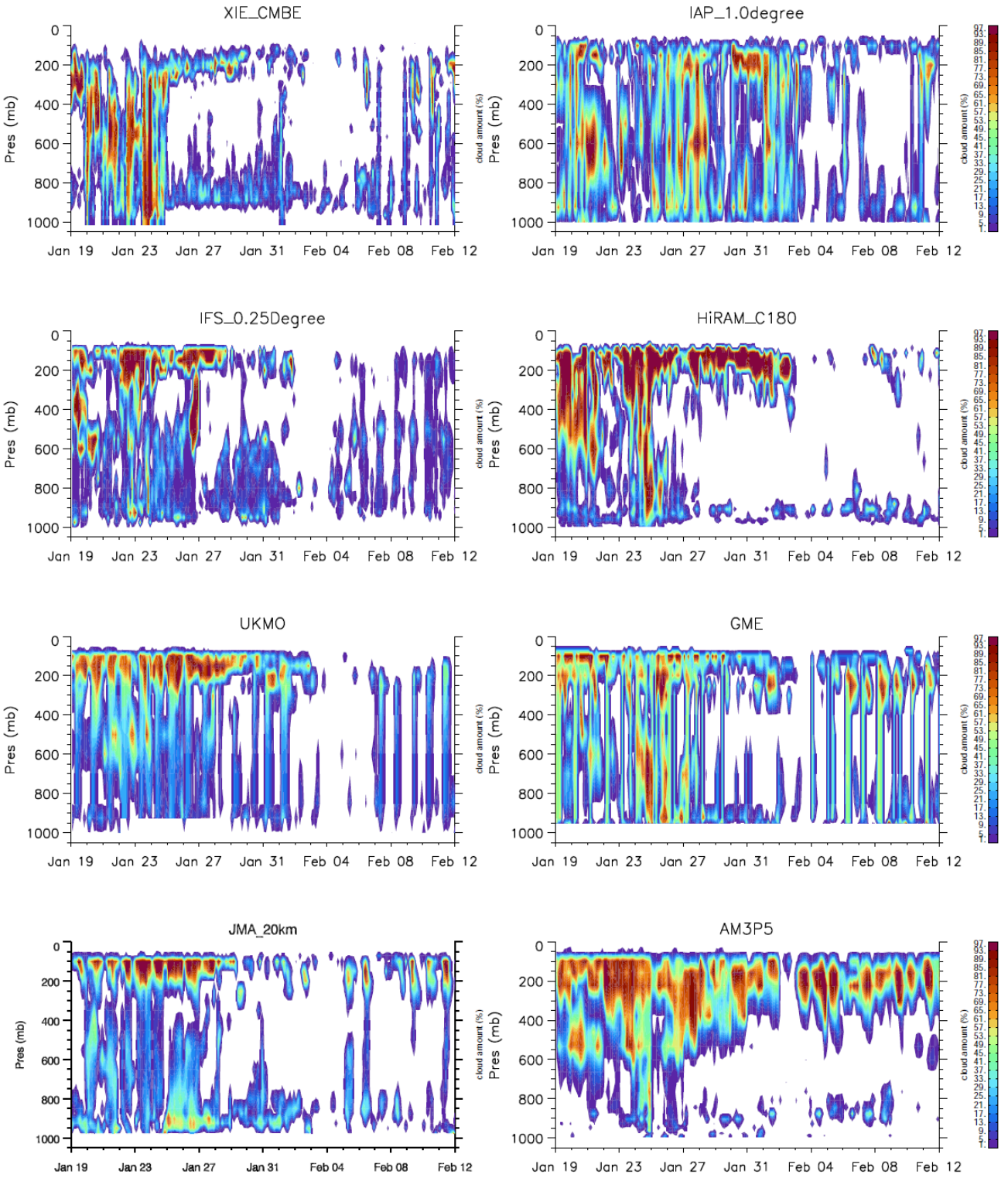
- *Various observations (prep, cloud, surface fluxes,radiation, etc.)*
- *Standard plots (time-height plot, time series, vertical profiles, composite plots) are prepared.(do we need to post all these plots on a web page for easy comparison?)*

