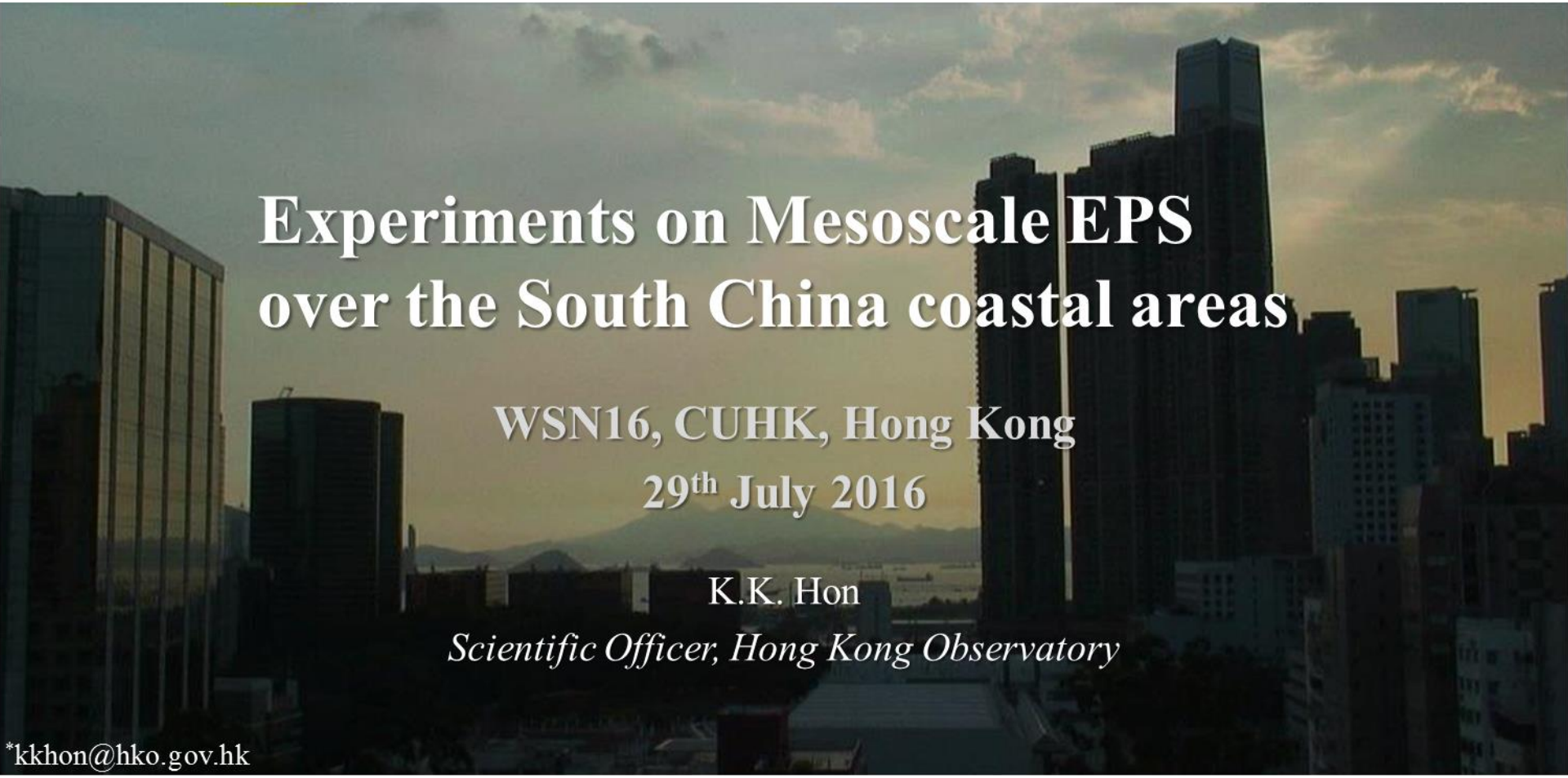

Experiments on Mesoscale EPS over the South China coastal areas

WSN16, CUHK, Hong Kong

29th July 2016

K.K. Hon

Scientific Officer, Hong Kong Observatory

*kkhon@hko.gov.hk

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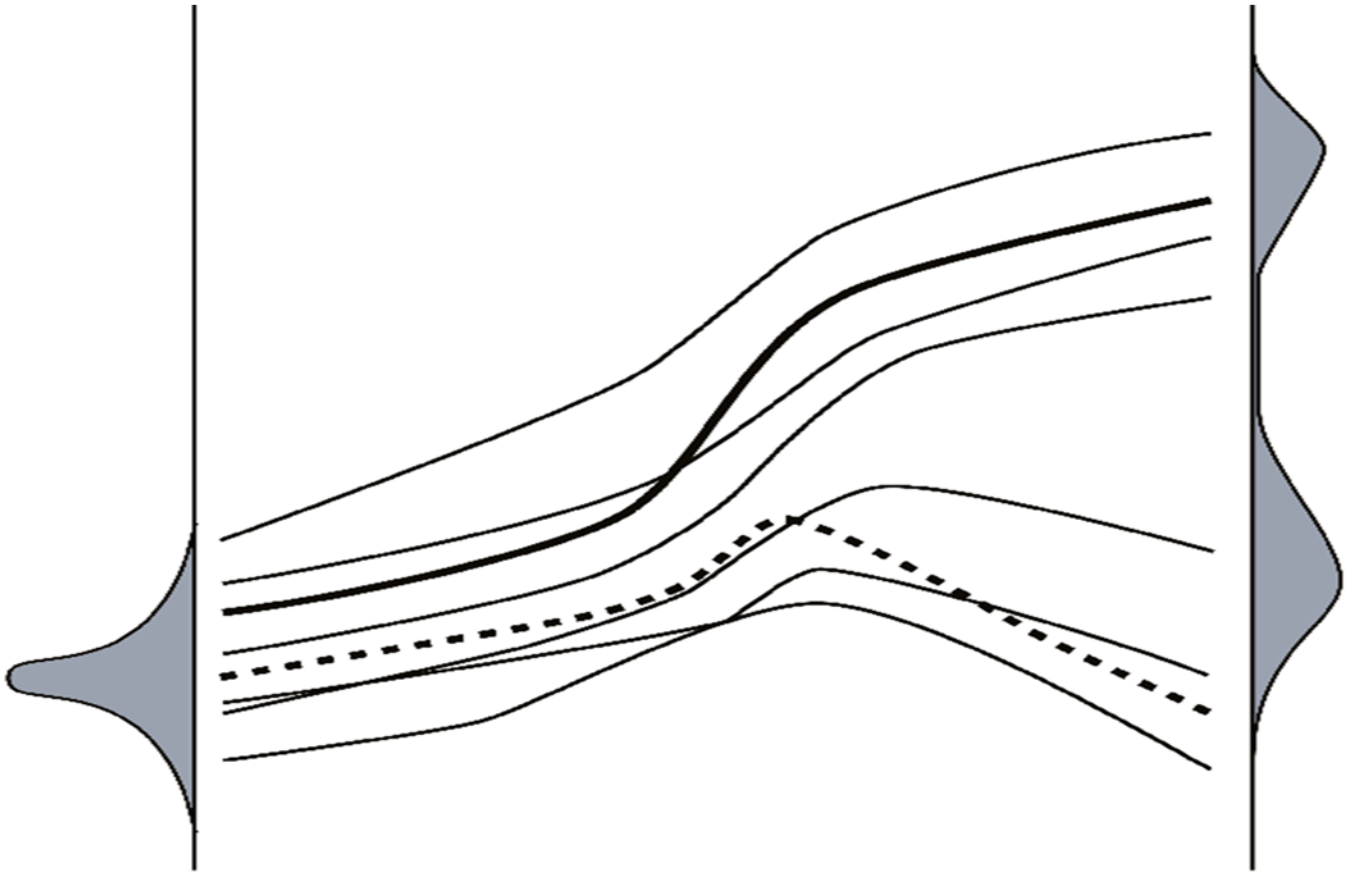
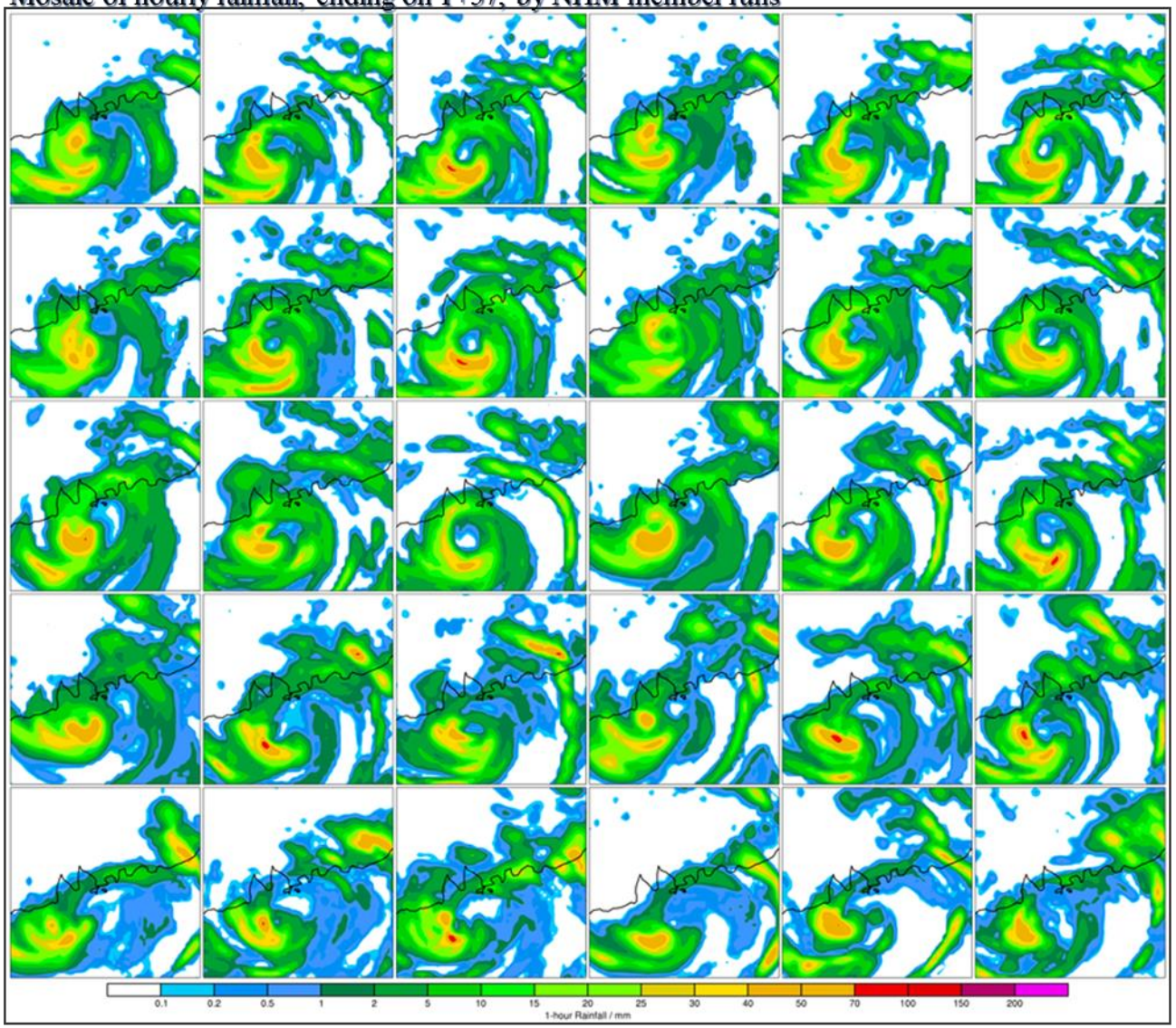
HONG KONG OBSERVATORY

