NICAM simulation plan for CINDY/DYNAMO project

T. Nasuno
NICAM group, RIGC, JAMSTEC
Group session CINDY/DYNAMO Workshop
8 November 2010

NICAM simulations targeting field campaign

1. MISMO（Miura et al. 2009; Katsumata et al. 2010）1-month hindcast

   Mirai Indian Ocean cruise fo r study of the MJO-convection Onset

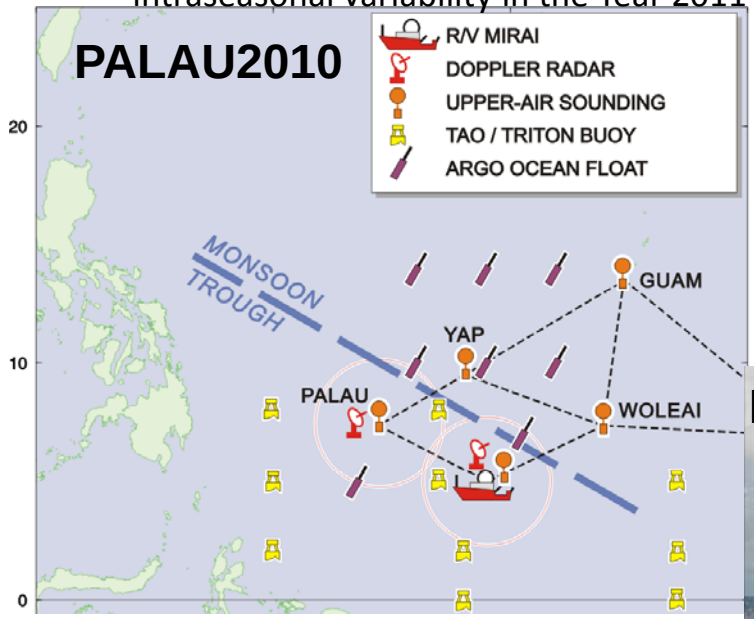
2. PALAU2008 (cyclogenesis event) 10-days hindcast (3.5km mesh)

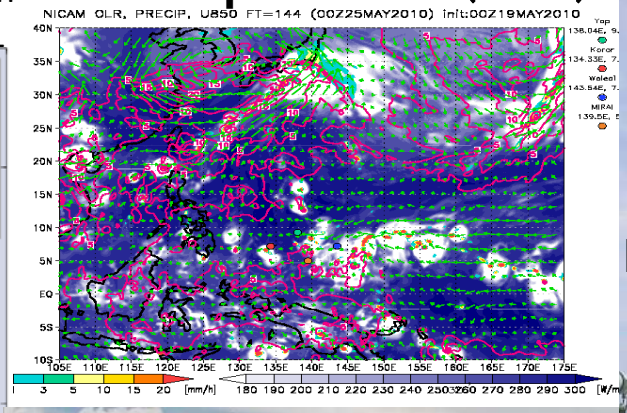
   Pacific Area Long-term Atmospheric observation for Understanding of Climate Change

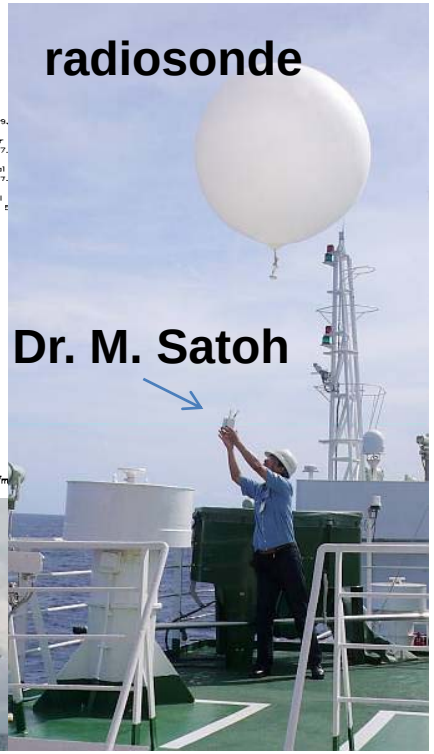
3. PALAU2010 (2010/5/6-6/20) near-realtime prediction using NICAM (regionally stretched grid) → Mirai (e-mail), web

4. **CINDY2011/DYNAMO**

   Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011

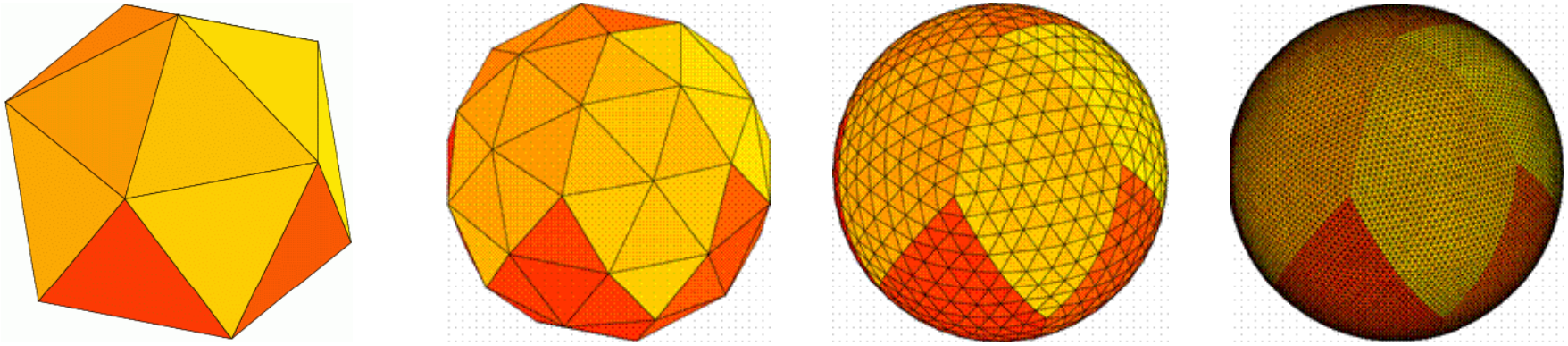




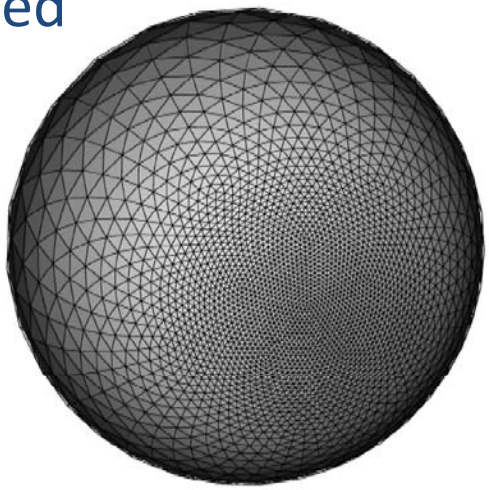


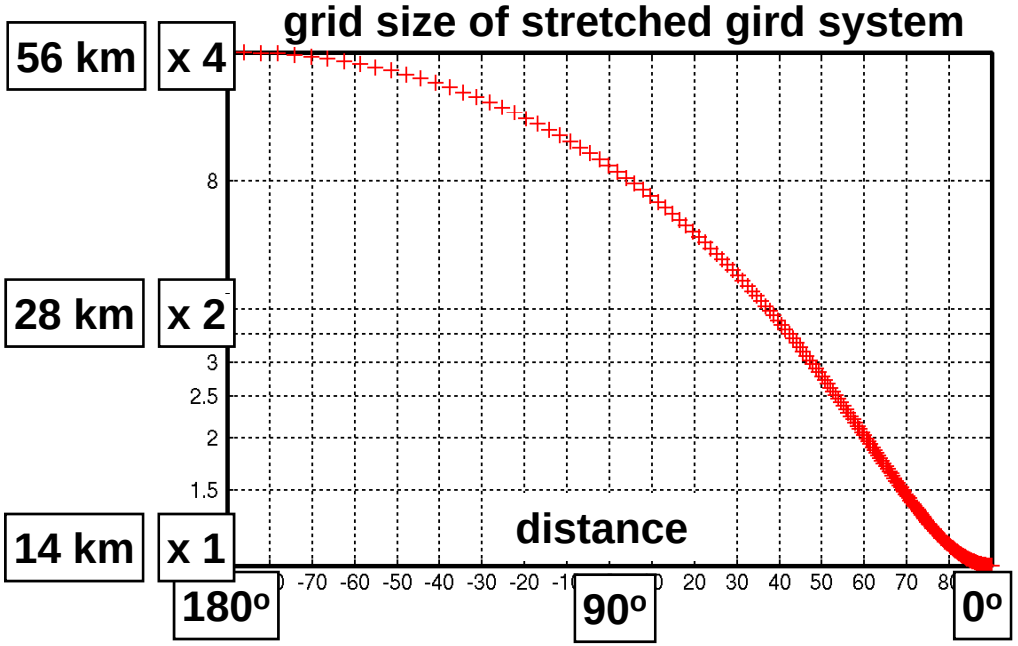
Non-hydrostatic ICosahedral Atmospheric Model (NICAM)

Icosahedra glevel-1 glevel-3 glevel-5



Stretched grid





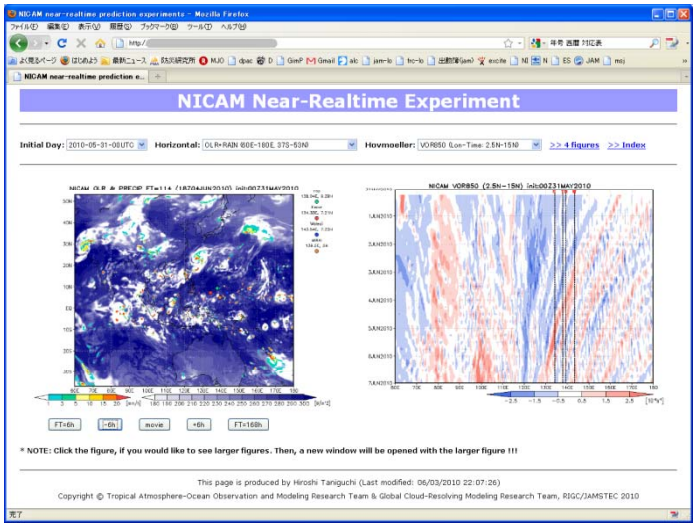
Outline of 1-week prediction system with stretch NICAM

by H.Taniguchi

initial data (ATM, LND, OCN) at 00UTC
NCEP/FNL (http://dss.ucar.edu/datasets/ds083.2/)

wget at 19:00 on the day

After 2days data available



1. make initial state (ATM, LND, OCN) for NICAM grids system
2. make ocean data for nudging
3. make configuration file for the run with above initial state
4. start run (7-days integ., MAT+Mix-Ocn+MY2Moist, 14km, 136E-8N)
   - multi-level: every 3hr (snapshot)
     - u, v, w, t, p, rho, qv, dh
   - single-level: every 1hr (average)
     - cldi, cldw, evap, olr, q2m, qr, slp, t2m,
     - t_sfc, tppn, u10m, v10m vap_atm

