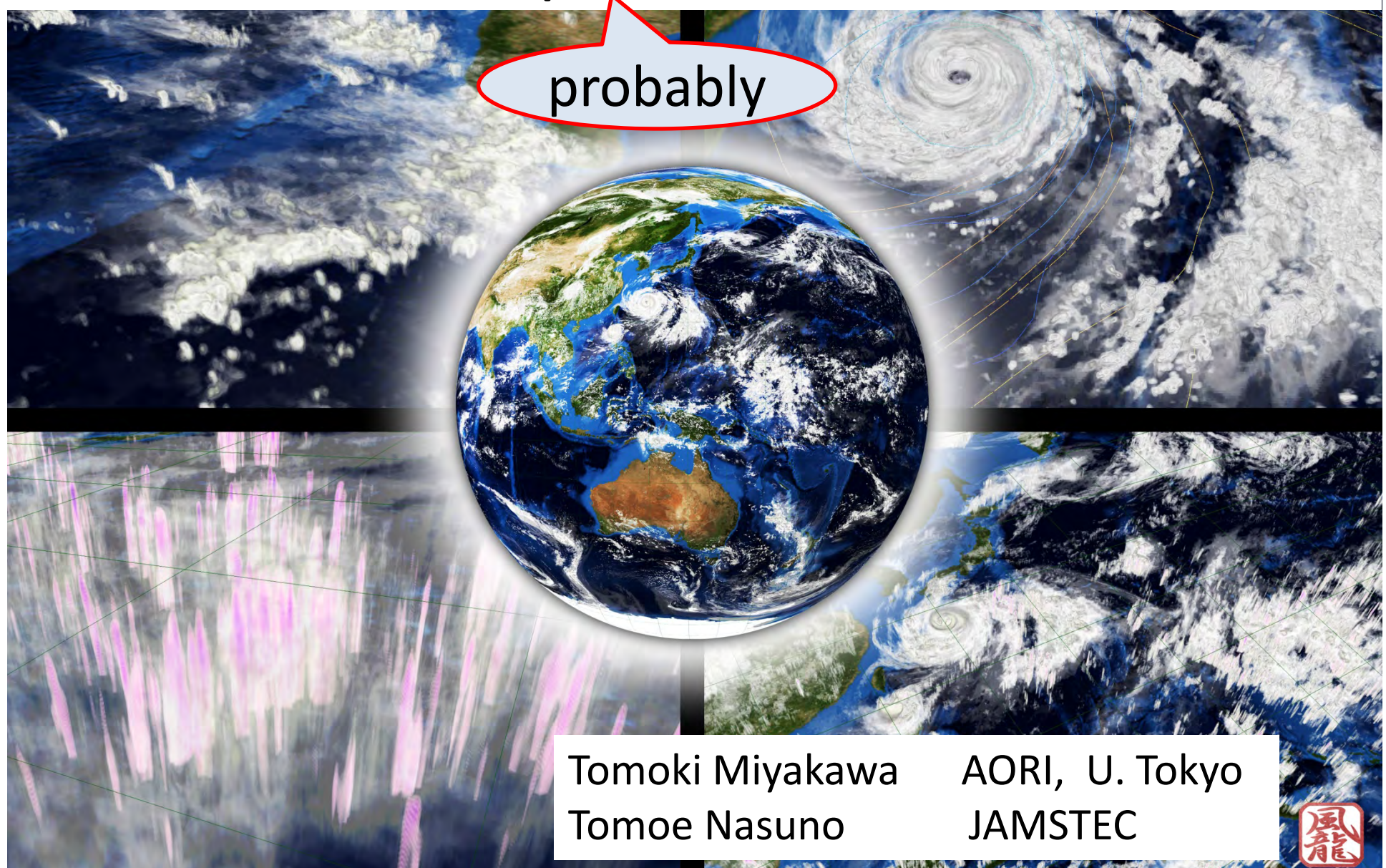


—Global CRM (NICAM)—

What we can provide / what we want



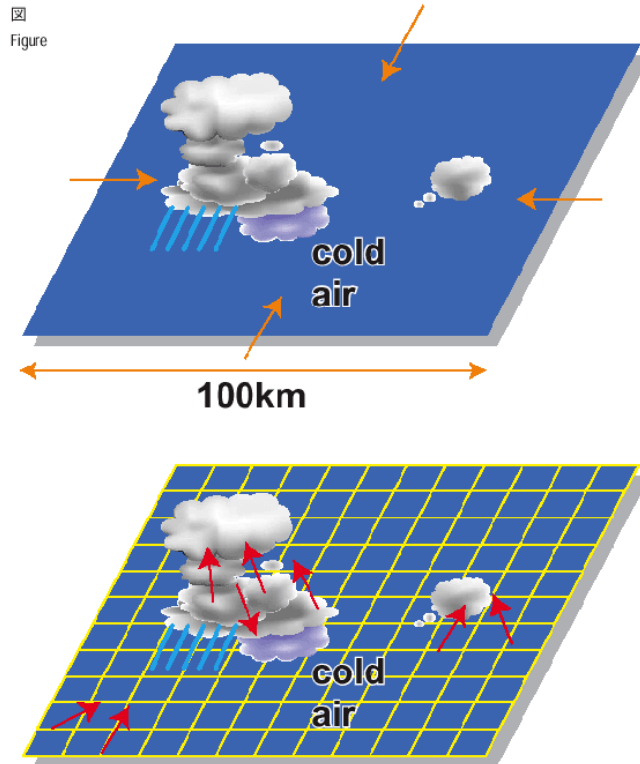
What NICAM can't do

- Remove overestimation of rainfall over the Indian Ocean
 - Climate ensemble simulation
 - Standard statistical tests regarding climatology
 - Produce realistic surface temperature over the Tibetan Plateau
 - Produce realistic mean rainfall to the east of Philippine
 - Tune the model systematically
 - Initial shock free simulations (data assimilation)
 - MJO simulations at resolutions higher than 1.7 km
 - Remove equatorial precipitation bias overly confined to the ITCZ and SPCZ
 - Baiu-prediction
 - Future climate projection
 - Evaluate Model performance at high-resolutions (~ 3.5 km) with standard skill measures
 - Predictions run at sub-kilometer resolutions
 - Predict rapid intensification of TCs