Dry intrusion

Moisture variation

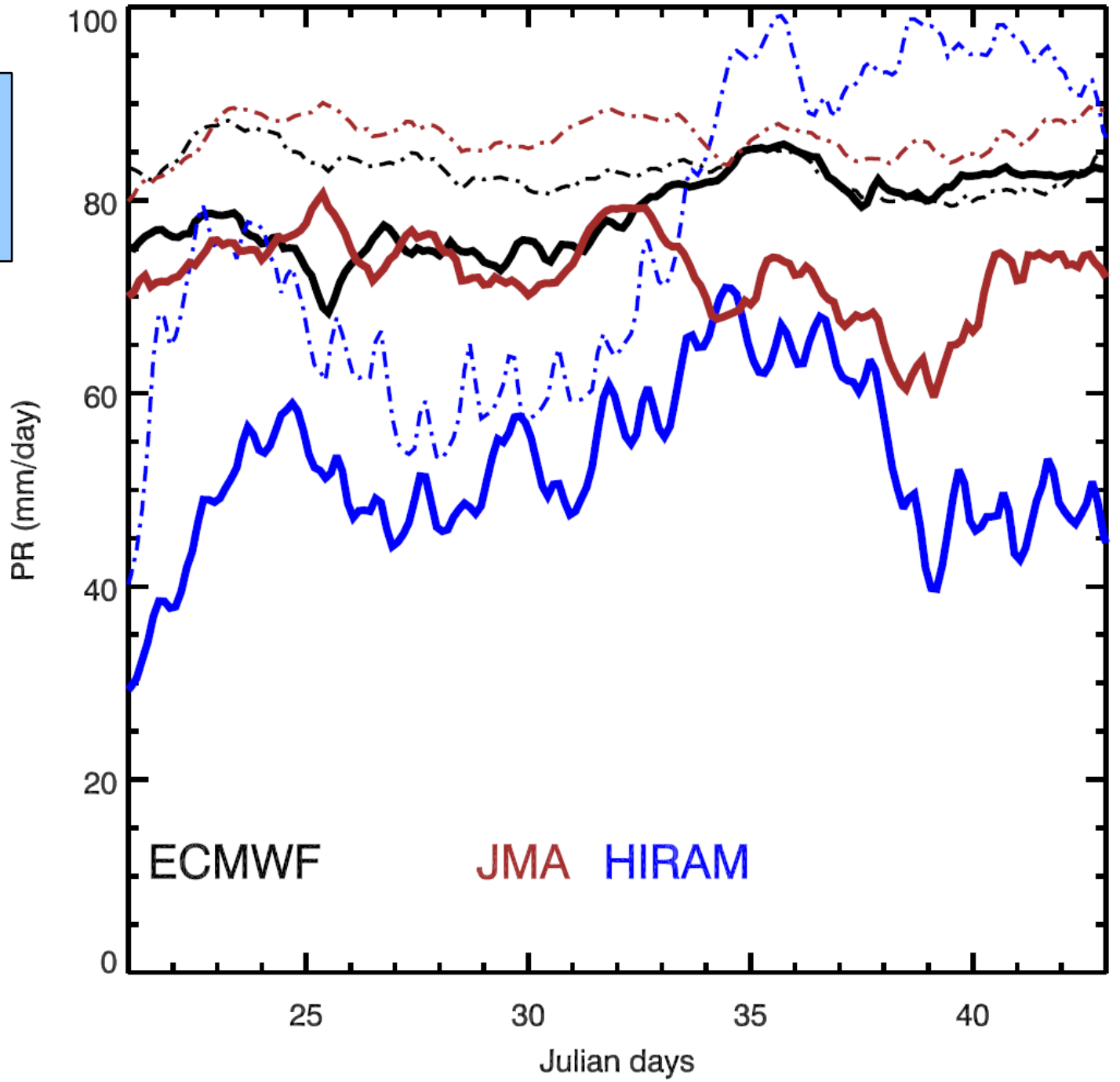


Cloud fraction



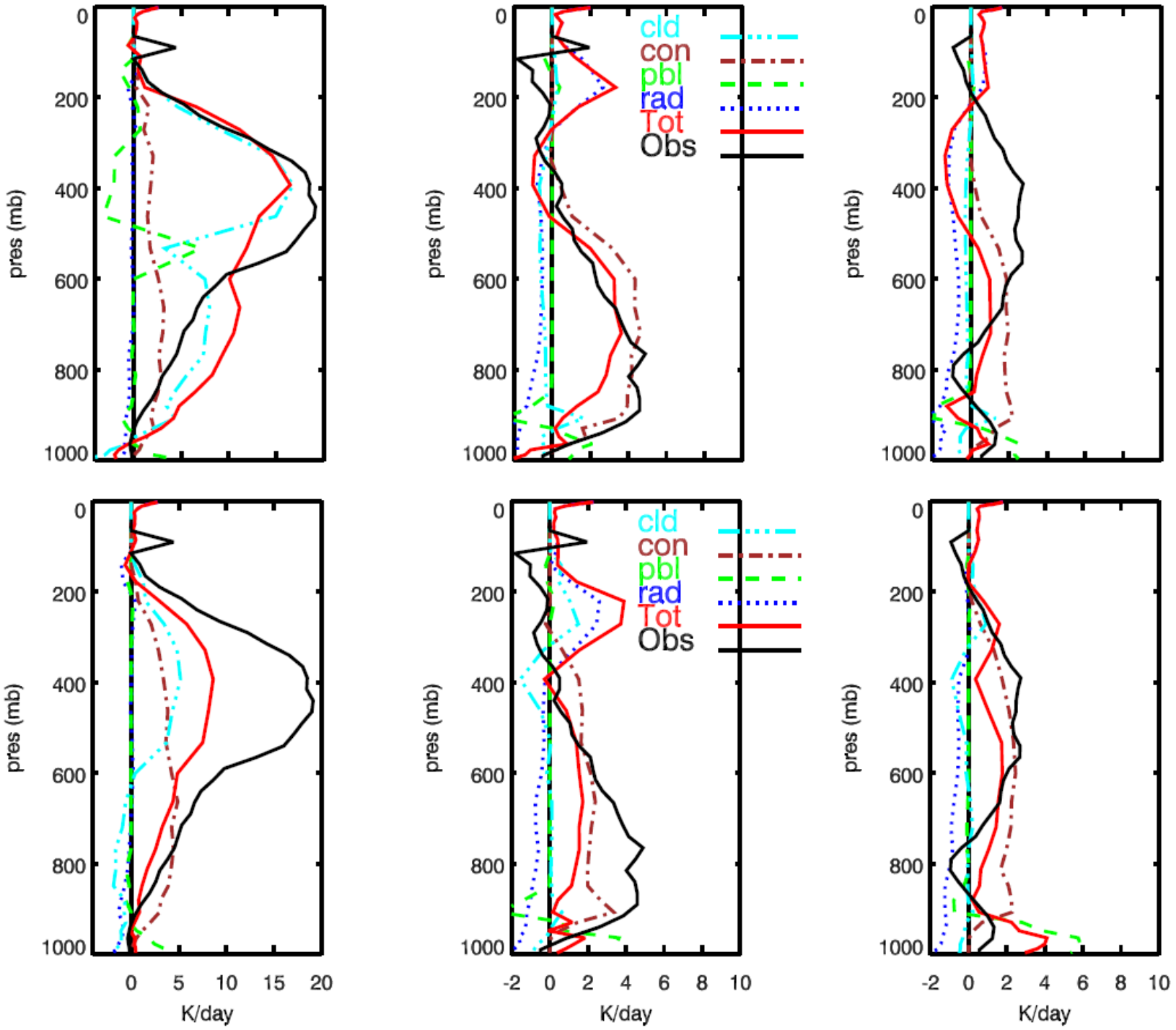
Convective precipitation ratio

Thick: high resolution
Thin: low resolution



HIRAM
(0.5 degree)

HIRAM
(2 degree)