chaotic atmosphere
imperfect models

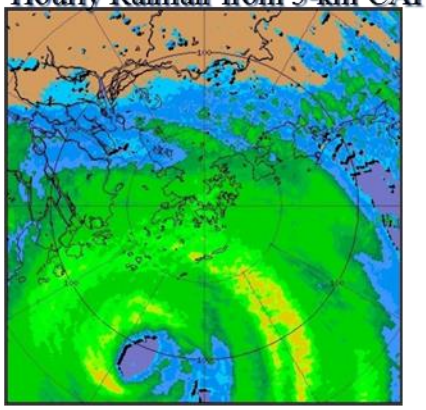


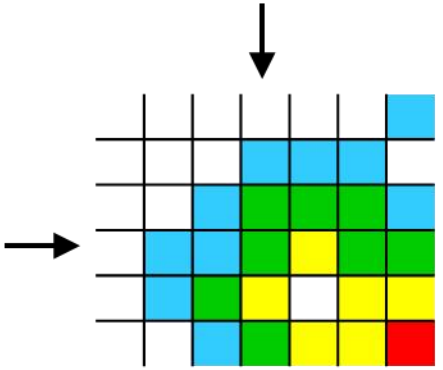
Numerical Studies on Vicente (Or, Hon and Wong, 2012)

Mosaic of hourly rainfall, ending on T+37, by NHM member runs



Hourly Rainfall from 3-km CAPPI

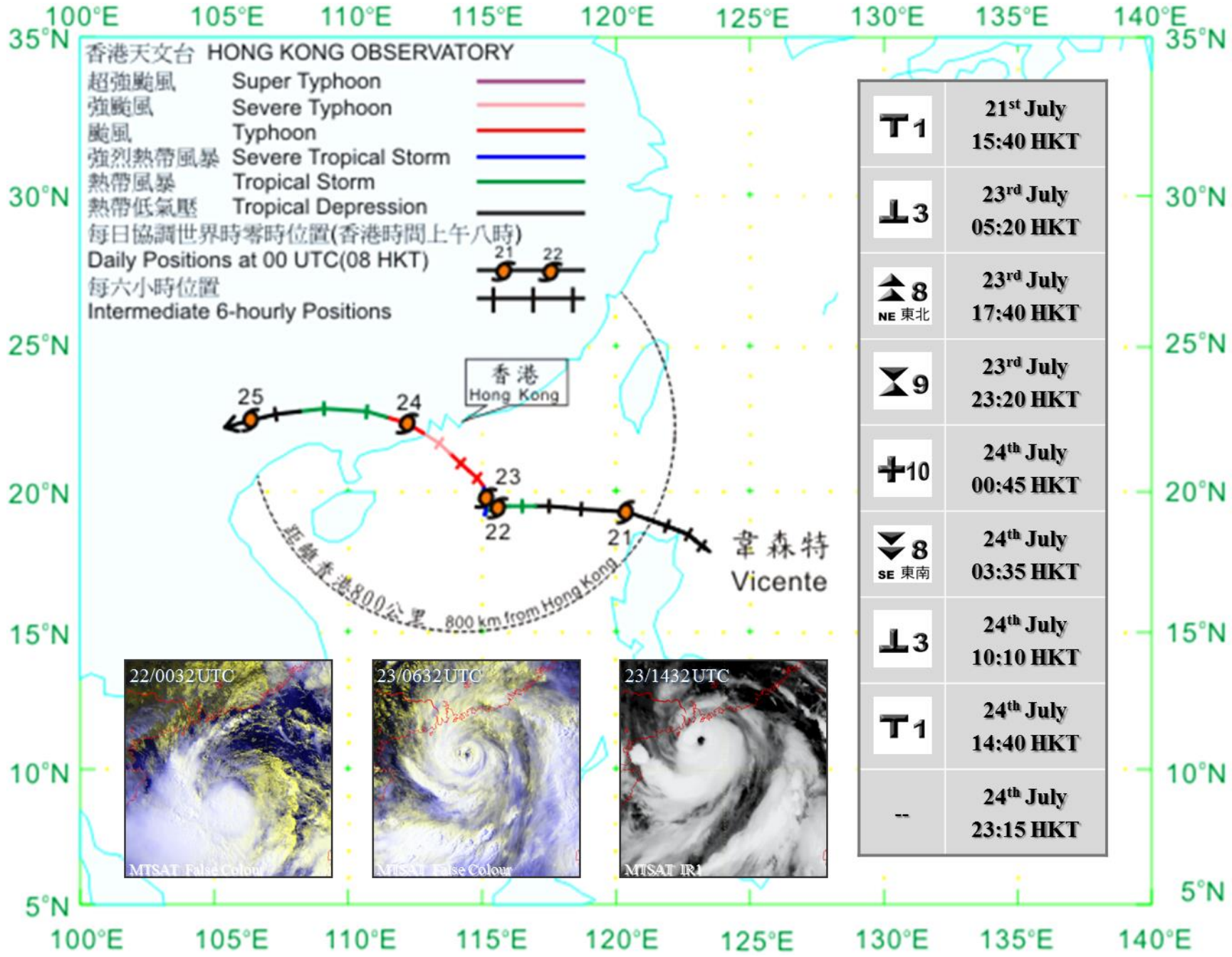




Fractional Coverage

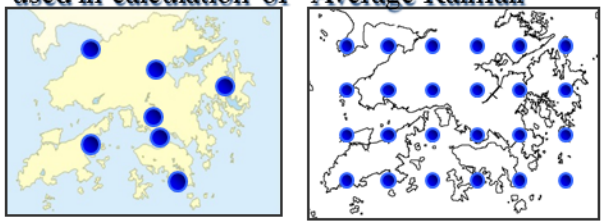
$$= \frac{\text{Gridpoints exceeding } x \text{ mm/hr}}{\text{Gridpoints within study area}}$$

- Within 250 km from Tai Mo Shan Radar
  - 2285 NHM grid-points
  - 180942 radar pixels