 - Apply realistic ice sheets that interact with ocean
 - Simulations that include chemical transactions
 - Prognostic aerosols
 - Flood simulations
 - Reliable snowfall prediction
 - Reliable short-term rain intensity prediction
 - Produce convective cell intervals unaffected by model resolution
 - Produce shallow clouds
 - Produce enough congestus heating
 - Remove overestimation of zonal winds
 - Send full 3-D dataset at the original resolution to you on-line
- and so on

Nonhydrostatic Icosahedral Atmospheric Model (NICAM)

Satoh et al. (2008, 2014)

[Group web page http://nicam.jp](http://nicam.jp)



➤ “cloud system resolving”

- global **14 km - 3.5 km** mesh

Tomita et al.(2005), Miura et al.(2007)

Miyakawa et al. (2014)

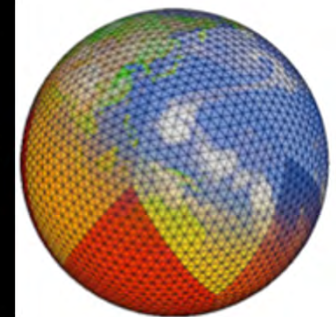
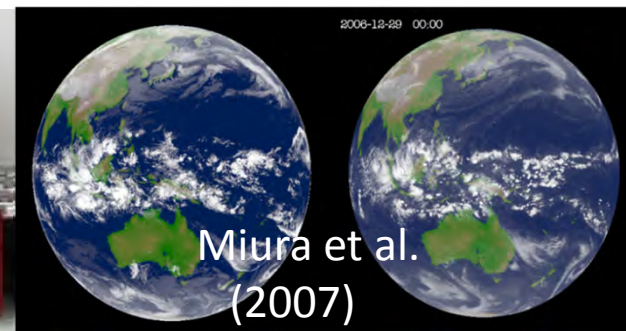
➤ “cloud-resolving”

- global **870 m** mesh

Miyamoto et al. (2013, GRL)

➤ “cloud-un-resolving”