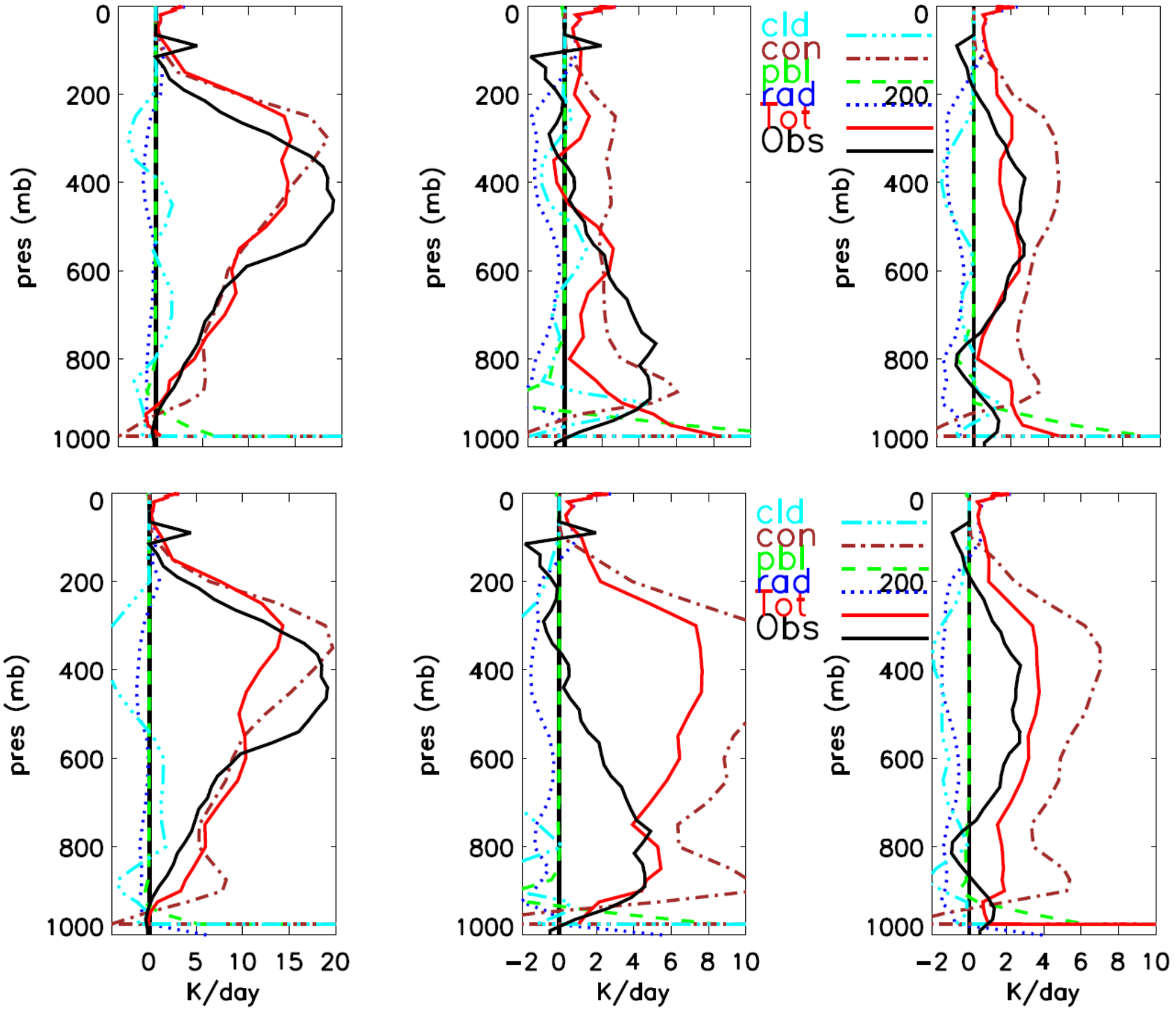
Active (1/20-1/25)

Suppressed (1/26-2/2)

Break (2/3-2/13)

JMA-20km

JMA-60km



Active (1/20-1/25)

Suppressed (1/26-2/2)

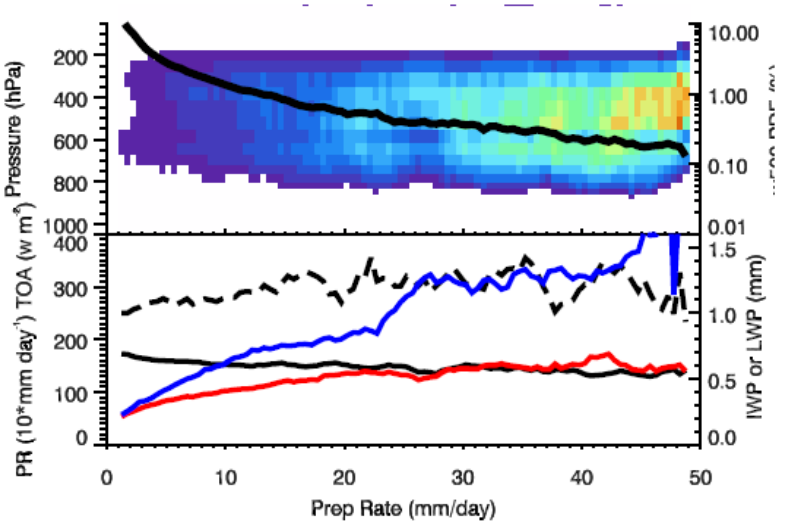
Break (2/3-2/13)