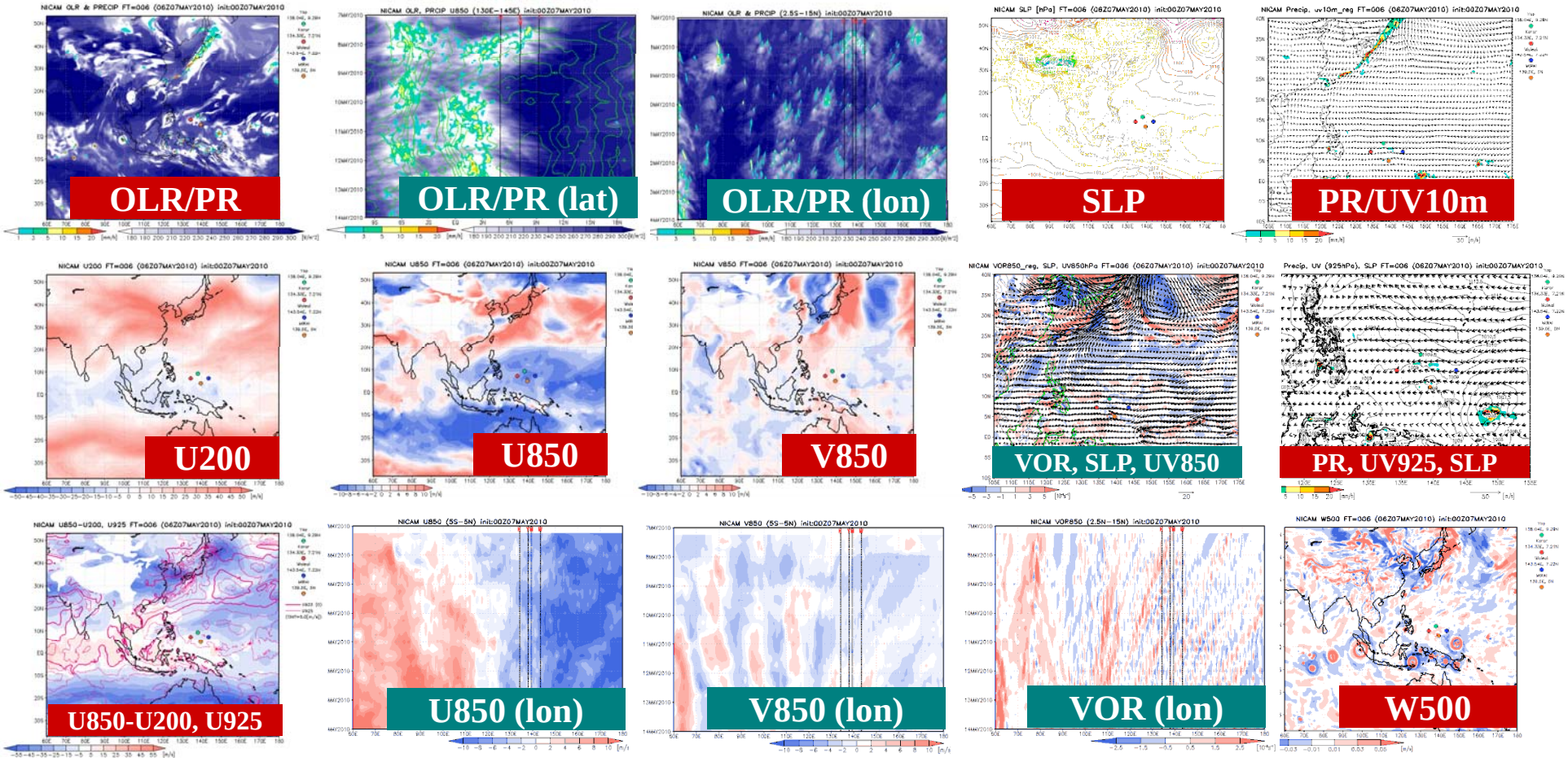
calc. time:1.7 days

near-realtime prediction with stretch NICAM for PALAU2010

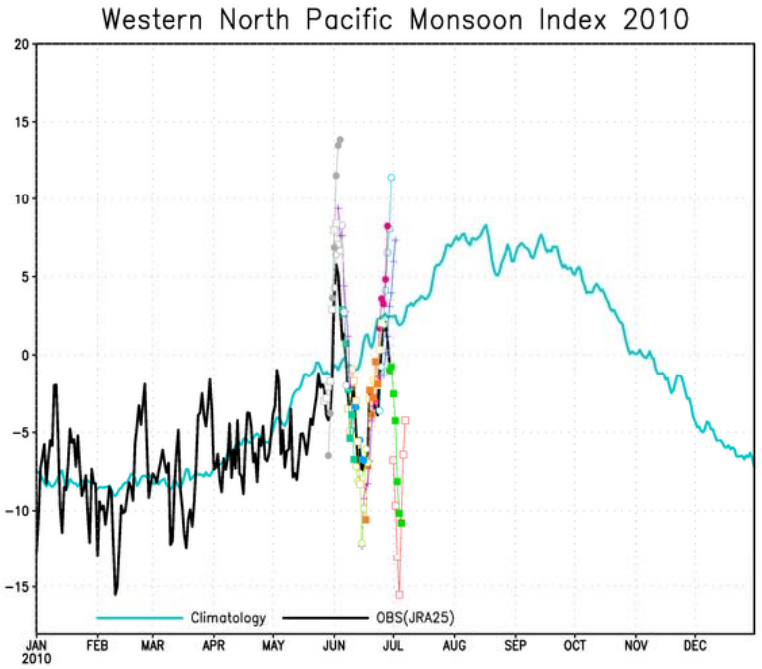
23 Apr. to 30 Jun (26 simulations), 3 times / week

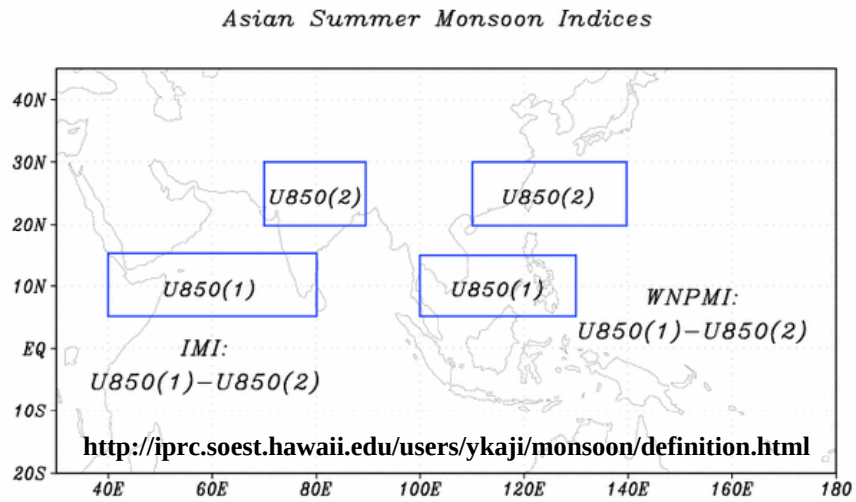
Images sent to Mirai via e-mail

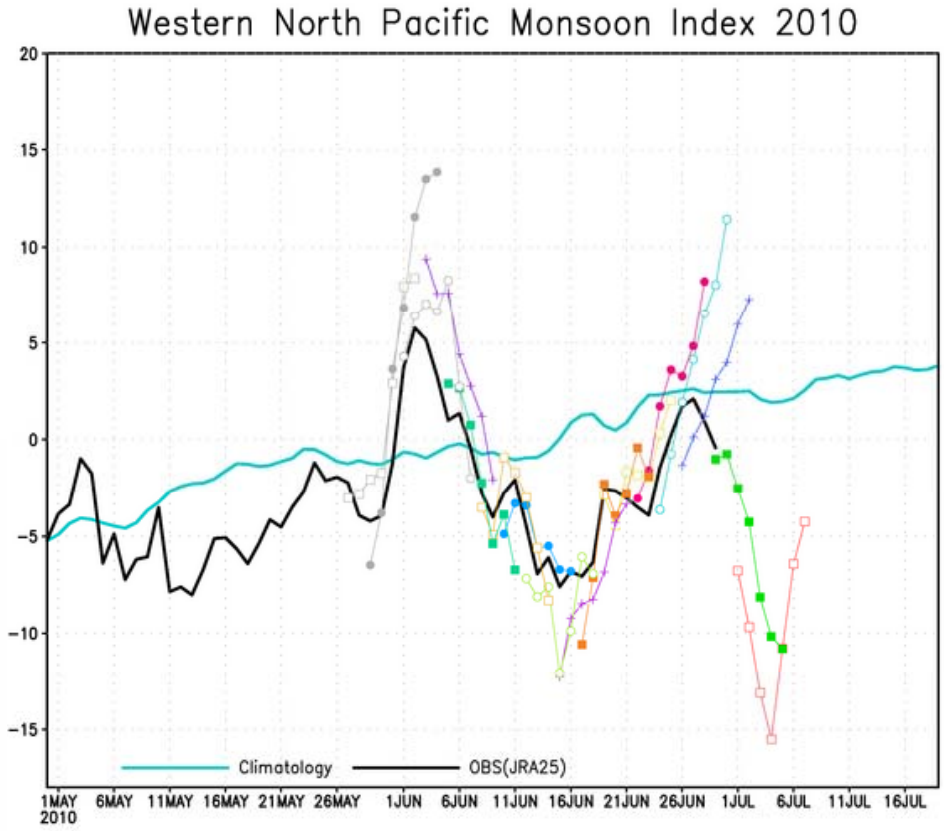
http://www.nicam.jp/realtime/ → web (internal access)