- global **220 km – 28 km** mesh
- Turn on/off cumulus parameterization

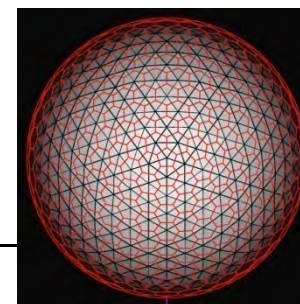


NICAM

Satoh et al. (2008, 2014)

■ Dynamics

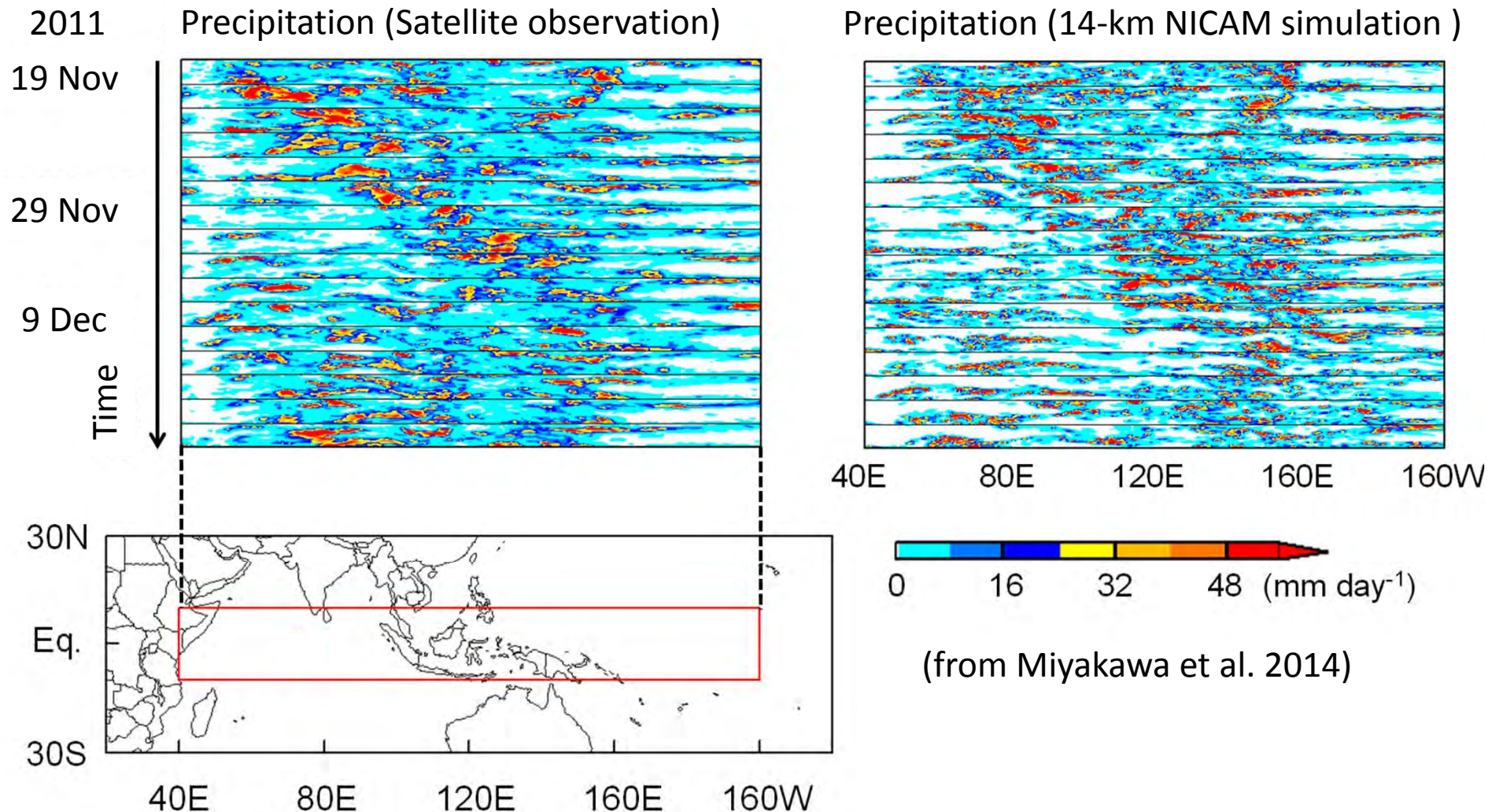
governing equations	Fully compressible non-hydrostatic system
spatial discretization	Finite Volume Method
horizontal grid	Icosahedral grid (Tomita et al. 2001, 2002)
vertical grid	Lorenz grid
topography	Terrain-following coordinate
conservation	Total mass, total energy Satoh (2002, 2003)
temporal scheme	Slow mode — explicit scheme (RK2, RK3) Fast mode — Horizontal Explicit Vertical Implicit scheme