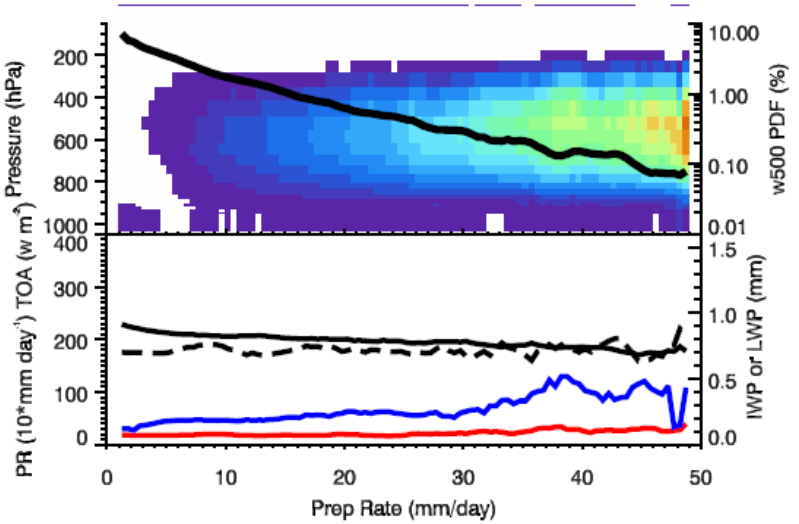
LS

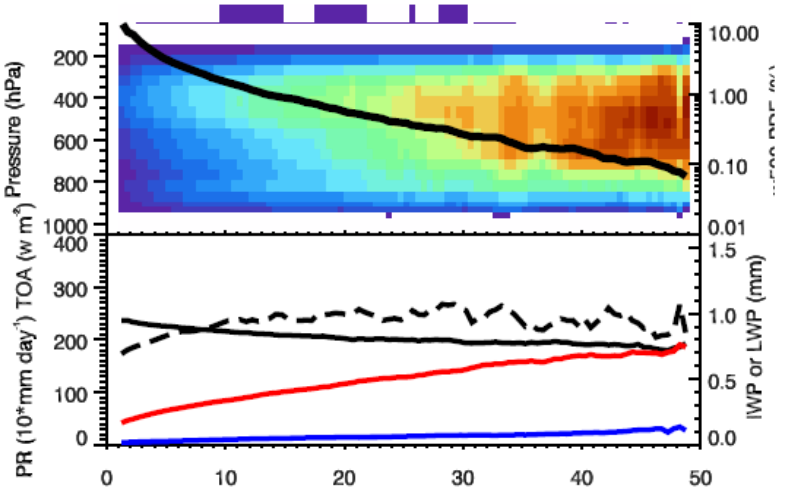
Convection

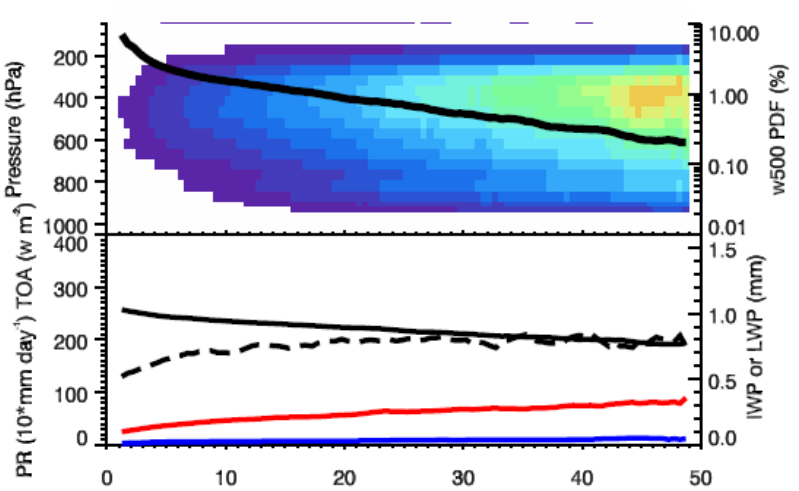
HIRAM (0.5 degree)