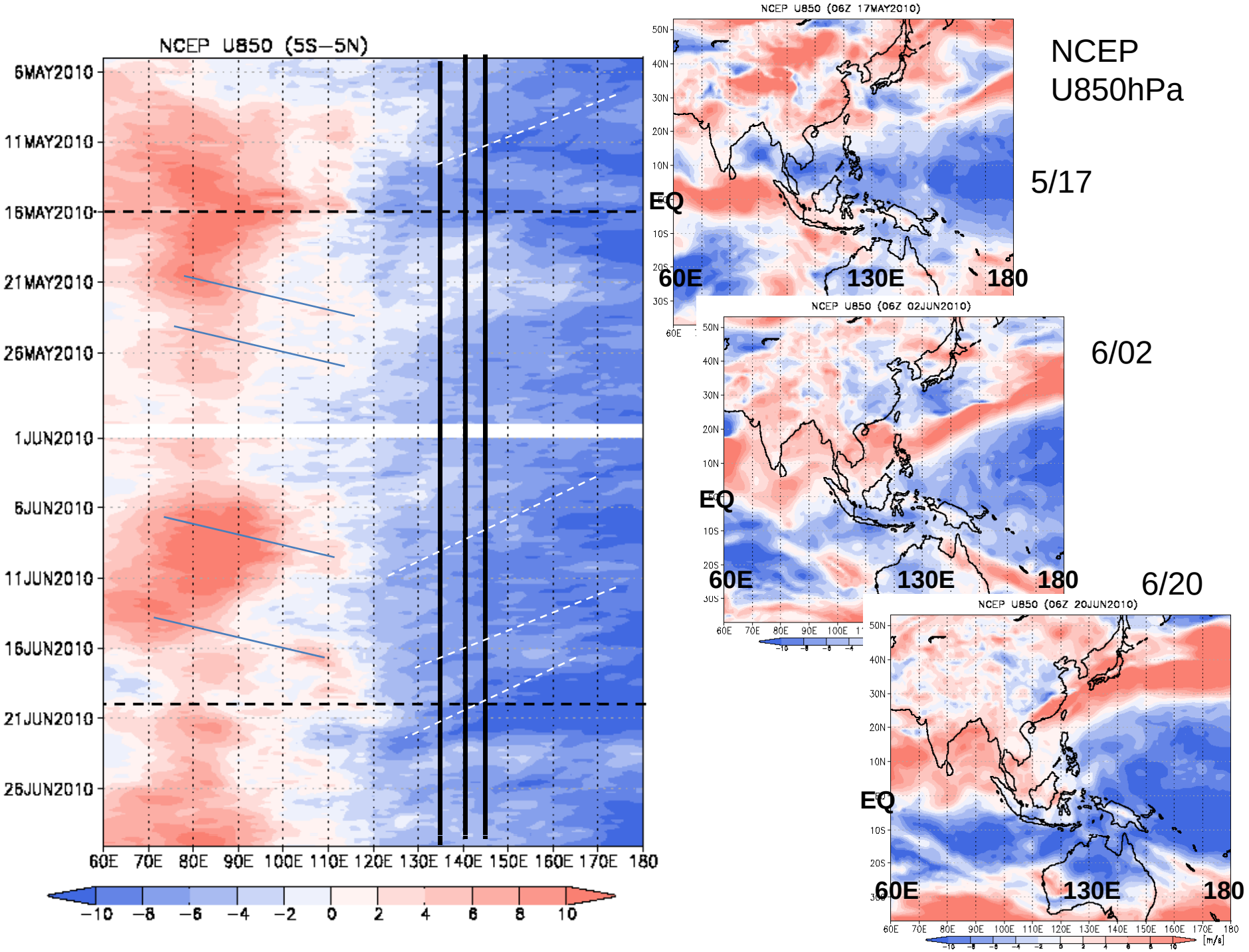


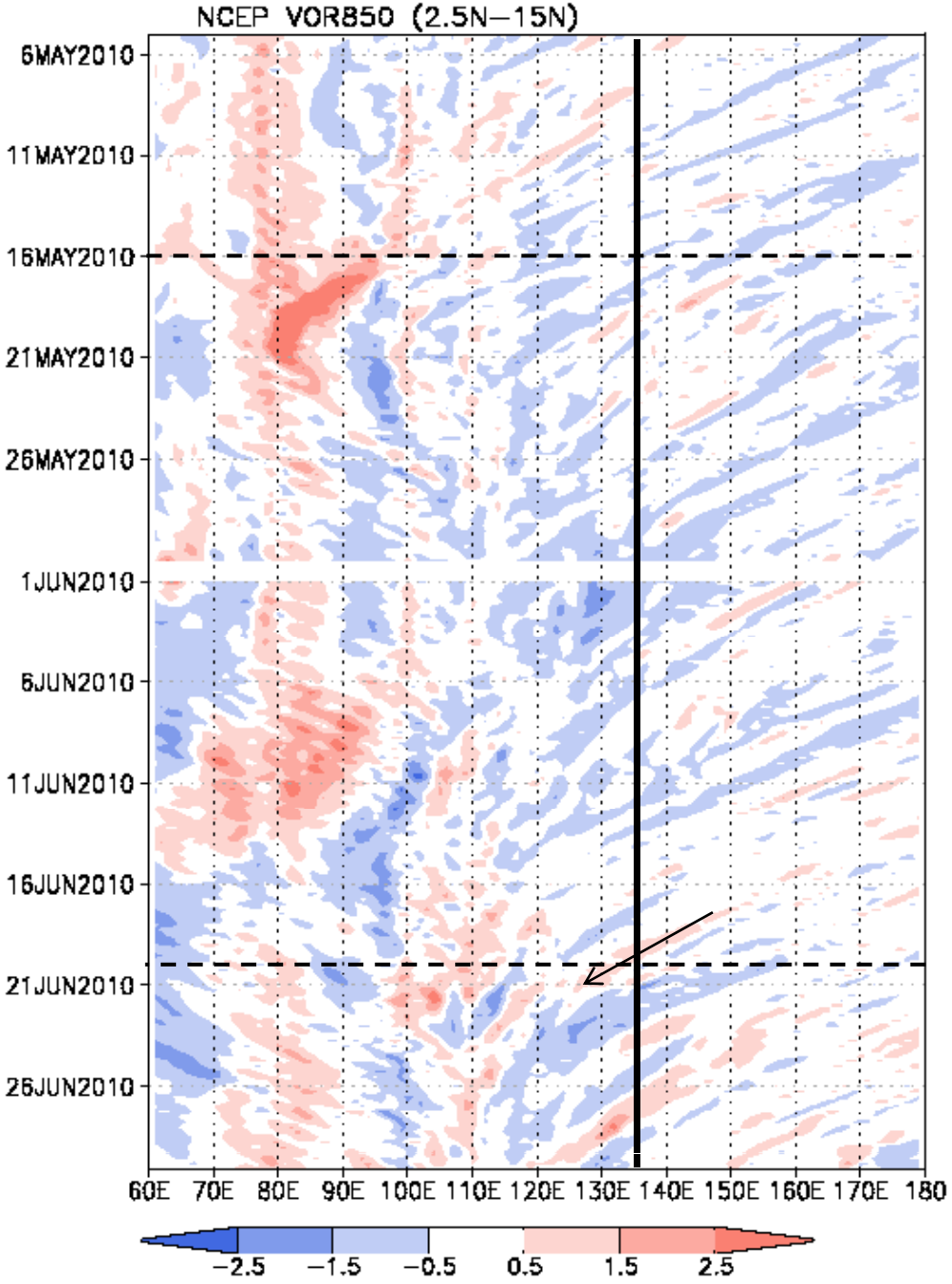
Experimental prediction of WNPM index



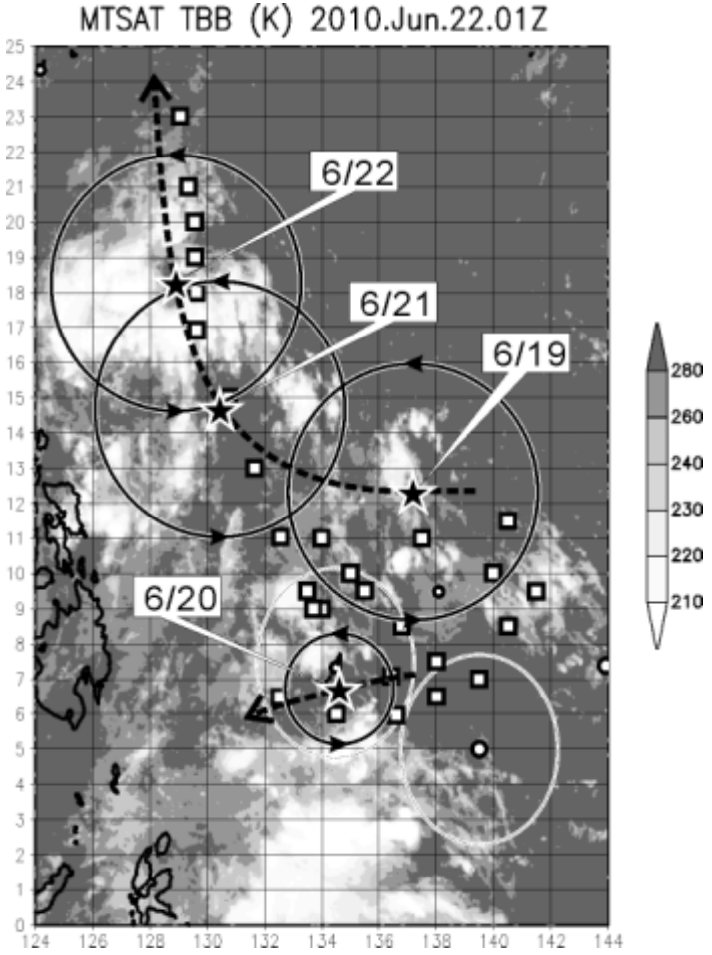





NCEP U850 (5S–5N)
6MAY2010
11MAY2010
16MAY2010
21MAY2010
26MAY2010
1JUN2010
6JUN2010
11JUN2010
16JUN2010
21JUN2010
26JUN2010
60E 70E 80E 90E 100E 110E 120E 130E 140E 150E 160E 170E 180
−10 −8 −6 −4 −2 0 2 4 6 8 10
NCEP U850 (06Z 17MAY2010)
EQ
60E
130E
180
5/17
NCEP U850 (06Z 02JUN2010)
EQ
60E
130E
180
6/02
NCEP U850 (06Z 20JUN2010)
EQ
60E
130E
180
6/20
NCEP
U850hPa



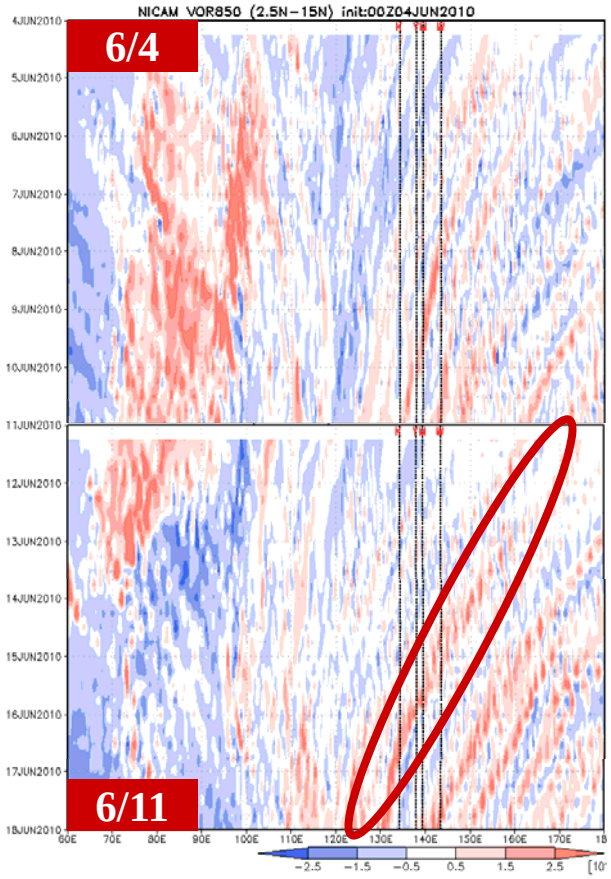
Route of aircraft observation

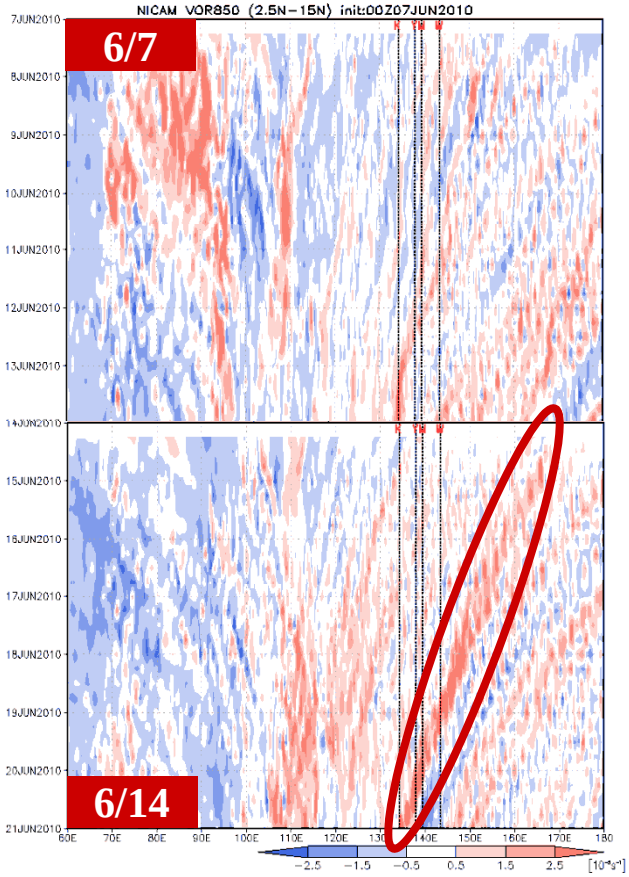


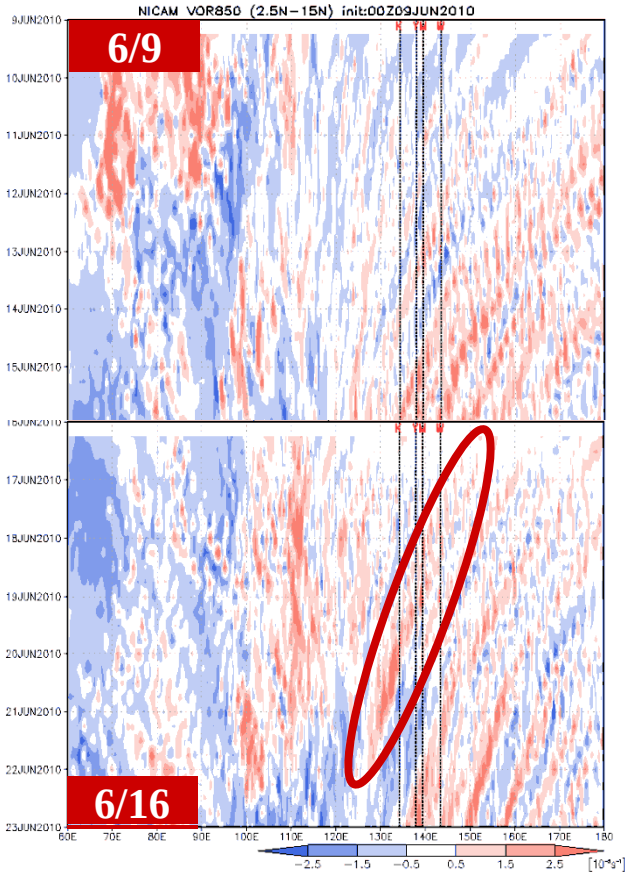
Moteki et al.