■ Physics

radiation	MSTRNX / MSTRNX-AR5 (Sekiguchi and Nakajima, 2008)
cloud physics	Grabowski(1998); NSW6(Tomita 2008) ; NDW6(Seiki et al 2013)
shallow clouds	MY level 2 (Mellor and Yamada 1982; Noda et al. 2010) or
boundary layer	MYNN level 2.5 or 3 (Nakanishi and Niino 2006)
surface flux	Louis(1979), Uno et al.(1995)
Land surface processes	Bucket or MATSIRO
Ocean	Specified sst or mixed-layer slab ocean or COCO (full ocean)

1) Real MJO case: Hindcast of CINDY2011/DYNAMO MJO event



NICAM produces nice MJO if we are fairly lucky... but, we don't know if it is interacting with MC realistically or not.

2) Diurnal cycle

global 3.5km NICAM

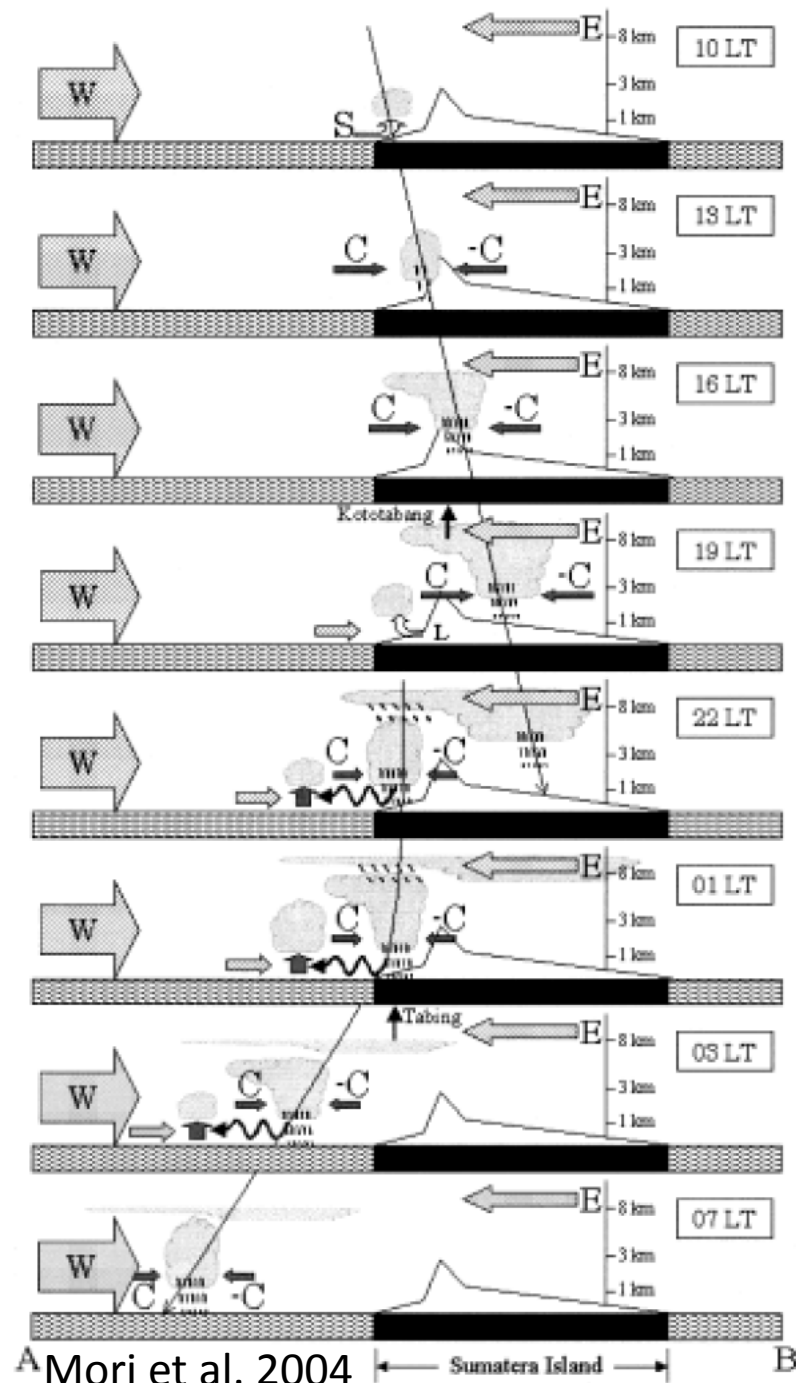
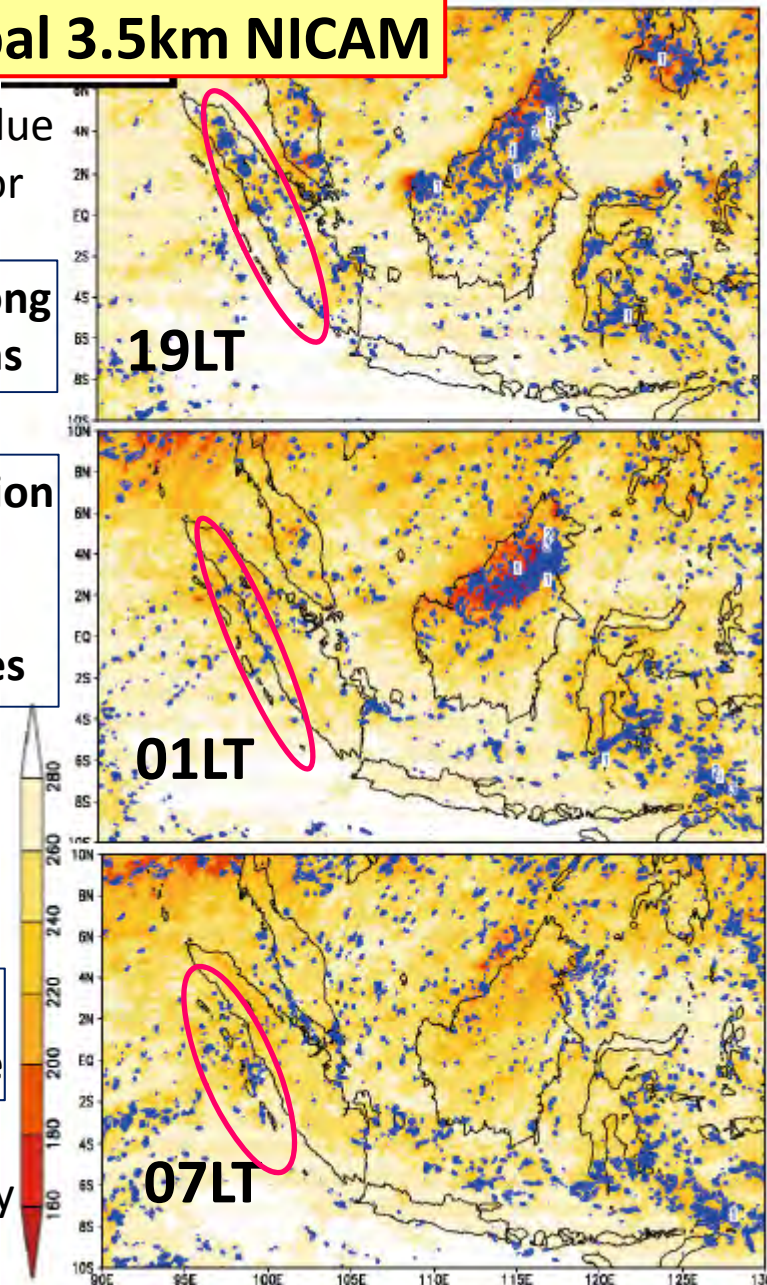
Precip: blue
OLR: color