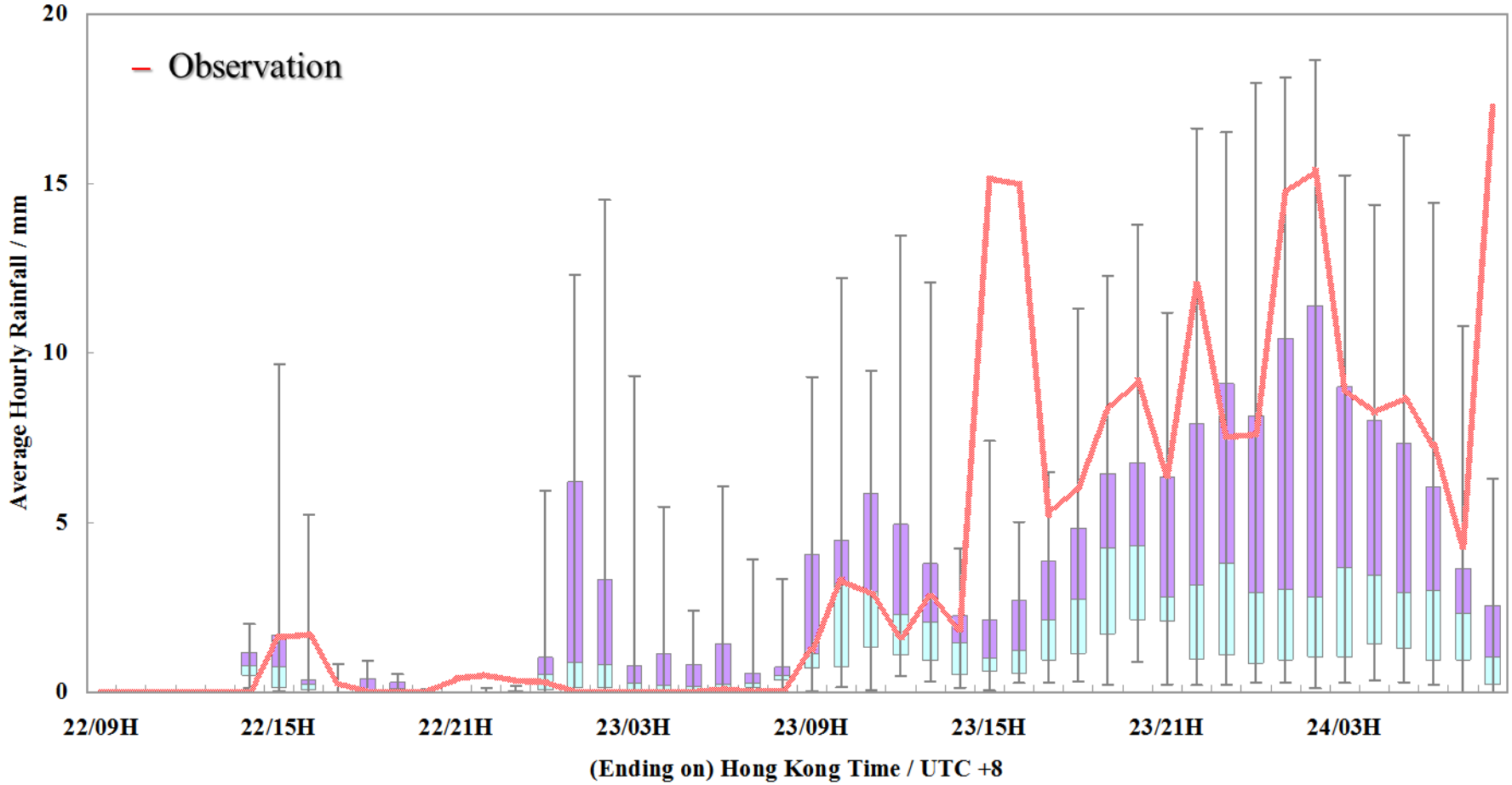

香港天文台 HONG KONG OBSERVATORY
超強颱風 Super Typhoon
強颱風 Severe Typhoon
颱風 Typhoon
強烈熱帶風暴 Severe Tropical Storm
熱帶風暴 Tropical Storm
熱帶低氣壓 Tropical Depression
每日協調世界時零時位置(香港時間上午八時)
Daily Positions at 00 UTC(08 HKT)
每六小時位置
Intermediate 6-hourly Positions
香港
Hong Kong
韋森特
Vicente
距離香港800公里 800 km from Hong Kong
22/0032UTC
MTSAT False Colour
23/0632UTC
MTSAT False Colour
23/1432UTC
MTSAT IR1
T1 21st July 15:40 HKT
⊥3 23rd July 05:20 HKT
8 NE 東北 23rd July 17:40 HKT
9 23rd July 23:20 HKT
10 24th July 00:45 HKT
8 SE 東南 24th July 03:35 HKT
⊥3 24th July 10:10 HKT
T1 24th July 14:40 HKT
-- 24th July 23:15 HKT

EPS Rainfall Meteogram

HKAWS Raingauges and NHM grid-points used in calculation of "Average Rainfall"

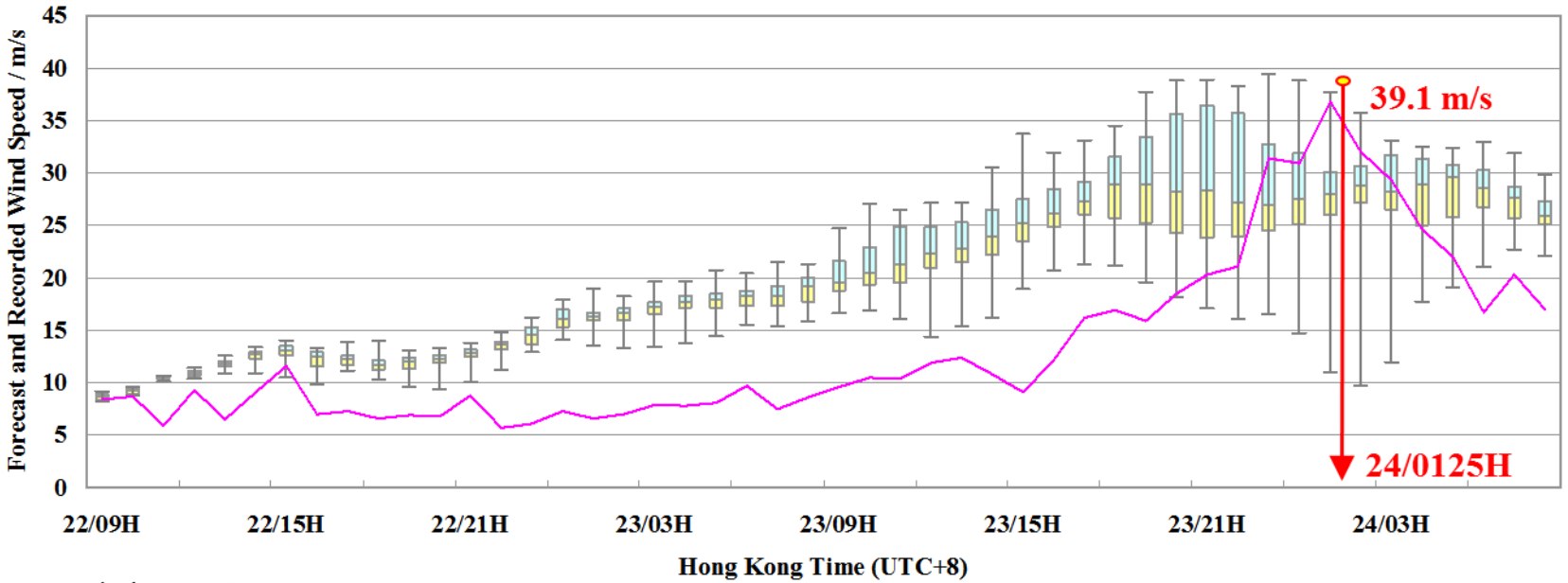


Recorded (red) and forecast (box-and-whisker) hourly average rainfall over the territory

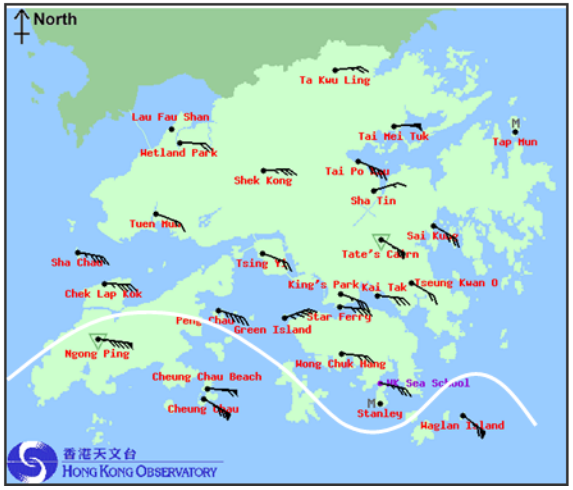


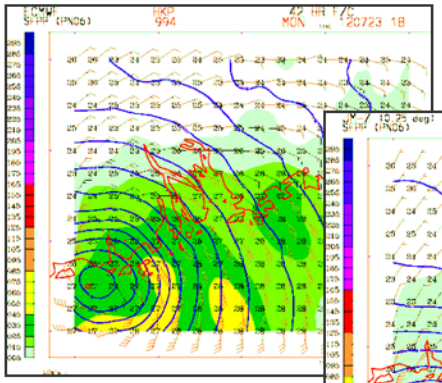
EPS Wind Speed Meteogram

10-minute mean wind, plotted every hour, recorded at Cheung Chau AWS (pink) and NHM forecast (box-and-whisker)