NICAM forecasts are used for decision of final flight plan.

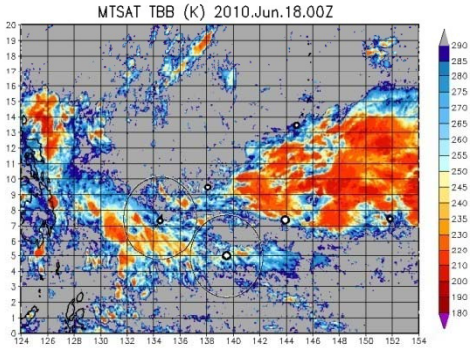
Vorticity (850hPa)

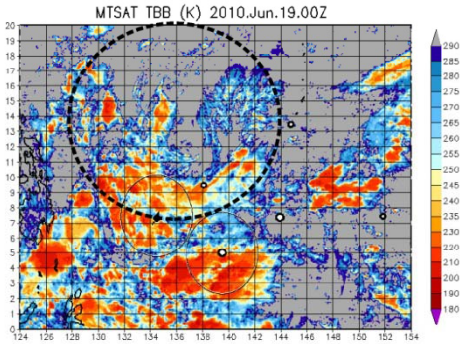


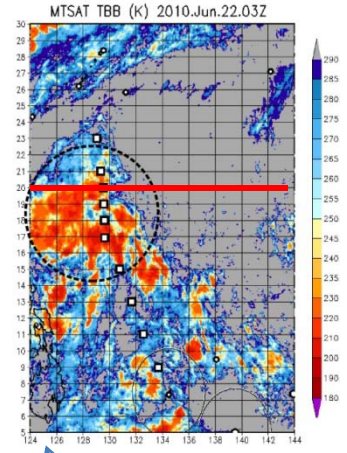




NICAM forecasts are used for decision of final flight plan.

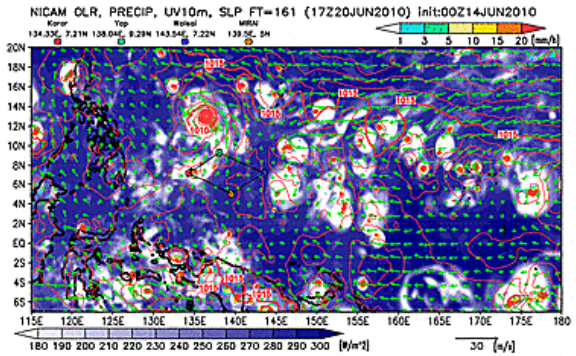


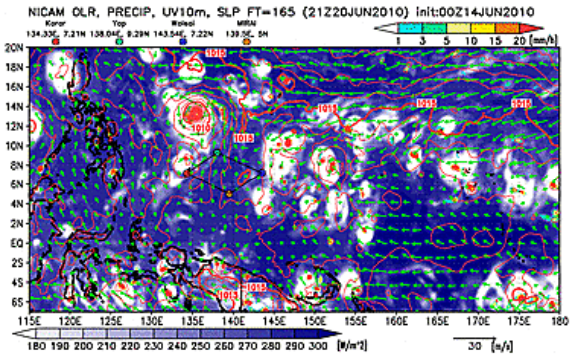


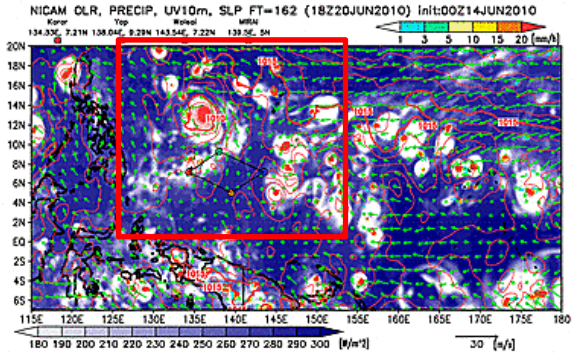


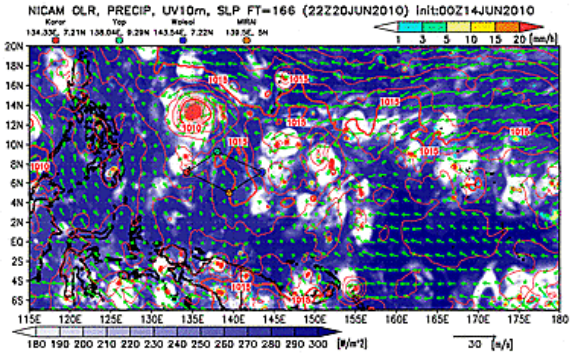
Moteki & Taniguchi

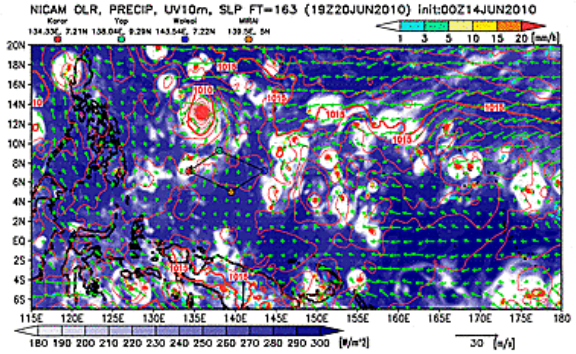
Observed and simulated convective vortices

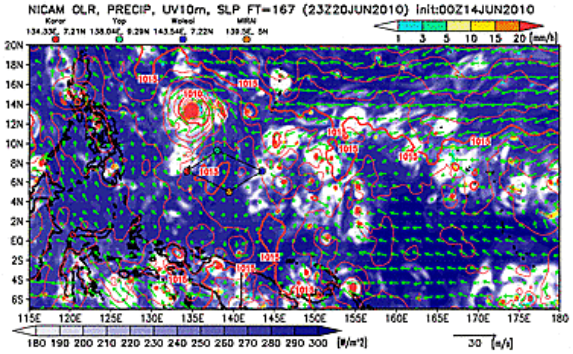


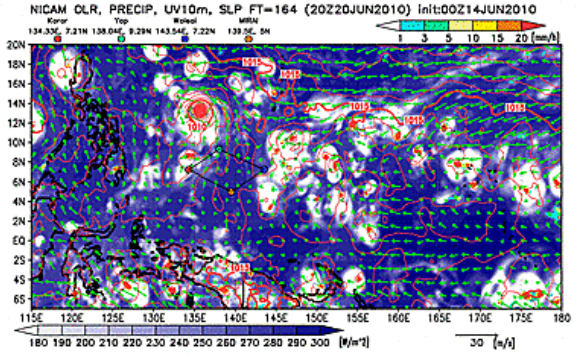


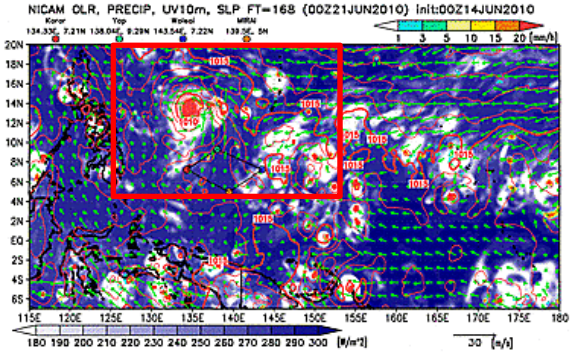












NICAM simulation (tentative plan)

1. Near-realtime prediction with regionally stretched NICAM
   operation: Oct. – Nov. 2011 → Mirai (e-mail), web (internal access)
   option: Sep., Dec. 2011, Jan.-Feb. 2012 → web (internal access)
   14~28km mesh in 90deg x 90 deg domain (center: 80E, 8S)
   7-days integration (5-days prediction)
   3 times / week (Wed., Fri., Sun.) → every day ??
2. Hindcast with full (global) NICAM (mainly conducted after IOP)
   1-2 month run with 14 km
   (Oct. – Nov. 2011 and/or prominent event)
   → 7 km mesh run (hopefully …, ES resource approval, Mar. 2012)
   option: 1-2 month run with 14-km mesh (~20 sets)
   2 or 3 week intervals / 5 ensemble run x 4 periods

* Initialization, validation using WRF reanalysis data (in collaboration with Prof. Li)

NICAM simulation data policy (tentative plan)

1. near-realtime prediction (Image)

   web access permission to CINDY/DYNAMO members during IOP

   → syncronize with NCEP/CPC ? (MJO diagnostics uninstalled)

2. near-realtime prediction (simulation data) → > 12TB in total

   available via order form within a year (contact: T. Nasuno)

   data lists and sample data will be provided on CINDY web site

3. Global (full) NICAM hindcast (simulation data)

   available datasets will be announced to CINDY/DYNAMO members

   (It takes ~ a year to finish hindcasts, a few month for QC)

   data will be opened to collaborators by individual negotiation

   (contact: T. Nasuno)

Near-realtime prediction
Test run for CINDY/DYNAMO Campaign

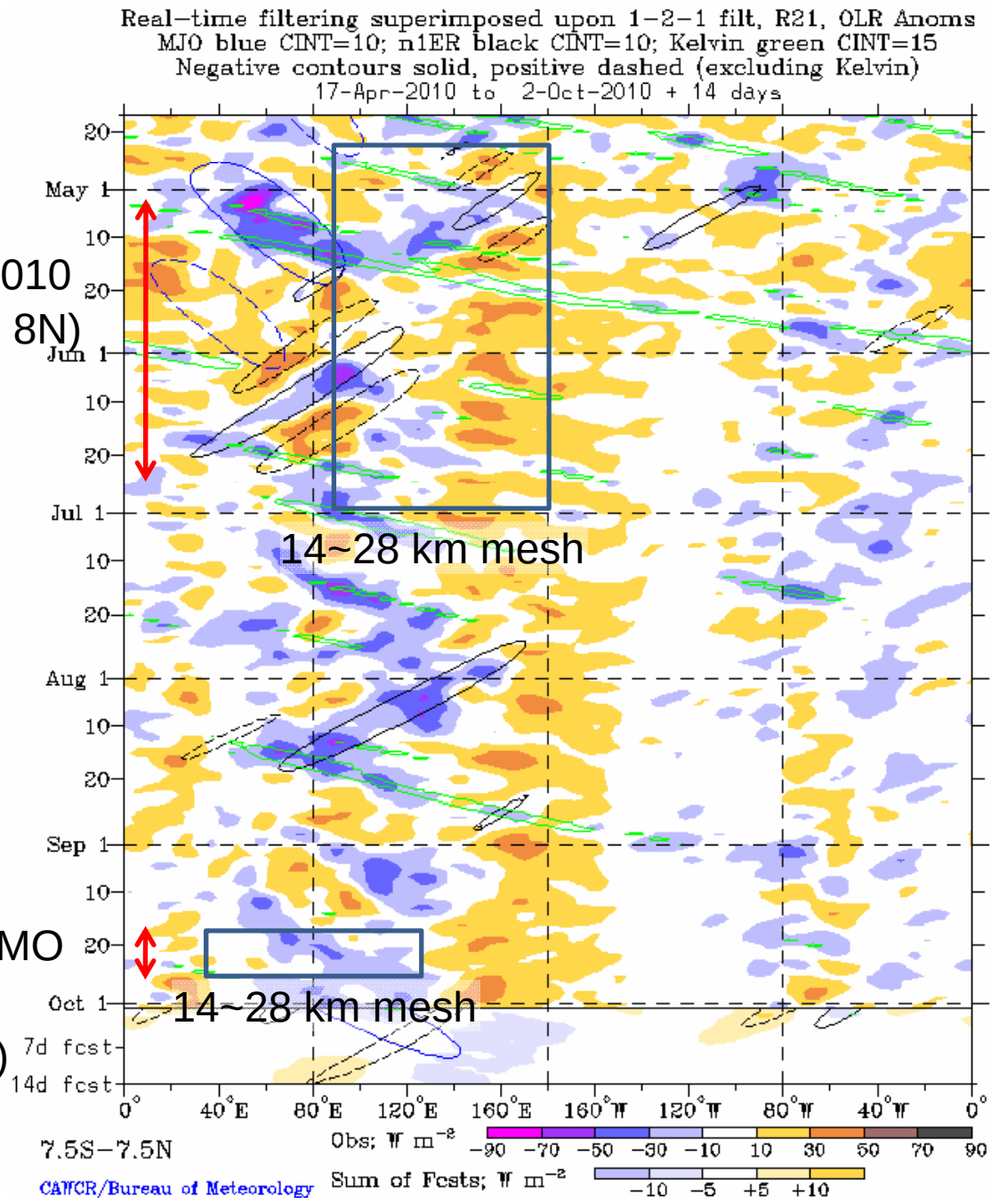
Initial: 2010/09/18 00UTC

NCEP FNL → stretch NICAM (interpolation)