Precip along
Mountains

Propagation
toward
Inland /
Coast lines

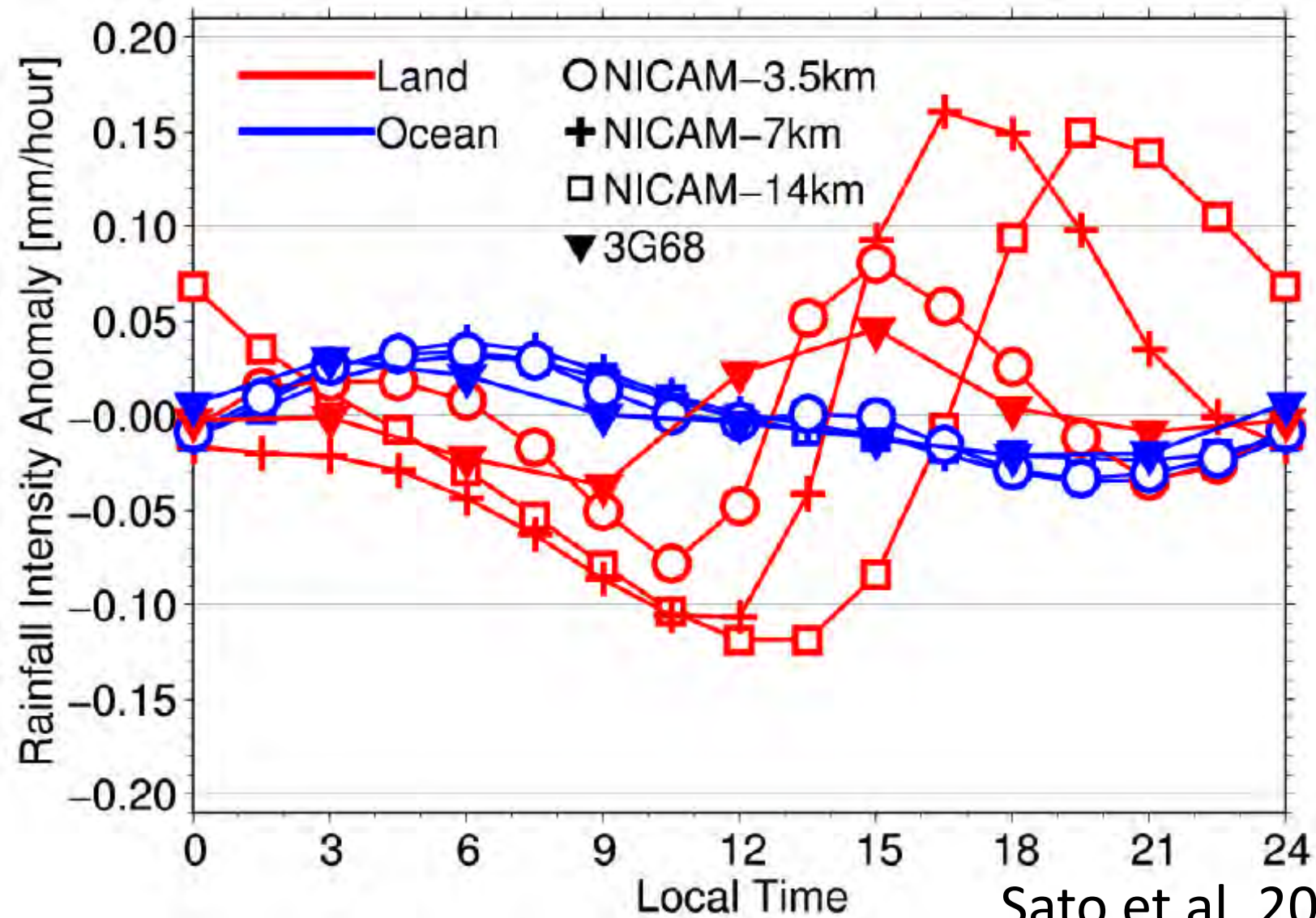
Precip
offshore

Analysis by
M. Fujita



A Mori et al. 2004

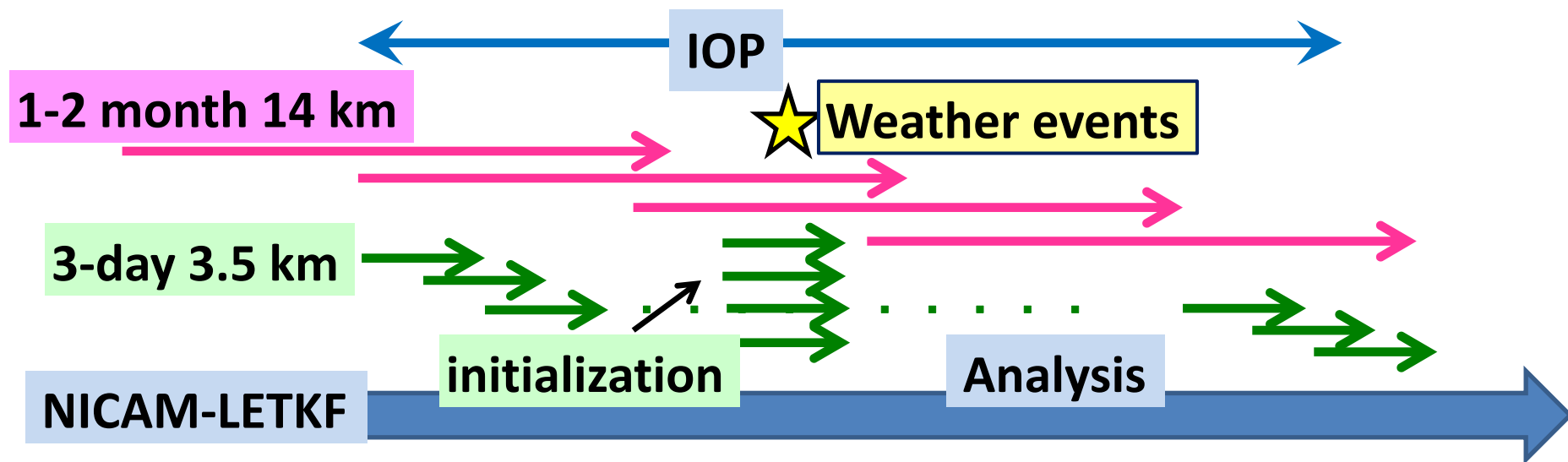
2) Diurnal cycle



3.5 km NICAM might have somewhat realistic diurnal cycles in the MC region

NICAM (tentative) plan for YMC

1. 1~2 month ensemble simulation (~14 km, 20 members)
2. 3-day simulation (3.5 km)
3. Data Assimilation (NICAM-LETKF; developing@Riken)



+

4. Science fiction simulations

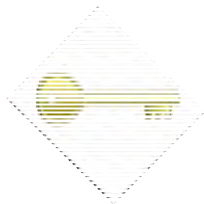
- Data to be shared for field operations and research use.

Can be provided:

- Consistent 3-D dataset (probably at 14 km)
- A bit of entertainment
 - Daily 3.5 km 3-day predictions during the IOP to boo/hurrah at.
 - Idealized experiments (removal of MC, etc.)

Wanted:

- Feedbacks
 - Tell us in what way the model failed.
... preferably with implications of why.
(missing process?)



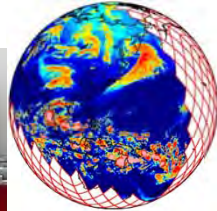
diurnal cycles/ offshore travelling systems

Conceptual illustration of an ideal real-time observation-modeling collaboration

Earth simulator
K computer



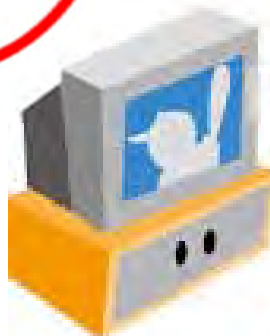
NICAM



3.5 km 3 days
14 km 30 days



Haha, model missed this
squall line!
Underestimating graupel?



みらい

Ship or island