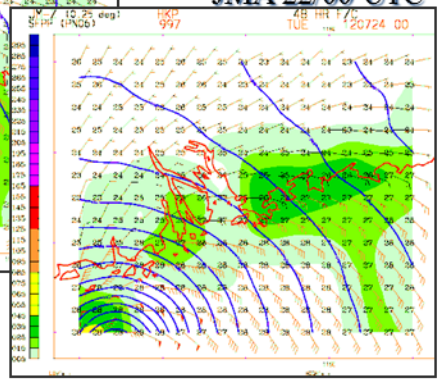
10-min. Mean Winds at 01:30 HKT



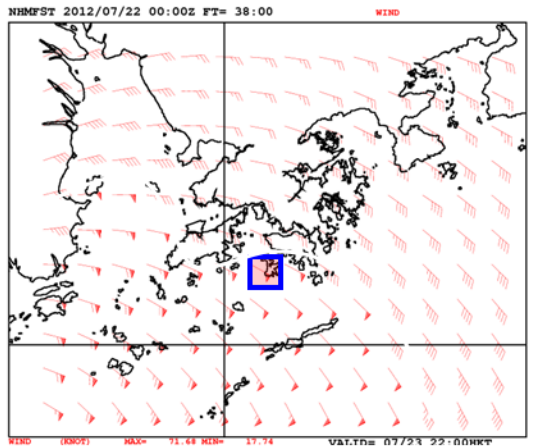


ECMWF 22/00 UTC

JMA 22/00 UTC

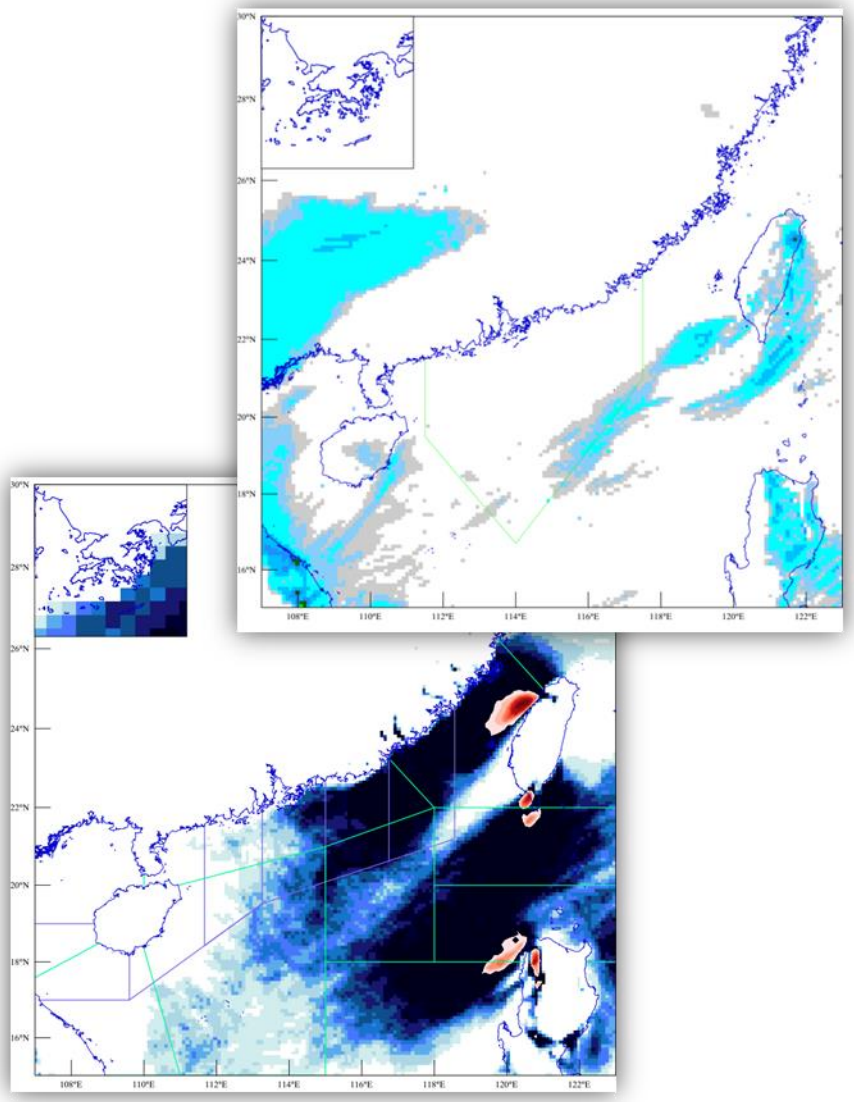


Selected NHM run

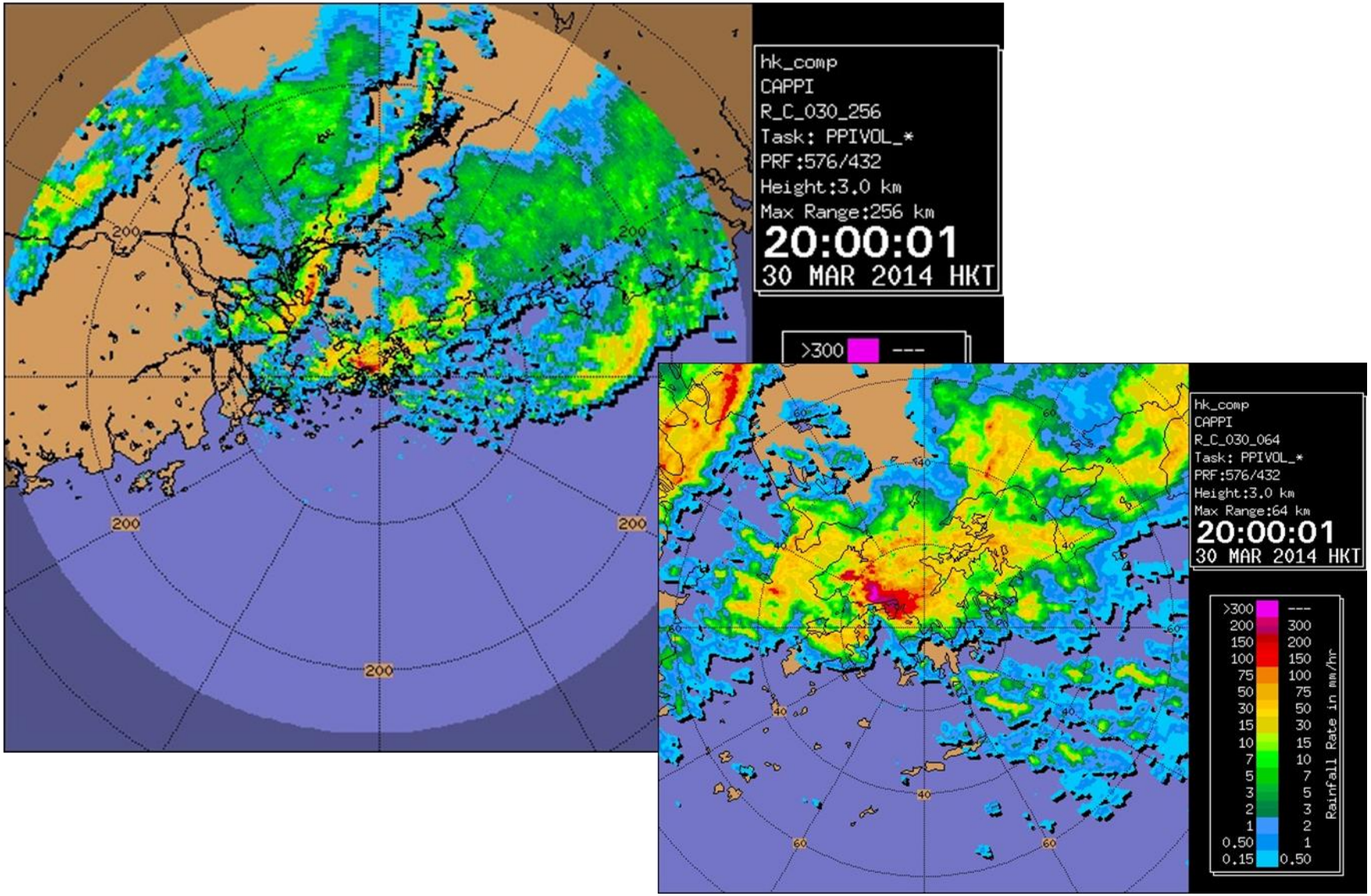


Model Configuration / Experimental EPS

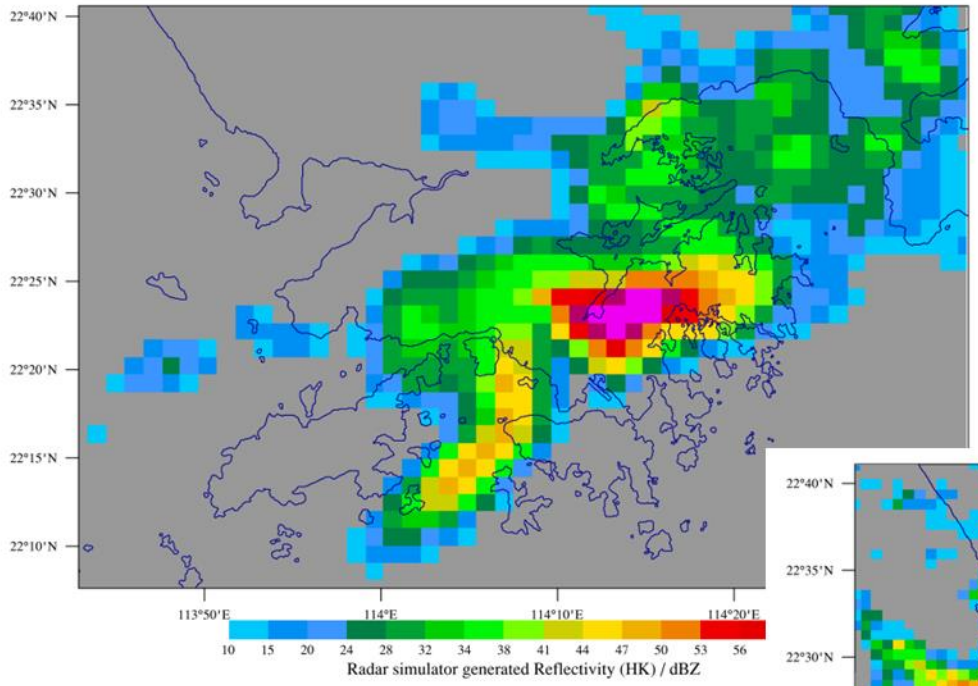
- **WRF-ARW v3.4.1**
- **10-km horizontal resolution**
- **Covering S.China + NCSC**
- **NCEP-GEFS boundary and initial conditions (1-deg)**
- **20 members / twice-daily**
- **Up to T+72**