14~28 km mesh, 7 days integration

PALAU2010
MIRAI (136E, 8N)

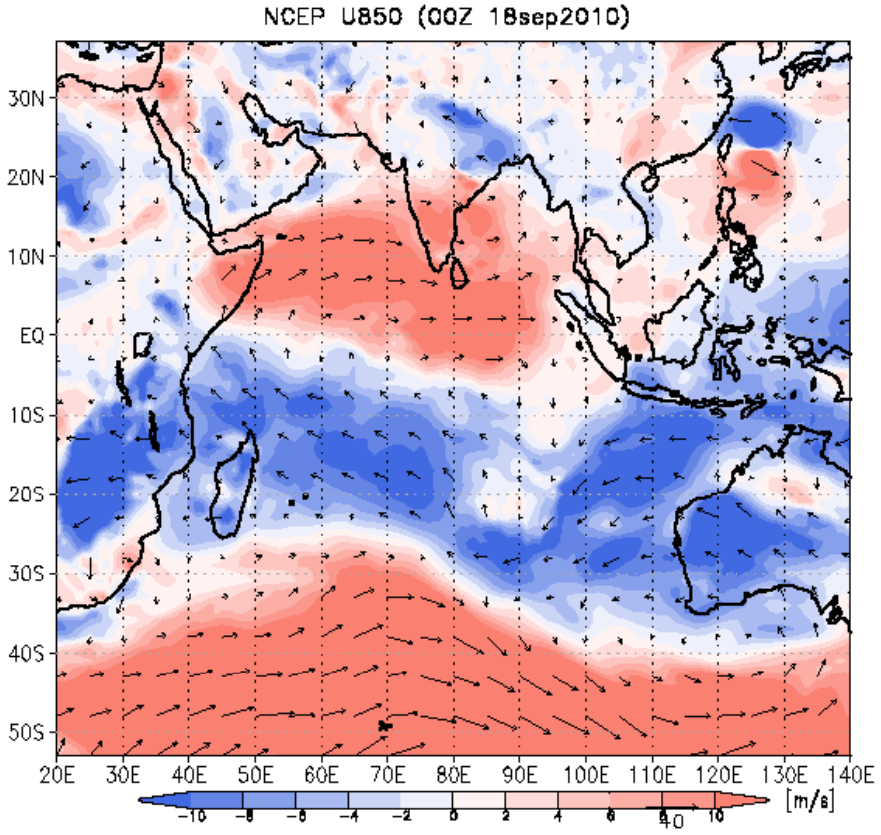
Test run for
CINDY/DYNAMO
18-25 Sep.
MIRAI (80E, 8S)



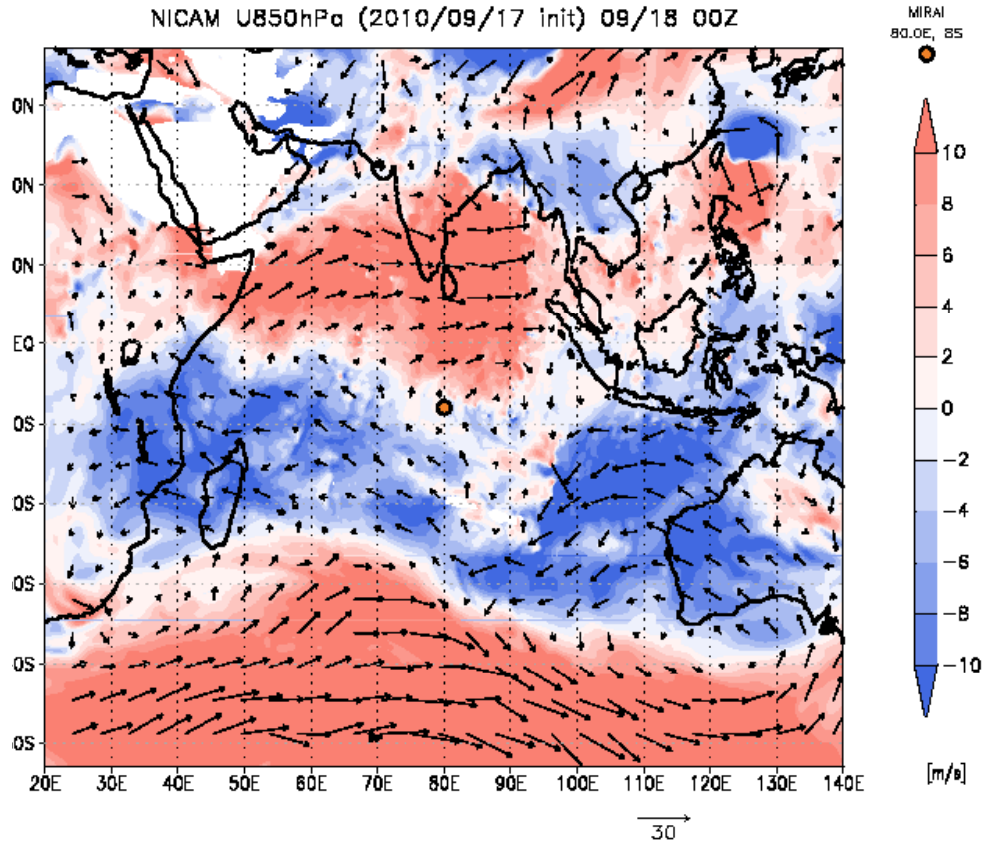
http://cawcr.gov.au/bmrc/clfor/cfstaff/matw/maproom/OLR_modes/h.6.ALL.N.html

U850hPa 9/18 (+1day)

NCEP



NICAM

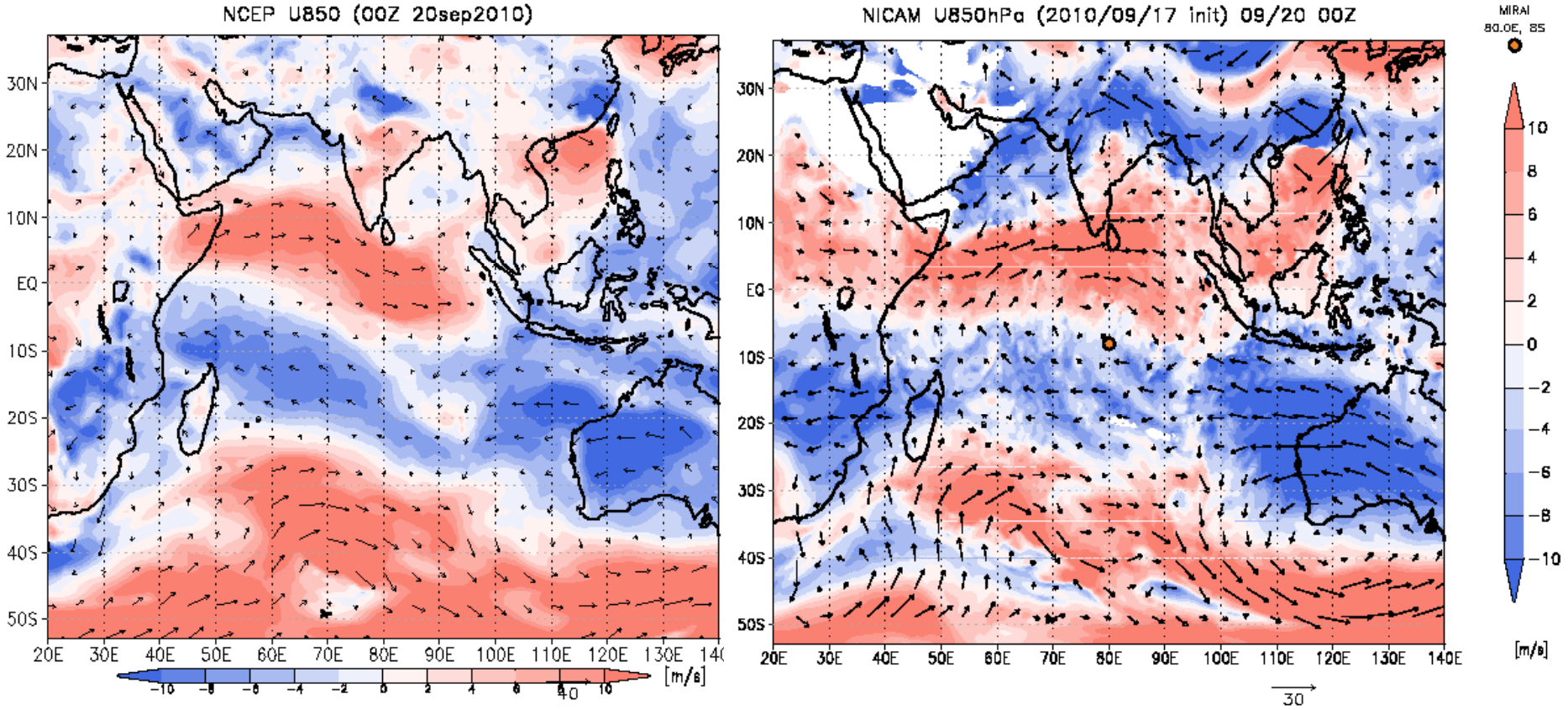


U850hPa

9/20 (+3day)