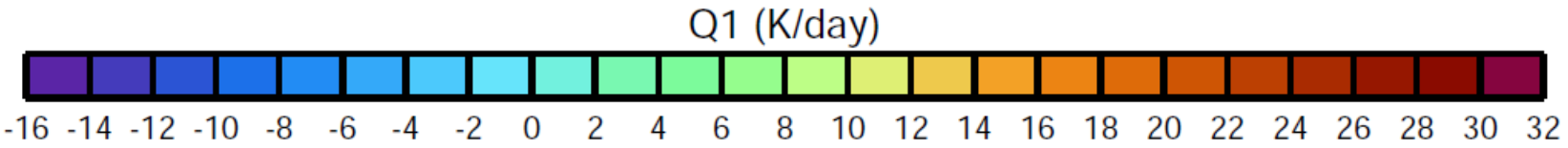
JMA 20 km





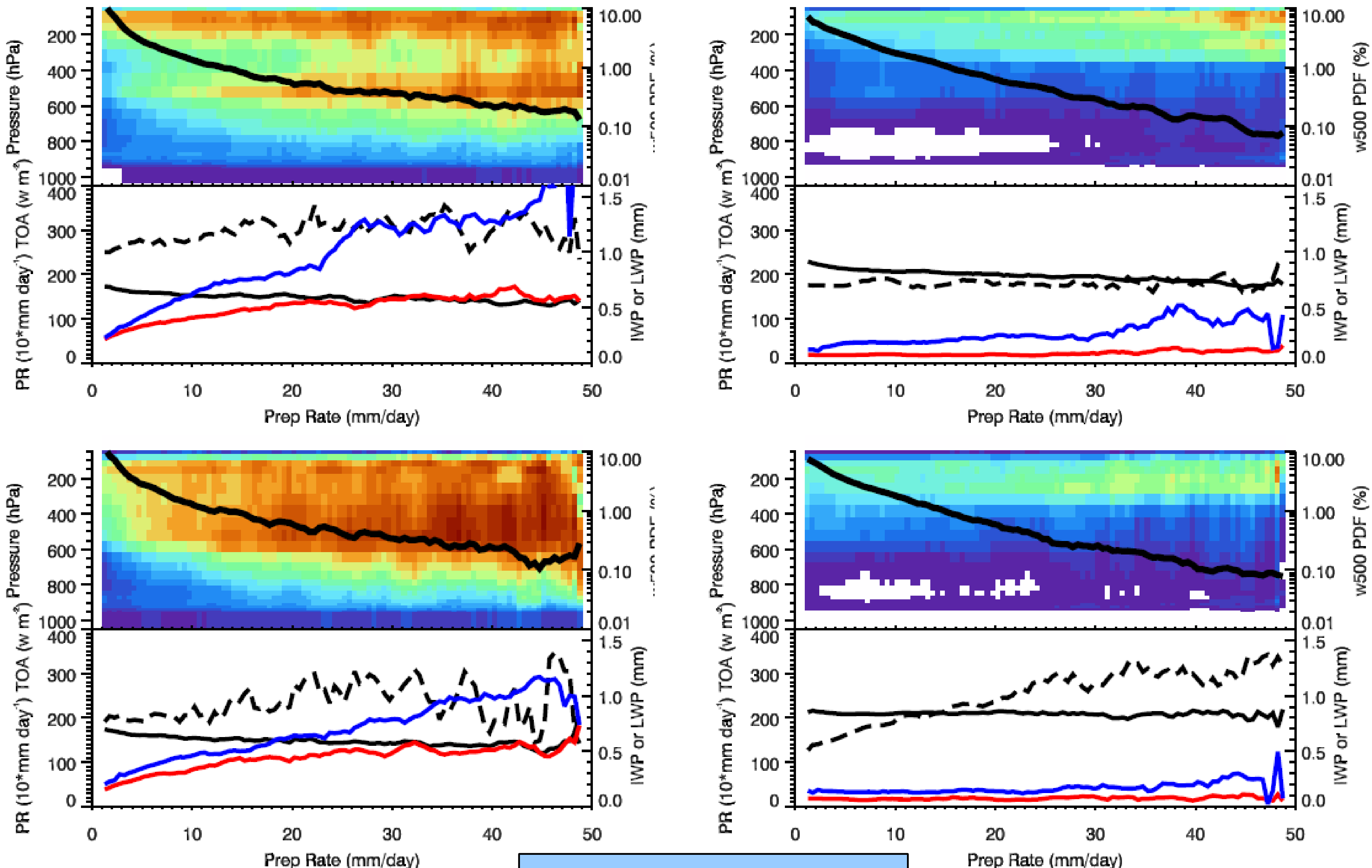






0.5-degree HIRAM

Stratiform | **convective**

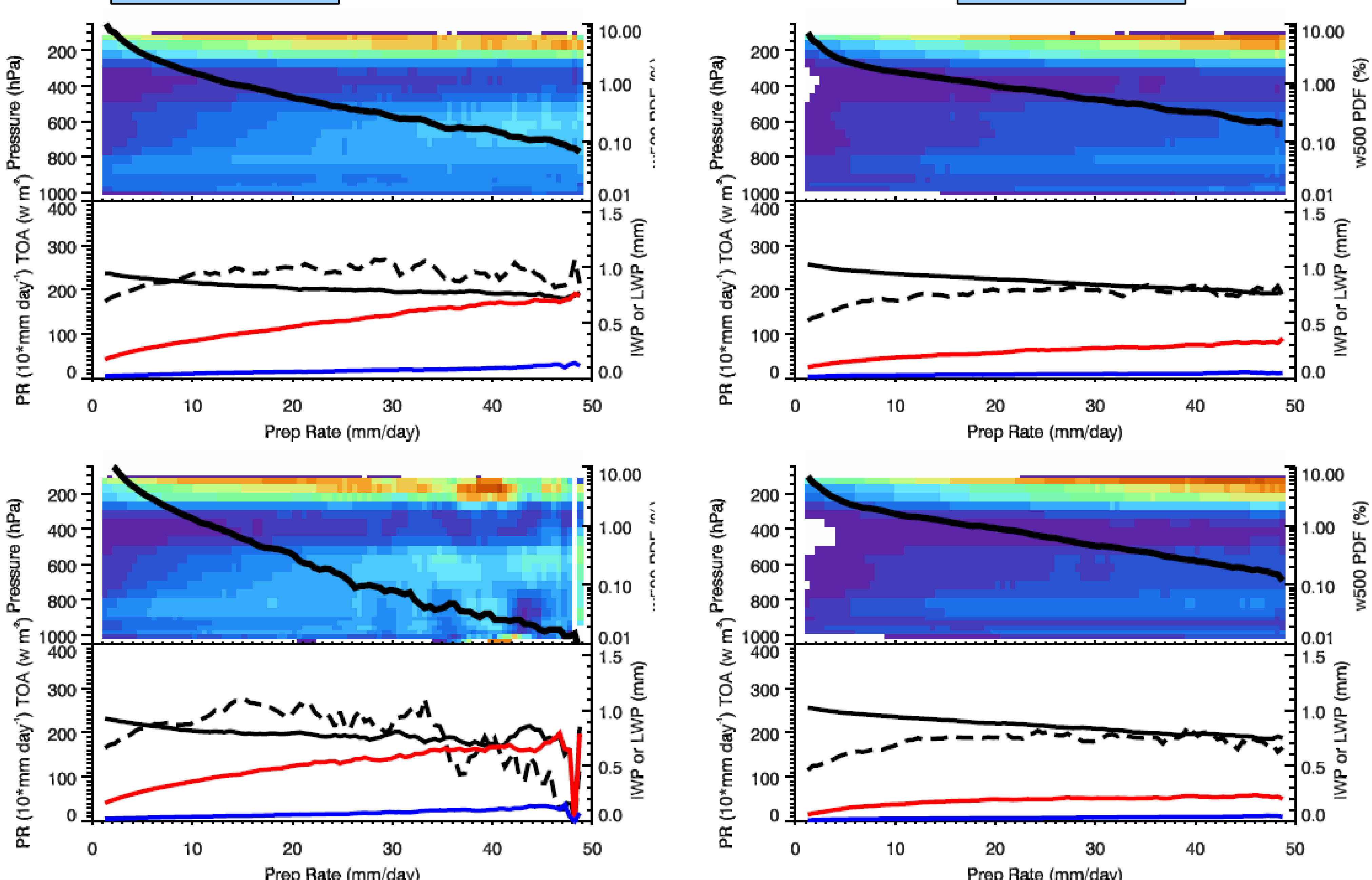


2-degree HIRAM

20-km JMA

Stratiform

convective



60-km JMA

Preliminary conclusions

- *Dry air intrusion is the reason for the suppressed convection from 1/26-2/2. Model cloud fraction and convection are closely related with the simulated dry air intrusion.*
- *Convective precipitation ratio generally decreases with resolution, but it also depends on synoptic regimes and models.*