Hail-bearing “Black” Rainstorm in HK

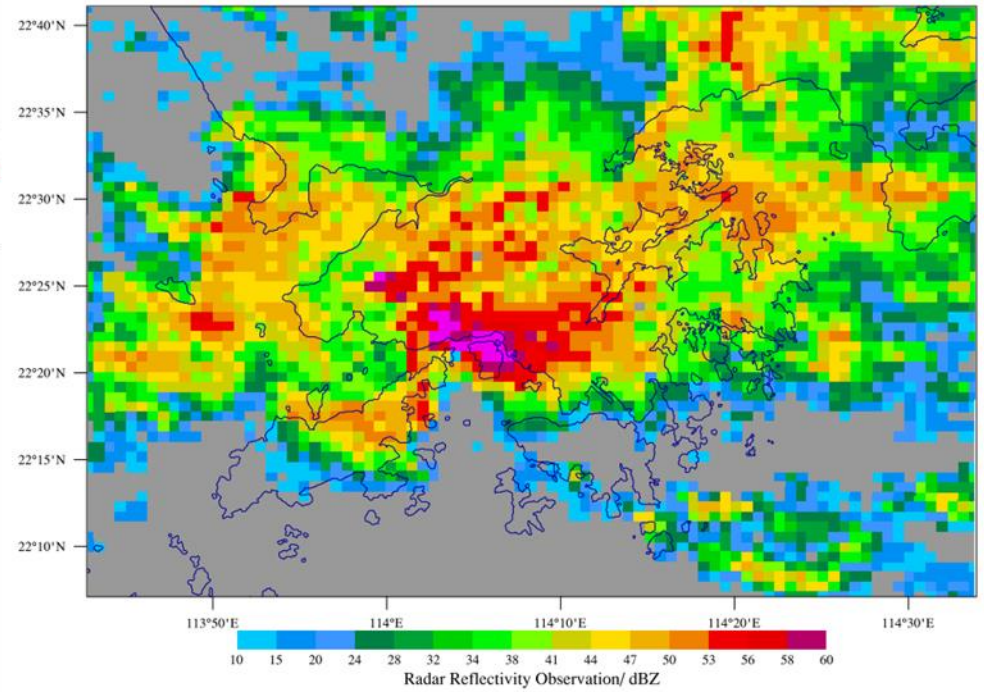


With higher res. Perhaps…

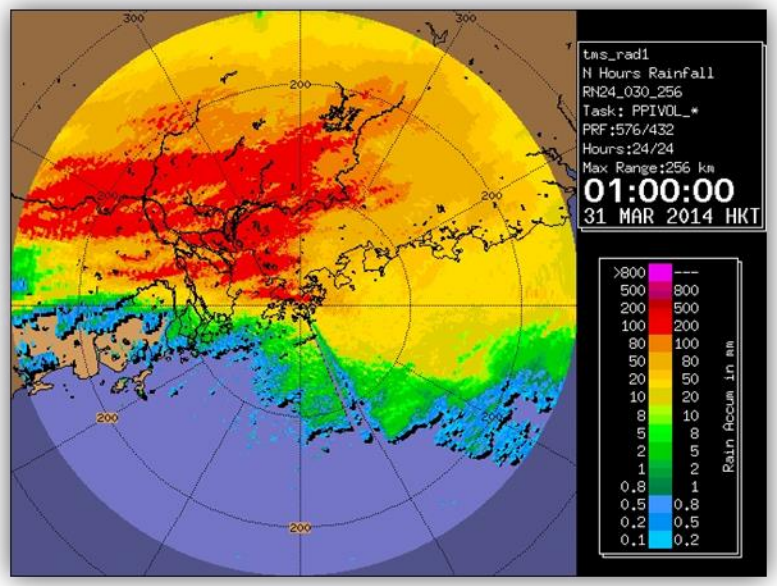


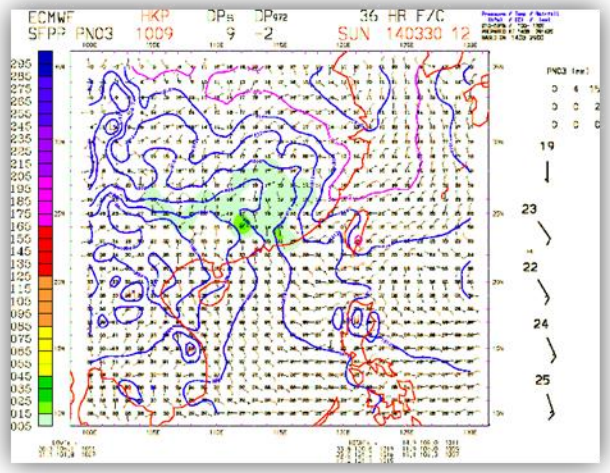
1.8-km Resolution Simulation

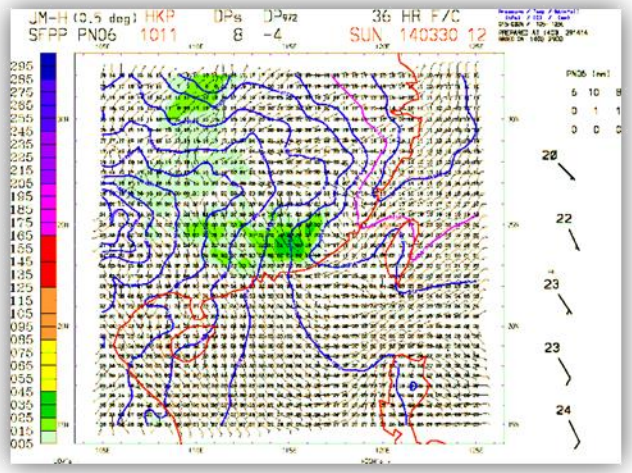
Actual Radar Reflectivity Obs.

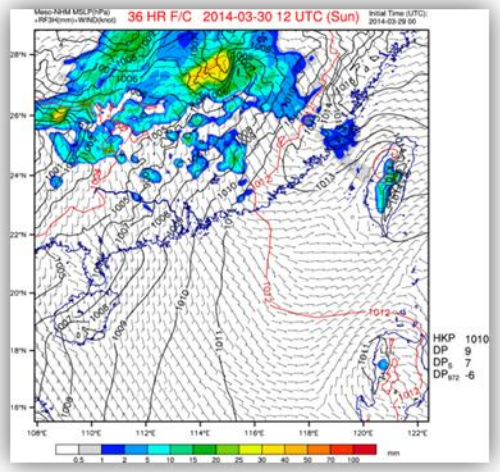


What say Global/Regional Models…?