NCEP

NICAM

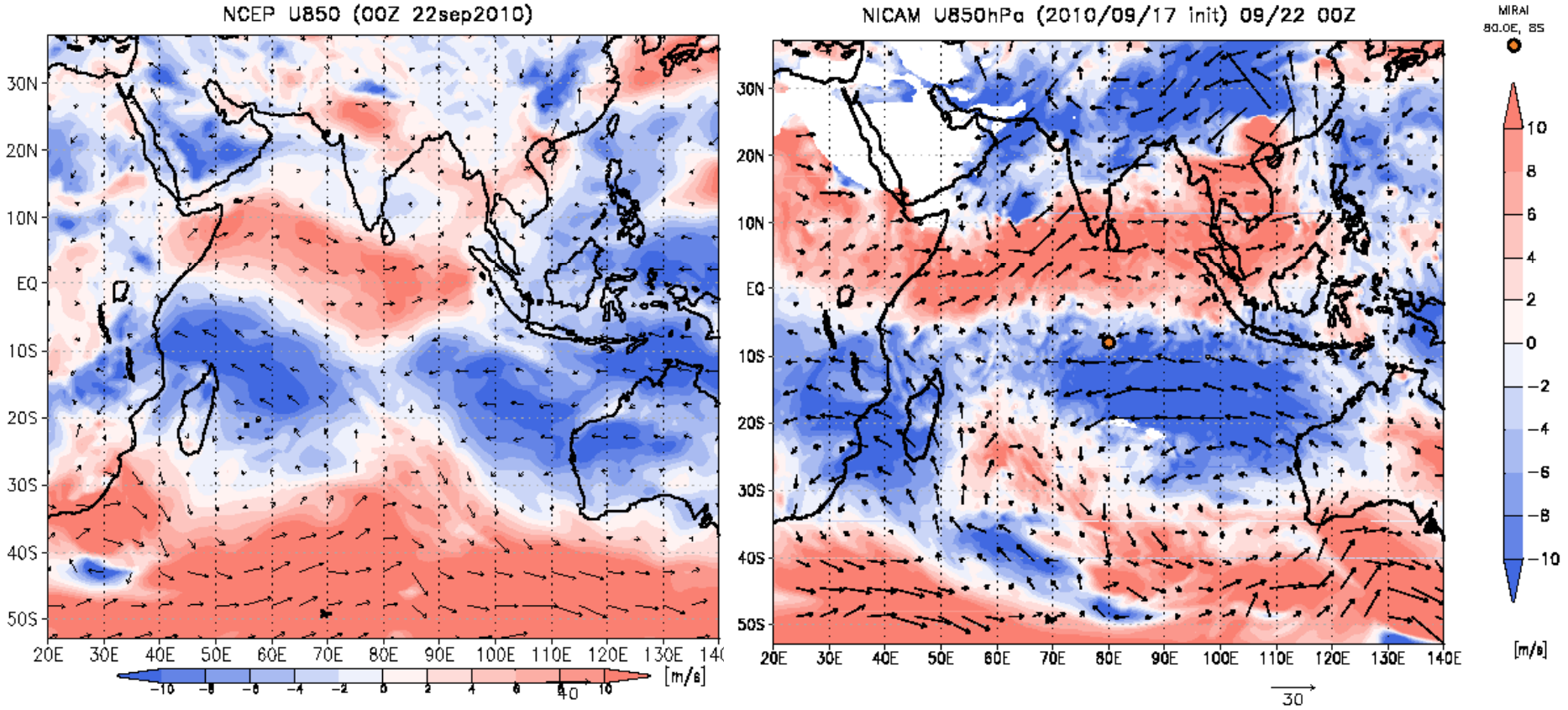


U850hPa

9/22 (+5day)

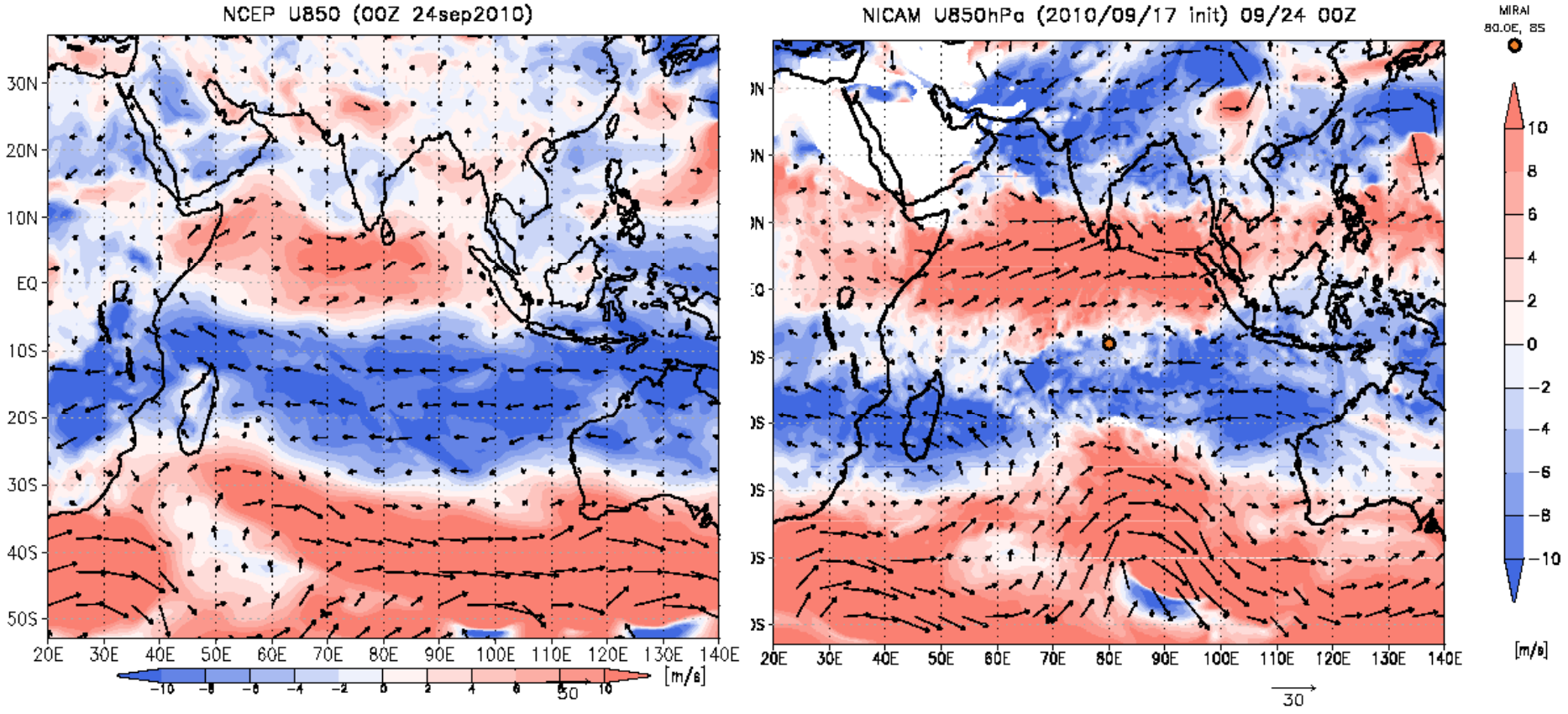
NCEP

NICAM



U850hPa 9/24 (+7day)

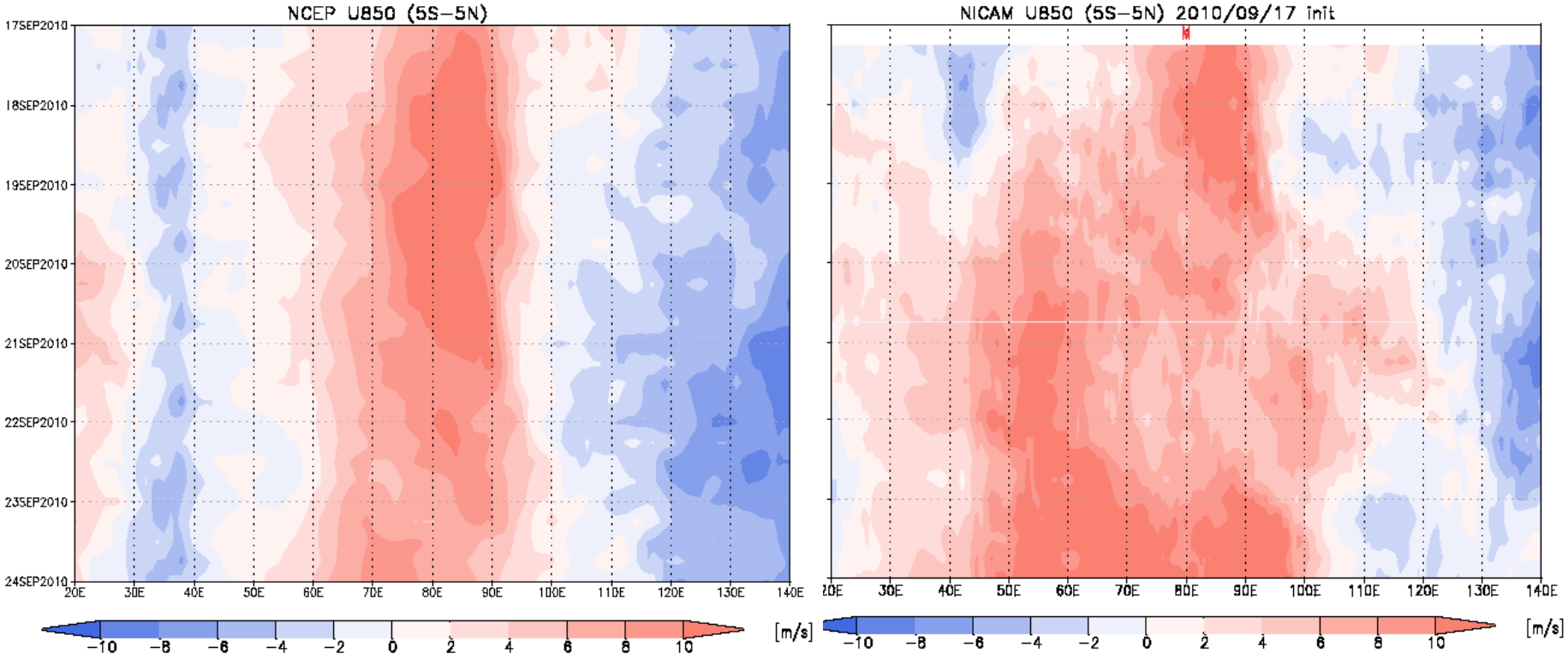
NCEP NICAM



NCEP

U850hPa (5N-5S)

NICAM



Need to validate and improve model performance

- Participation to reforecast of MISMO ?

  (DYNAMO workshop summary Appendix C)

  MISMO hindcast 7km, 14km (Miura et al. 2009)
- Horizontal resolution
- Initialization (use of WRF/ALERA reanalysis ?)
- Model physics

Gottschalck et al. 2010 (BAMS)

"Considering the long time scale of the MJO and its prominent role in global climate, the MJO is a critical component of extended-range forecasts (weeks 2–4) by operational weather and climate providers (Waliser 2006b). Real-time forecasts of the MJO are becoming increasingly important for potential improvements in forecasting for this time range."

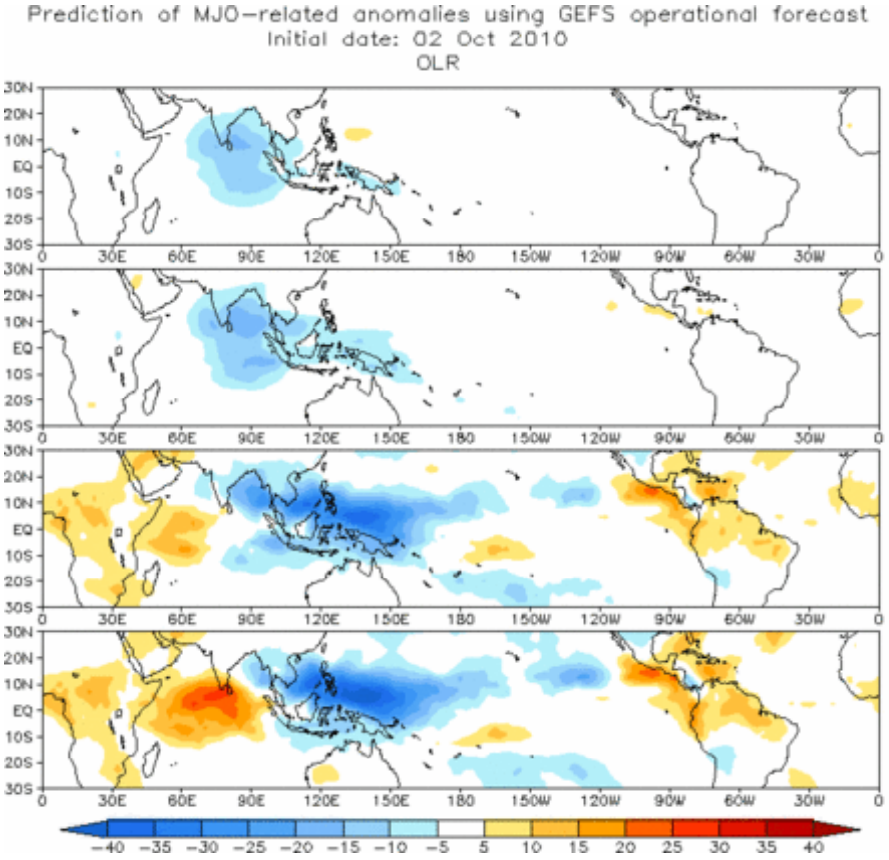
"NCEP–CPC has volunteered to act as a host of this MJO forecast activity by gathering the data streams from the multiple modeling centers, displaying the forecasts, and providing some initial evaluation. In order to receive the data in an organized manner, an FTP area has been established at NCEP that is continuously monitored in order to maintain a reliable flow of data in real time."