- *Composite analysis help identify model cloud and precipitation characteristics.*

Can we go one step further beyond just describing the model difference?

- *How to relate model results to model physics, especially for cloud and precipitation?*
- *How does resolution impact cloud and precipitation simulations?*
- *Can we identify any systematic bias, such as diurnal cycle, convection triggering, and vertical heating profiles, etc.?*
- *Any useful analysis to detect relationships at mechanism levels, like some physically meaningful conceptual variables?*

Future work

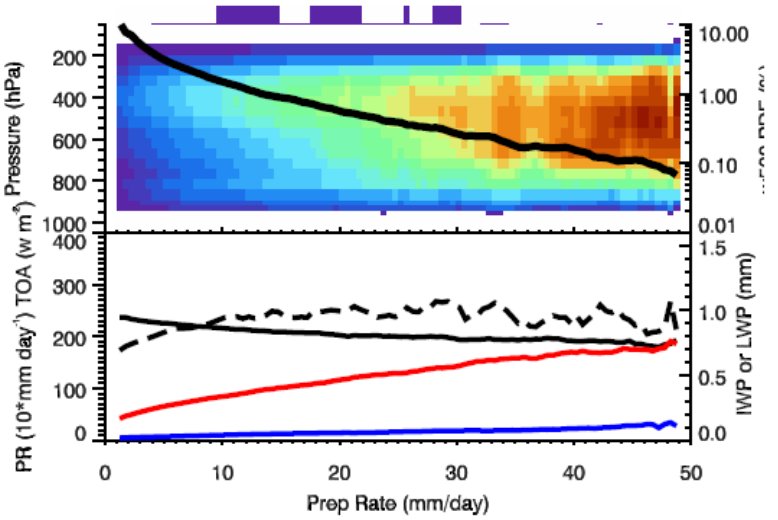
- Determine the theme of the manuscript and prepare the first draft.
- Have comments and suggestions from each participants.

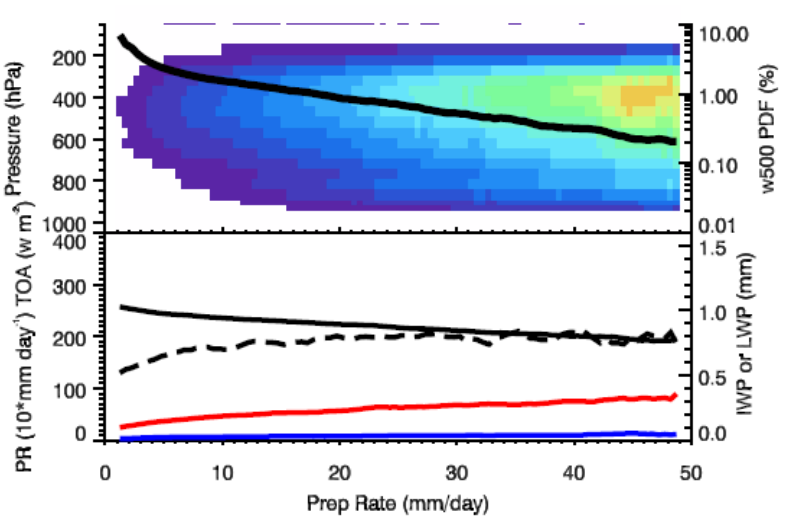
Questions and comments

- *What is the realistic partition between convective and LS precipitation over the tropics?*
- *How do model cloud microphysics, macrophysics, convective parameterization, and PBL schemes interact to affect the model cloud and precipitation?*

JMA 20 km

Q1





Q2