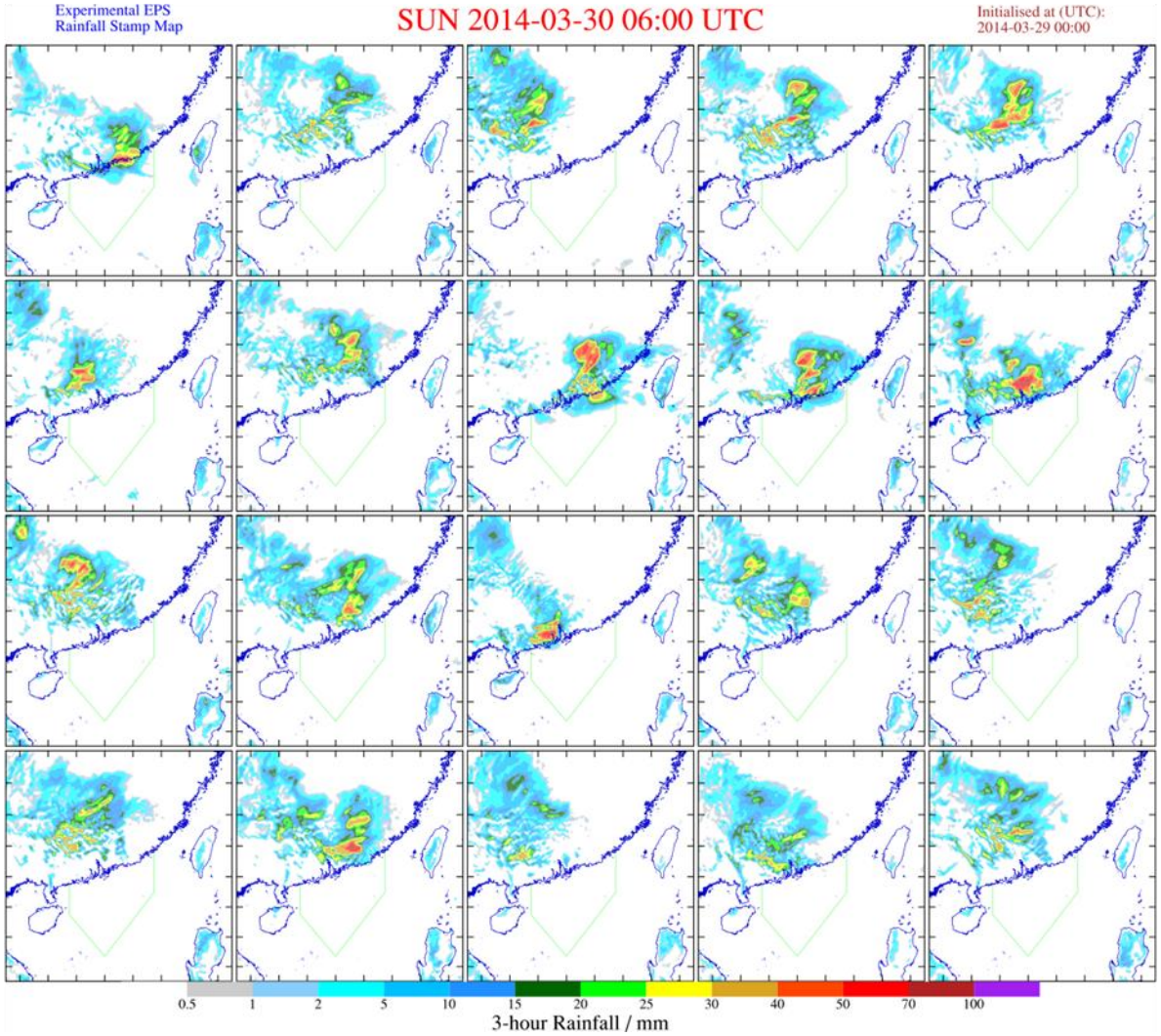


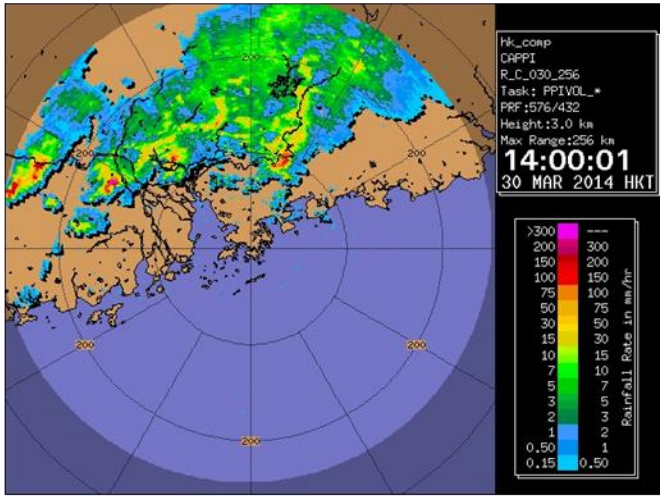




EPS Rainfall Stamp Maps

2014年3月29日 00 UTC 起报之不同预报成员

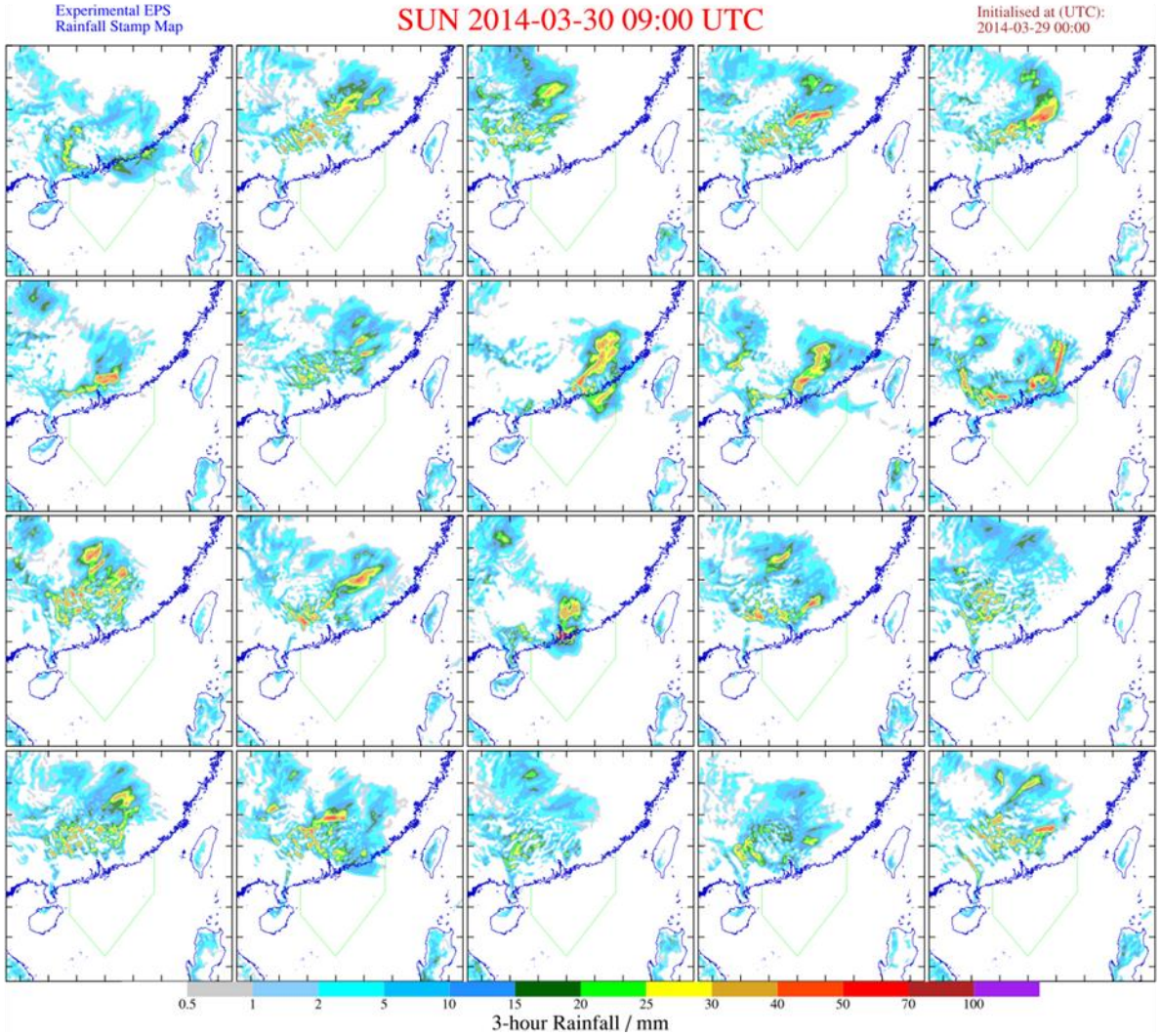


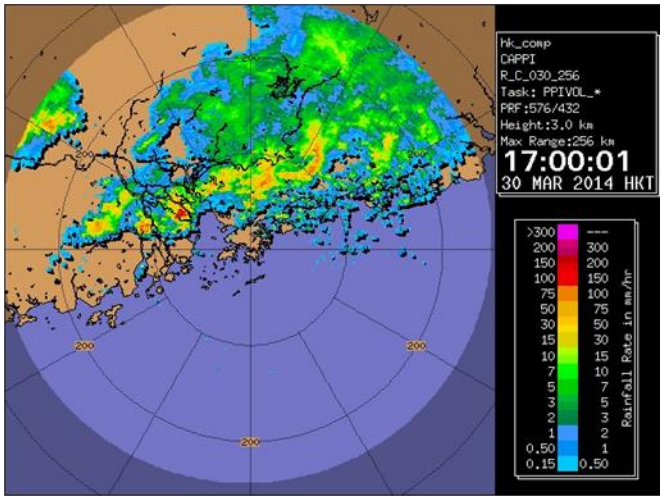


2014年3月30日 06 UTC 之雷达观测

EPS Rainfall Stamp Maps

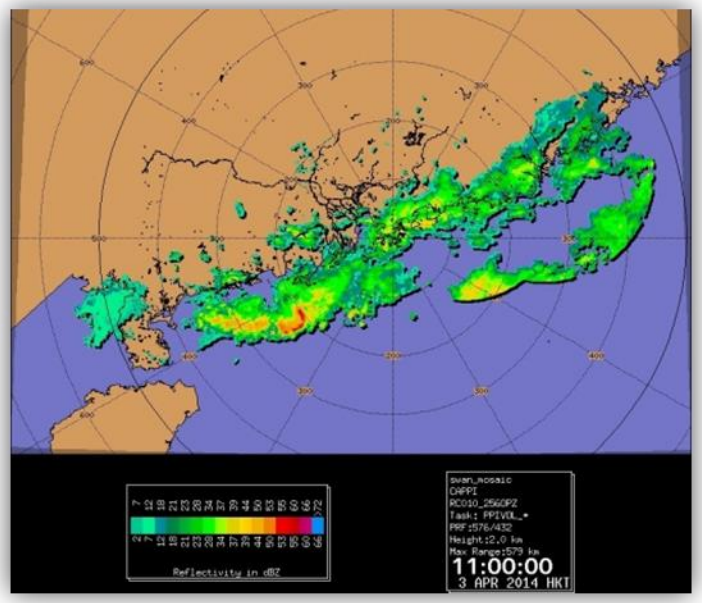
2014年3月29日 00 UTC 起报之不同预报成员

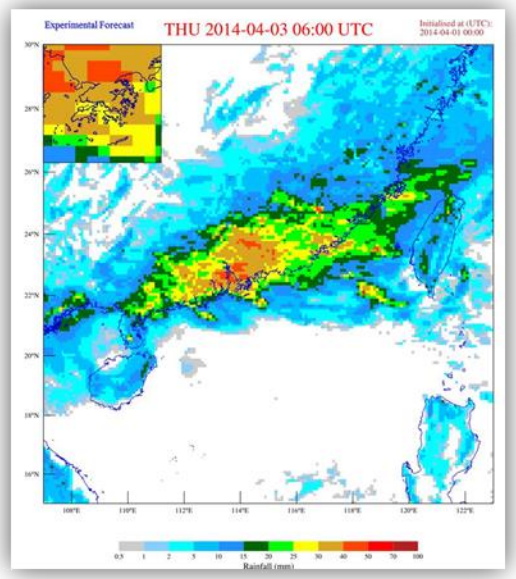