"An operational Web page has been developed for the real-time display of forecasts from all contributing models (Table 1), including documentation on model specifics(www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/clivar_wh.shtml). The Web site is continuously updated as more models are added and as improvements are made to the method and display."

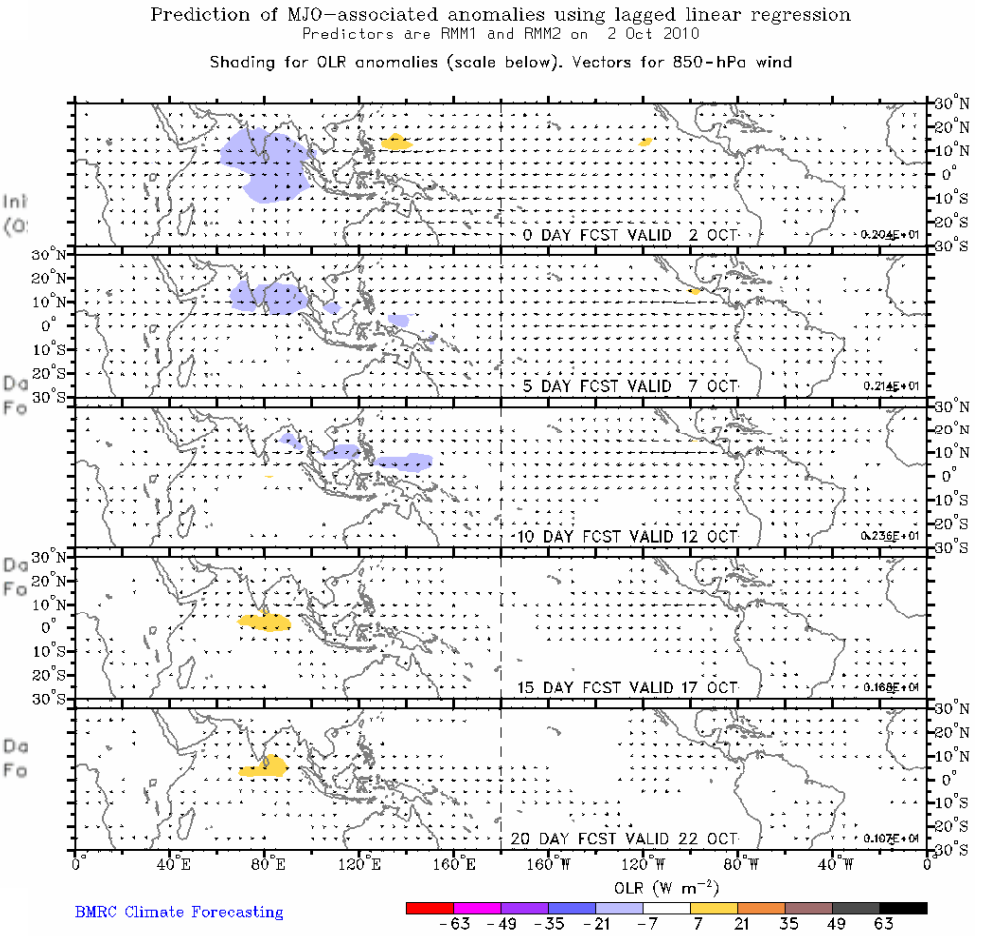
"Using a COR of 0.5 as a threshold for skill (e.g., Rashid et al. 2010), the plot illustrates skill out to approximately 11 days when using all days (i.e., all seasons and varying levels of MJO activity). The skill extends to 15 days for stronger MJO periods during the winter season (not shown). However, a much greater record of forecasts is needed to accurately represent the true skill of a model."

MJO real-time forecast

NCEP/CPC



CAWCR

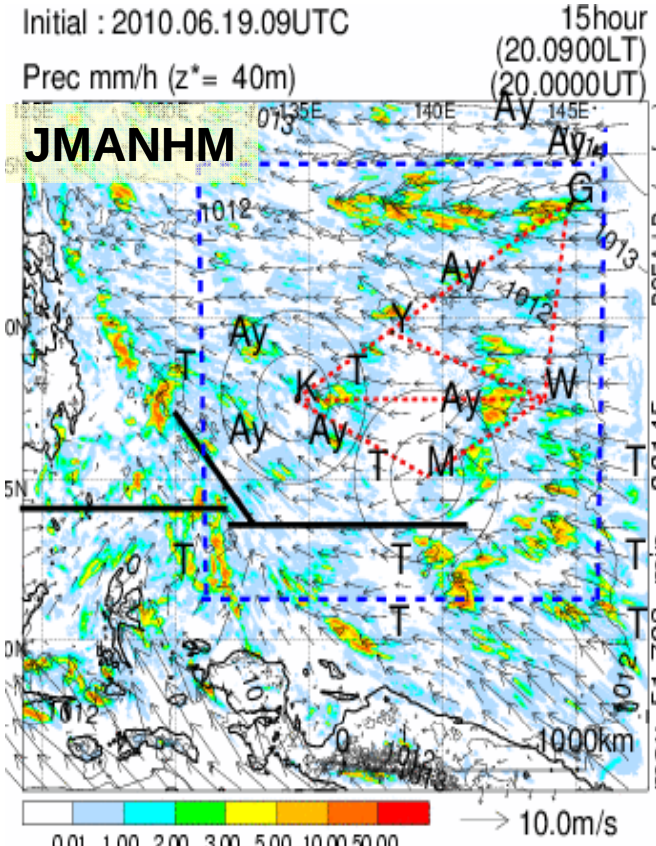


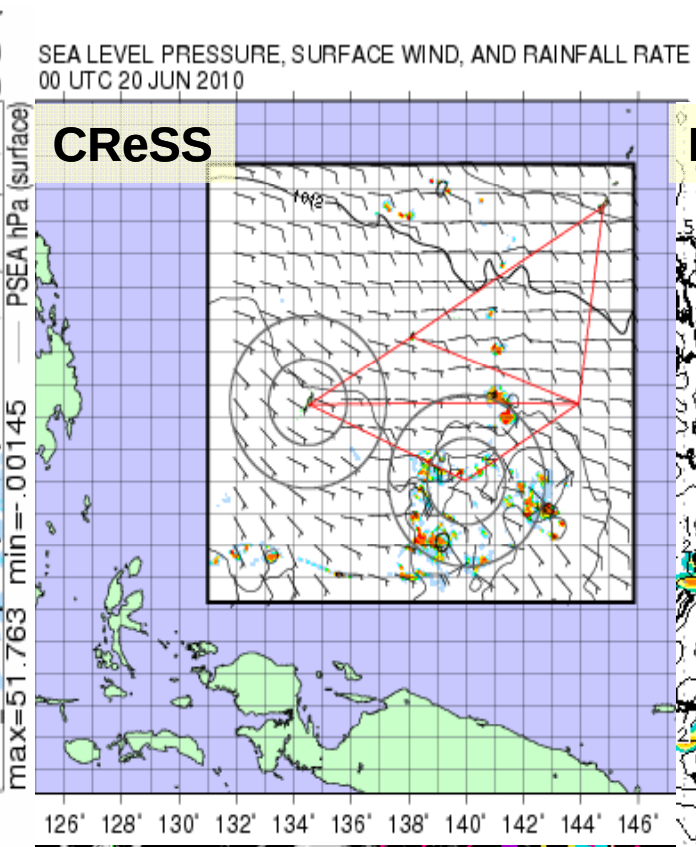
http://www.cpc.noaa.gov/products/precip/CWlink/MJO/mjo.shtml#forecast

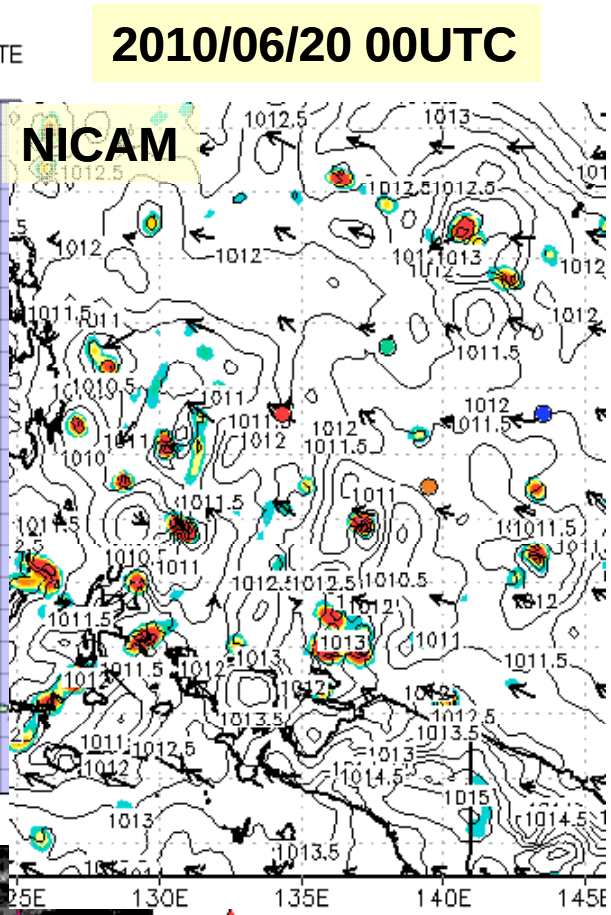
http://cawcr.gov.au/staff/mwheeler/maproom/RMM/fcsts/m.anom.OLR.uv850.gif

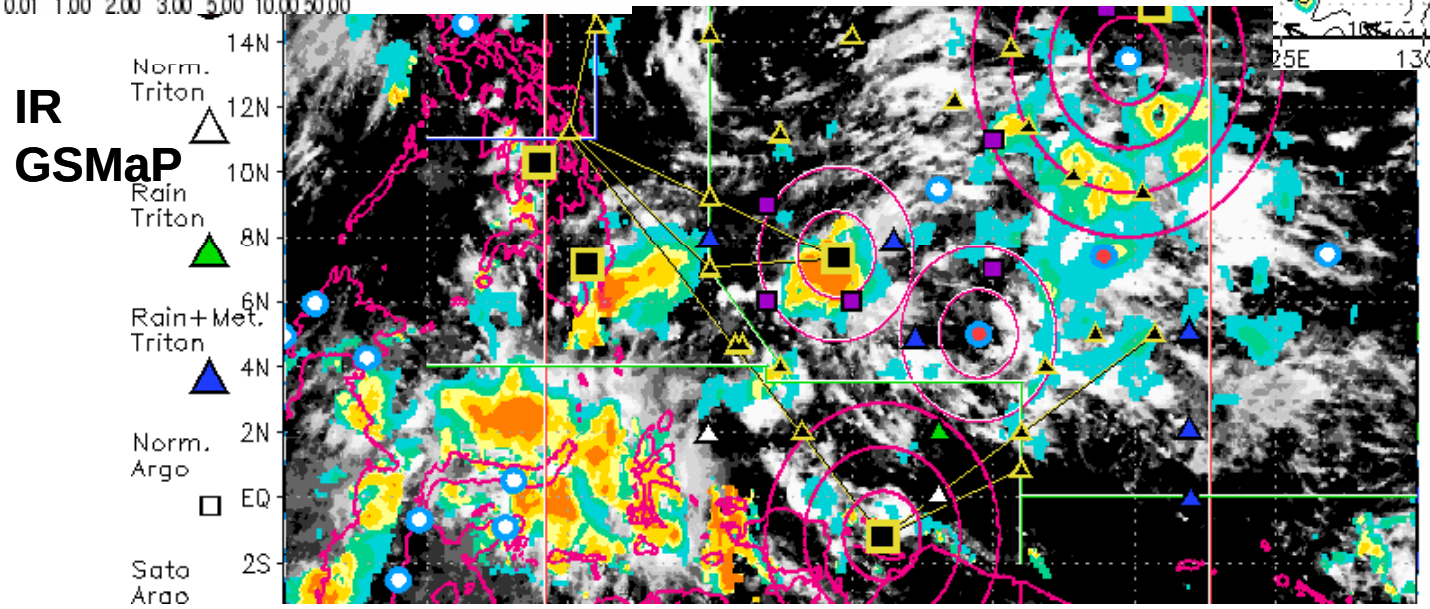
Near-realtime prediction PALAU2010 (2010/4/23-6/30)

2010/06/20 00UTC

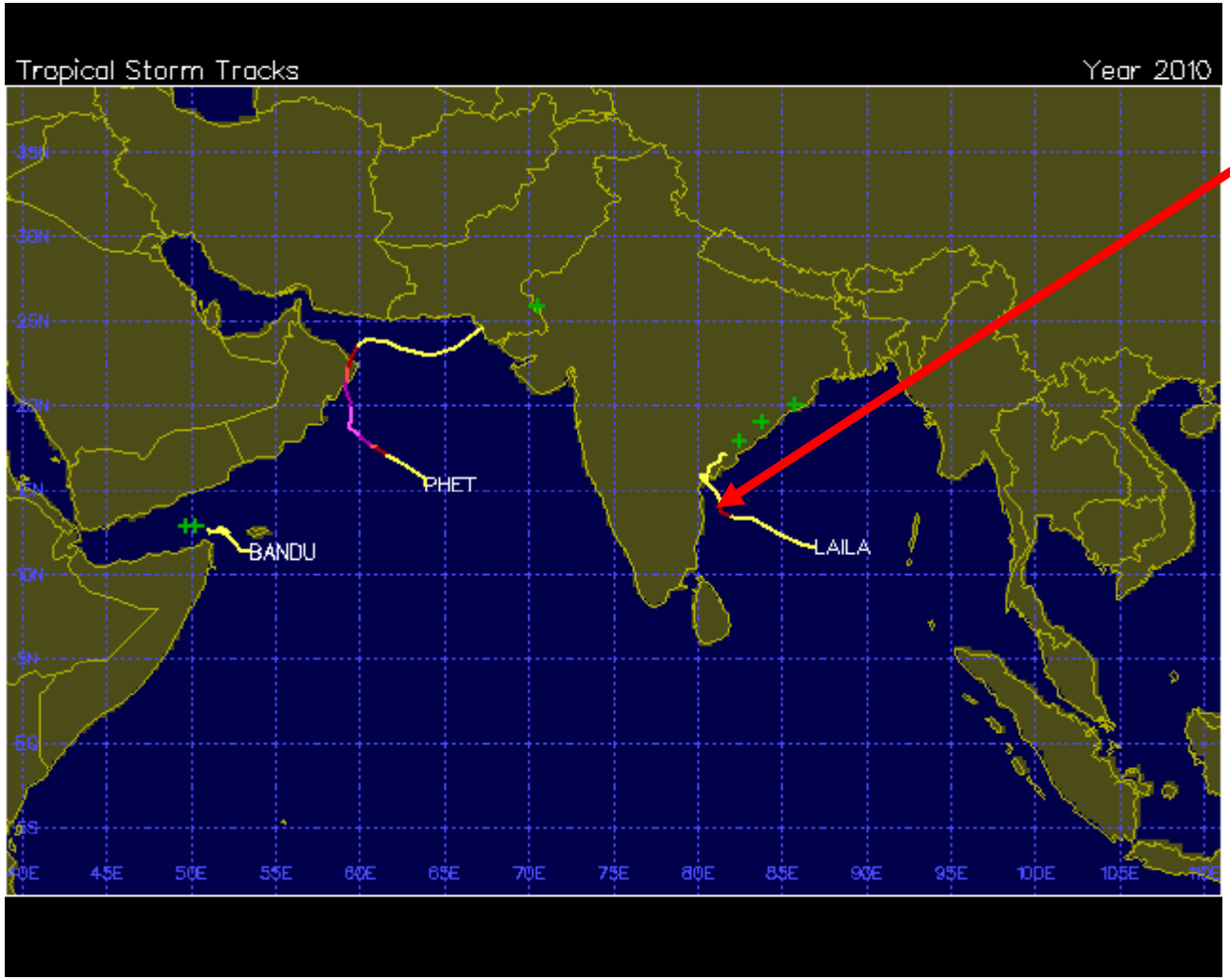








2010 Cyclone LAILA

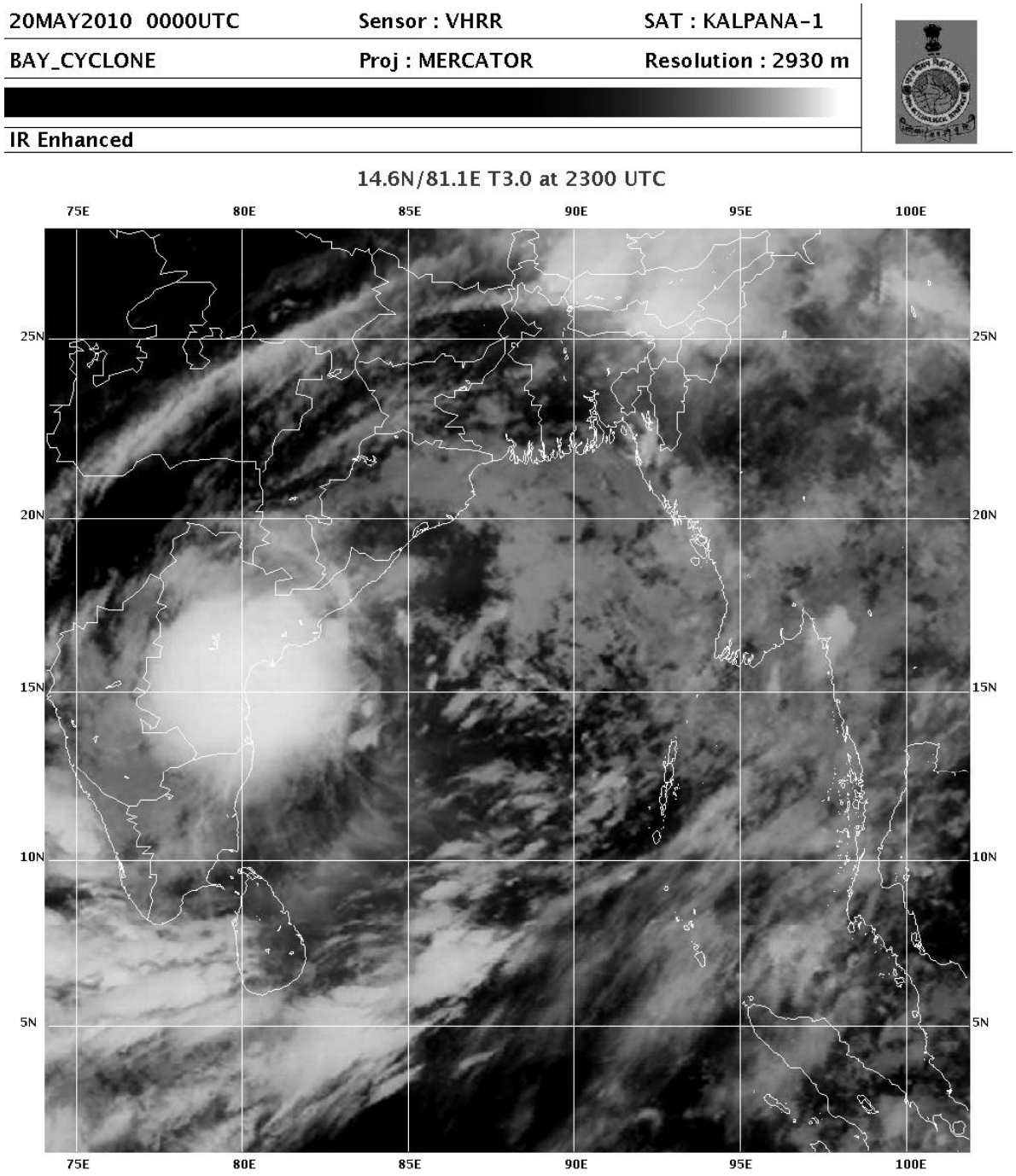


http://weather.unisys.com/hurricane/n_indian/2010/index.html

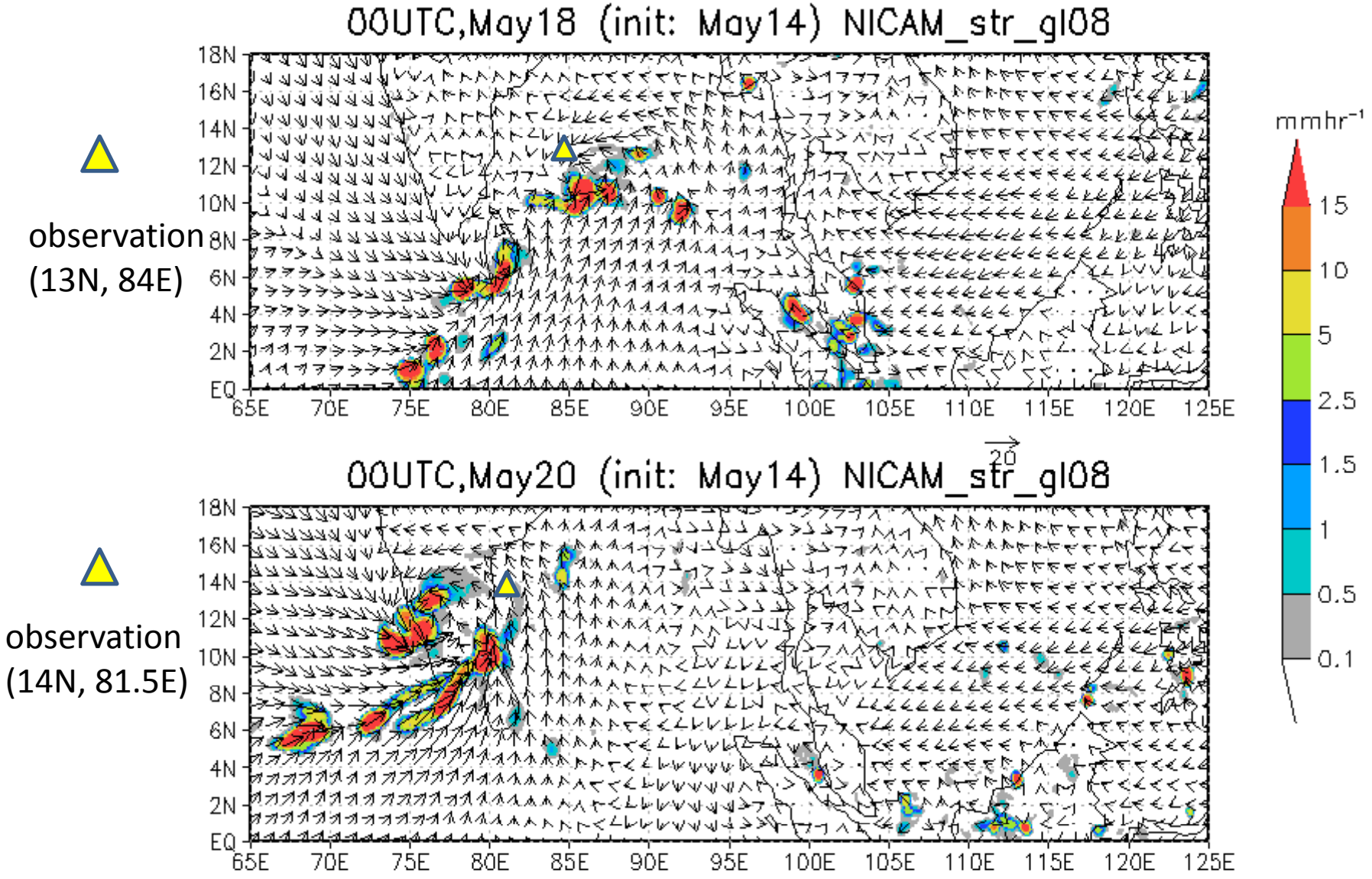
IR image

(00UTC May20)

India Meteorological Department



BoB cyclone in NICAM (init: May 14, 2010)



precipitation, velocity at 10m

Oouchi et al. 2010, submitted to BAMS