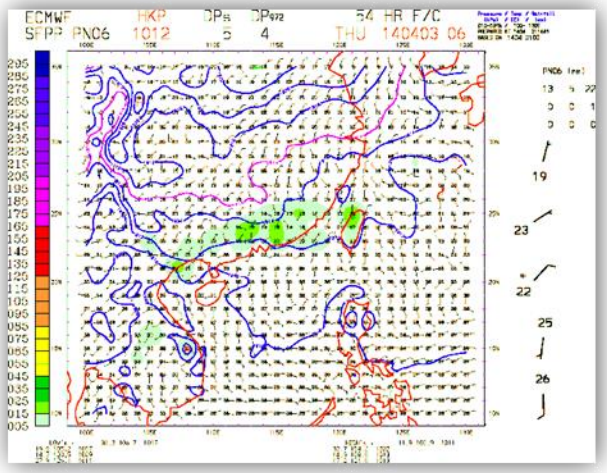


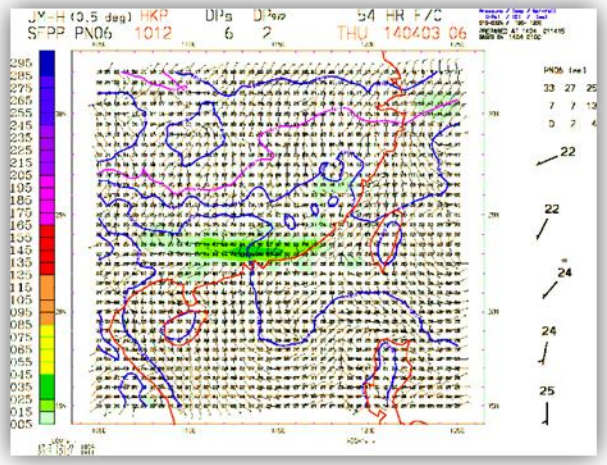
2014年3月30日 09 UTC 之雷达观测

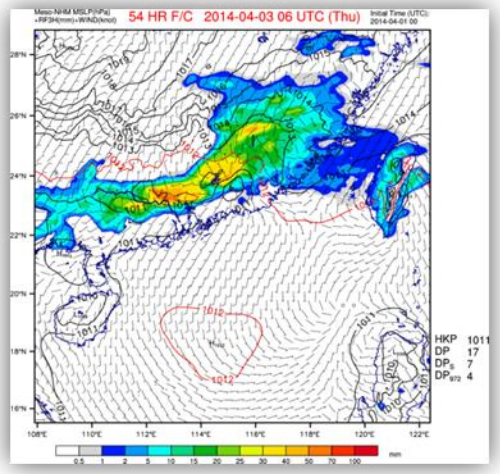
Another Case on 3 Apr 2014…



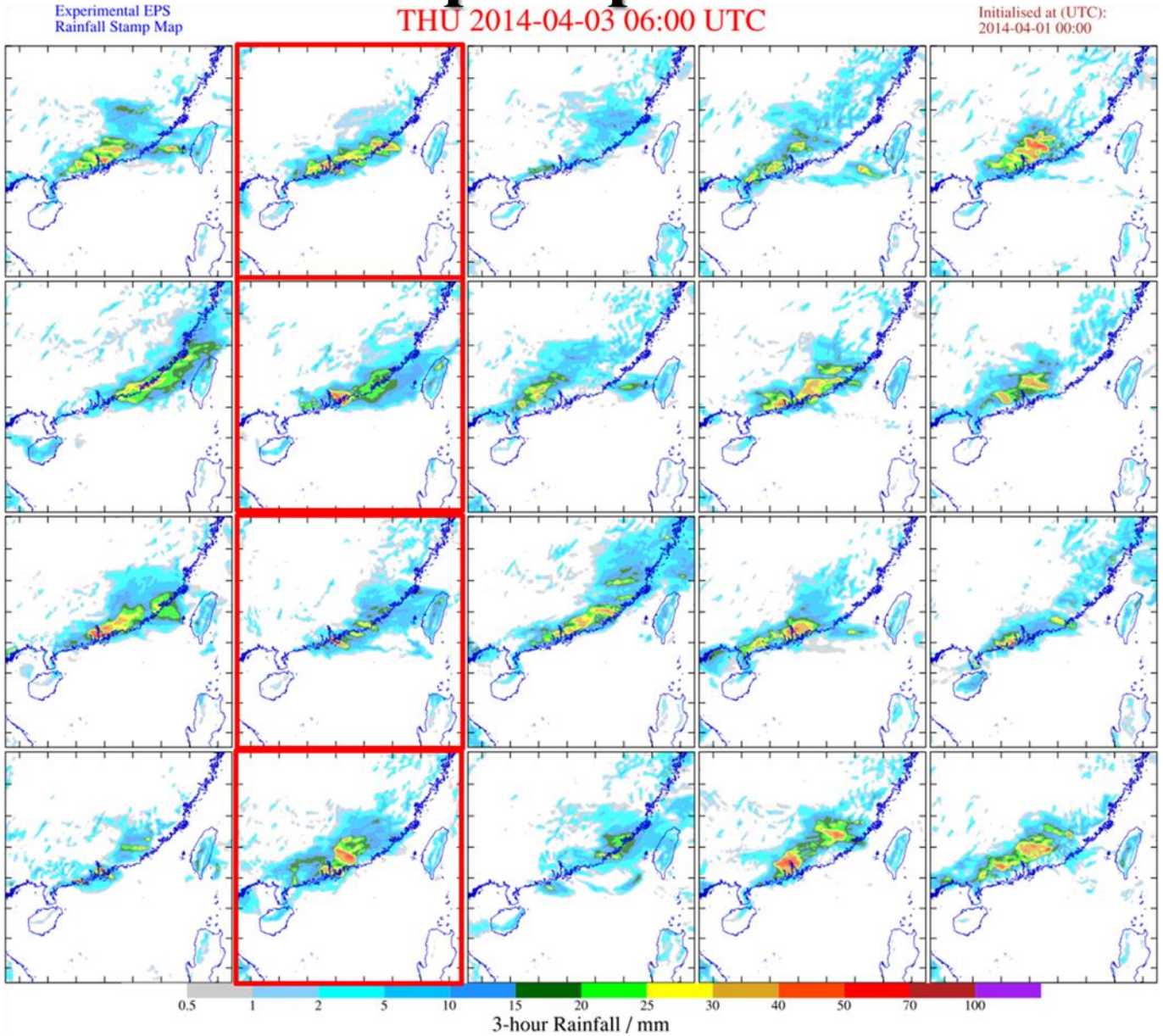




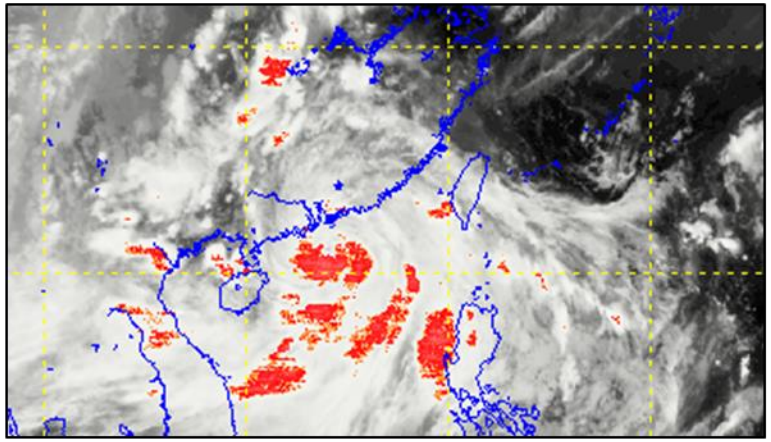


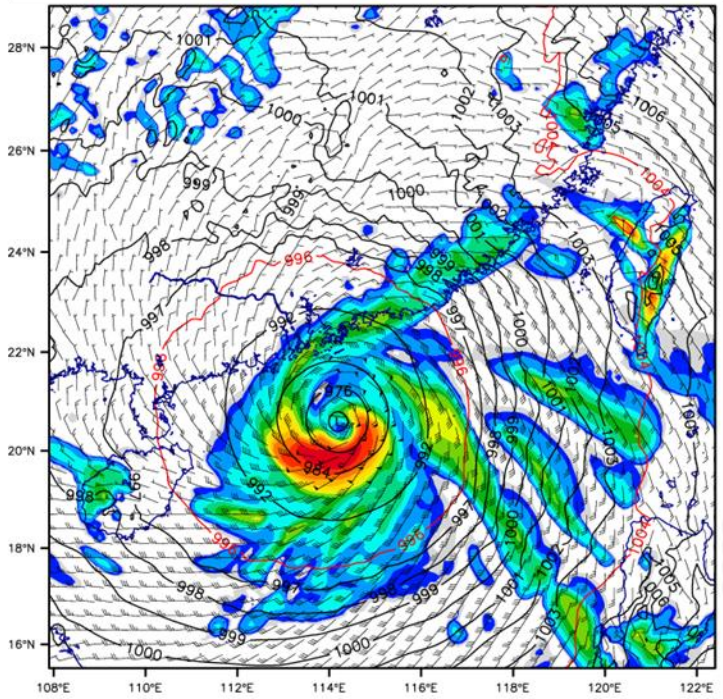


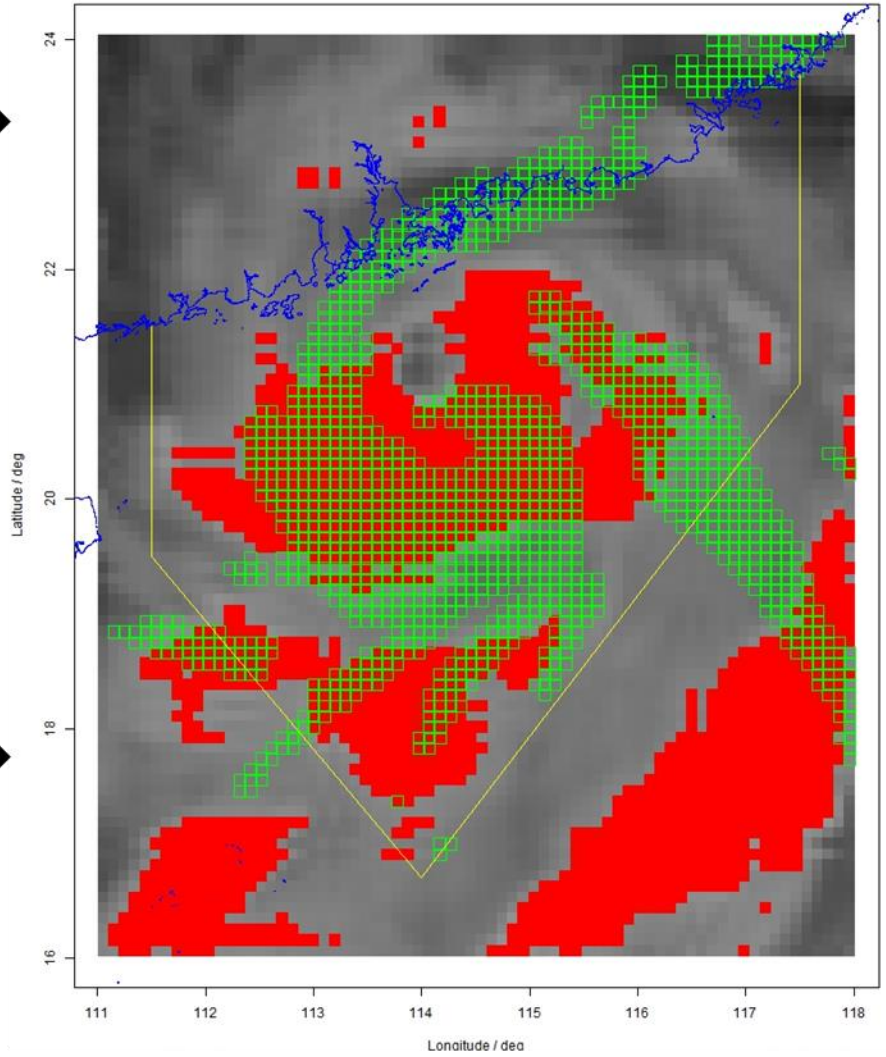
EPS Rainfall Stamp Maps



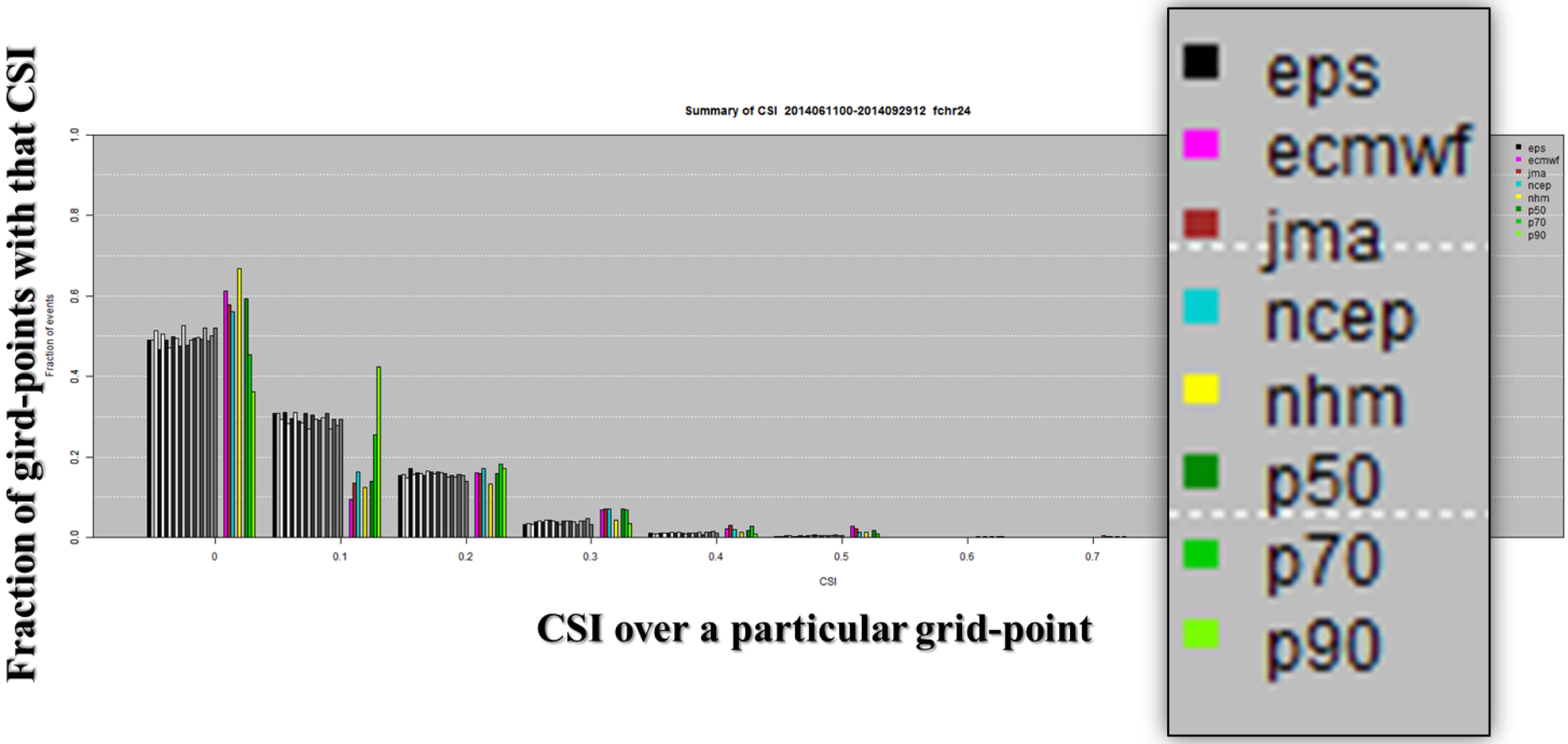
Spatial Verification of Sig. Convection







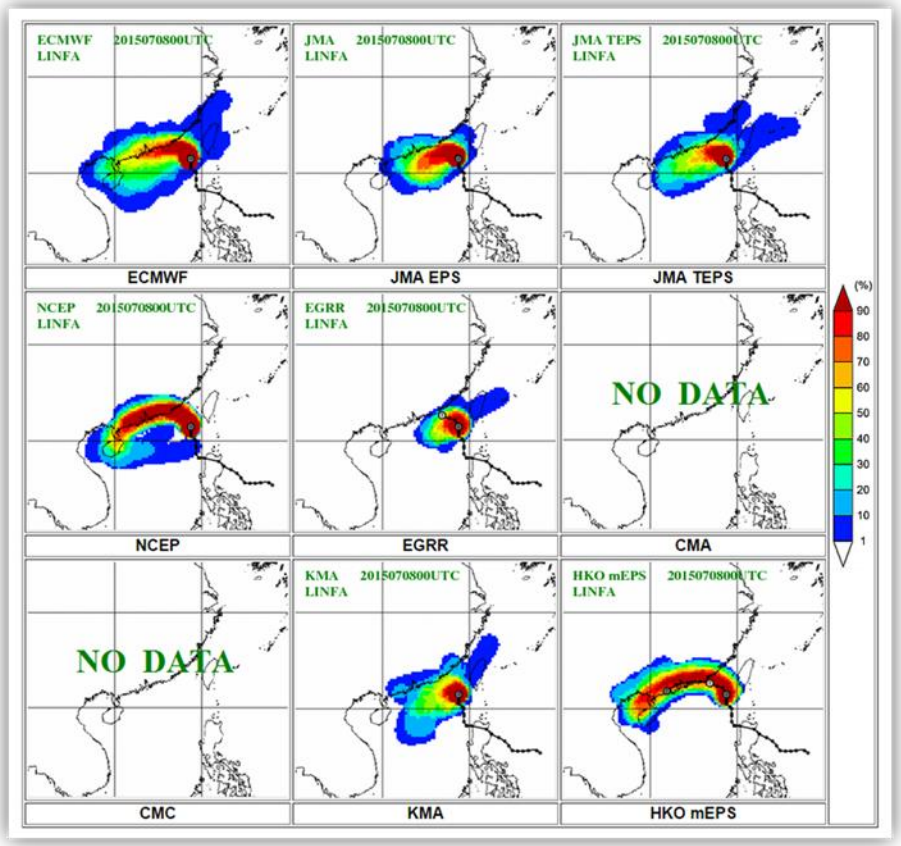
Distribution of *by-grid* CSI over Domain

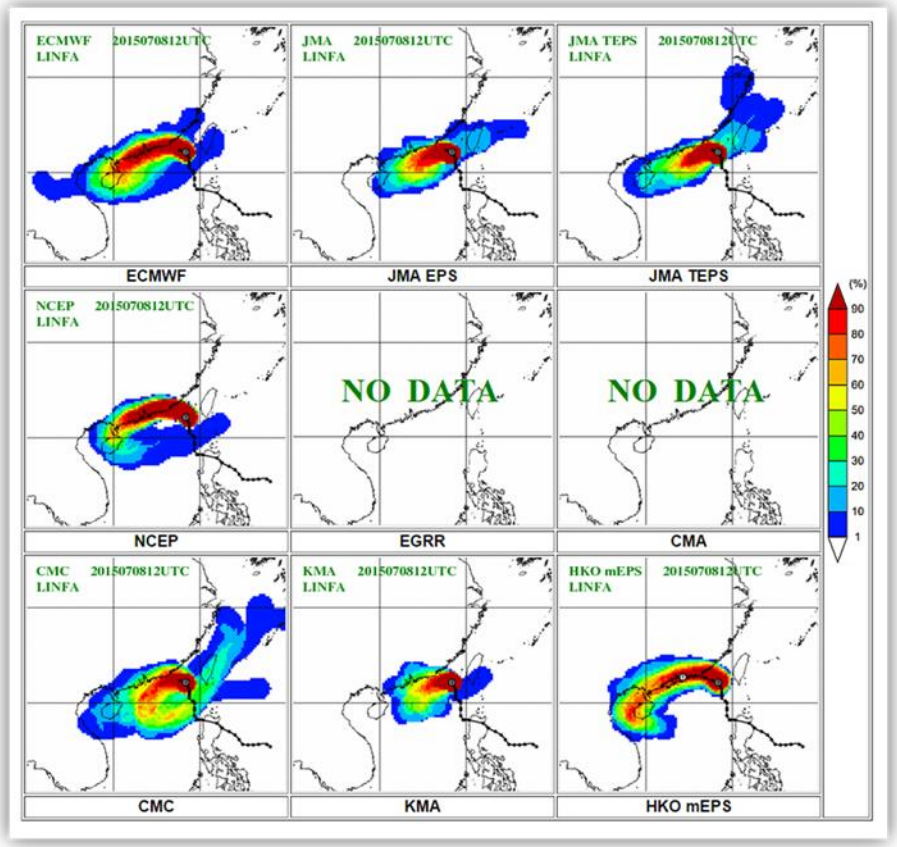


CSI over a particular grid-point

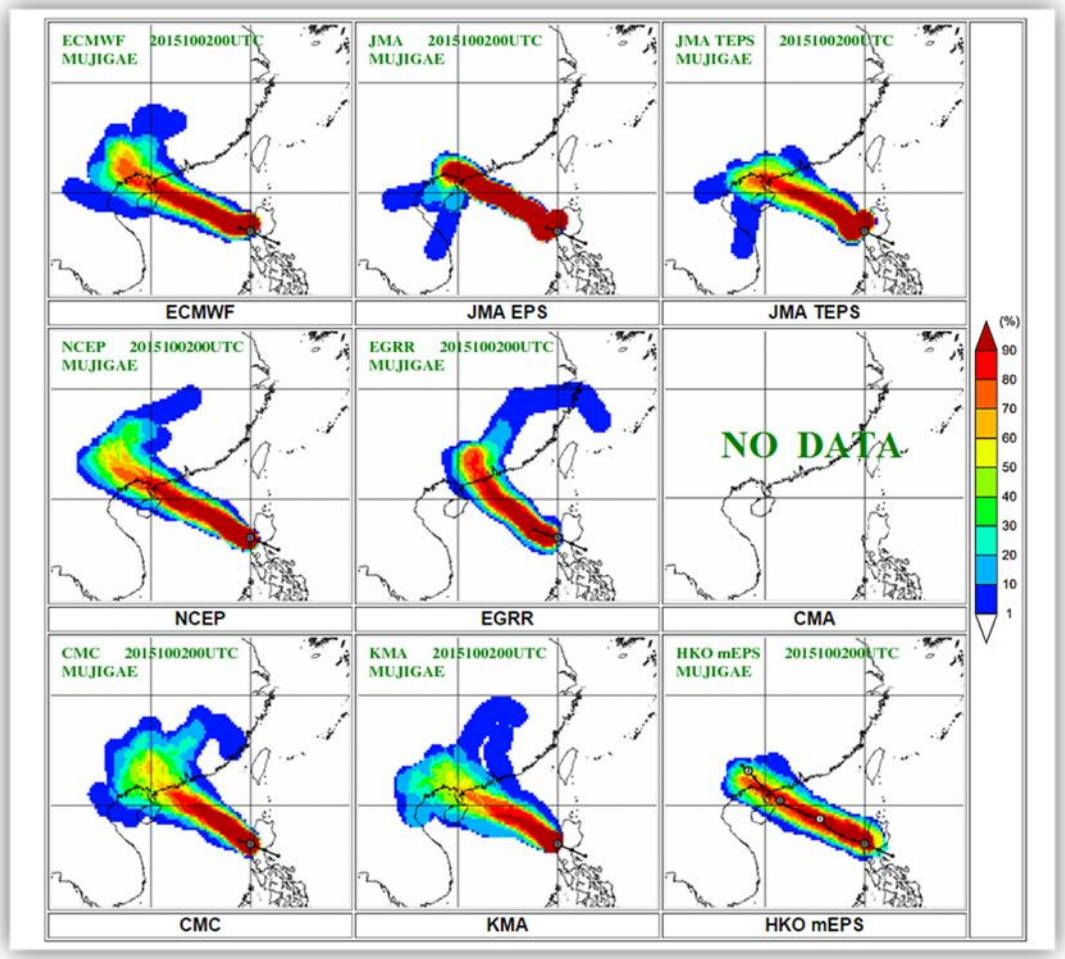
- **Perfect = 100% with CSI of 1.0**
- **Apparently considerable areas of convection go *un*-forecast…**

TC Strike Probability – Linfa (2015)

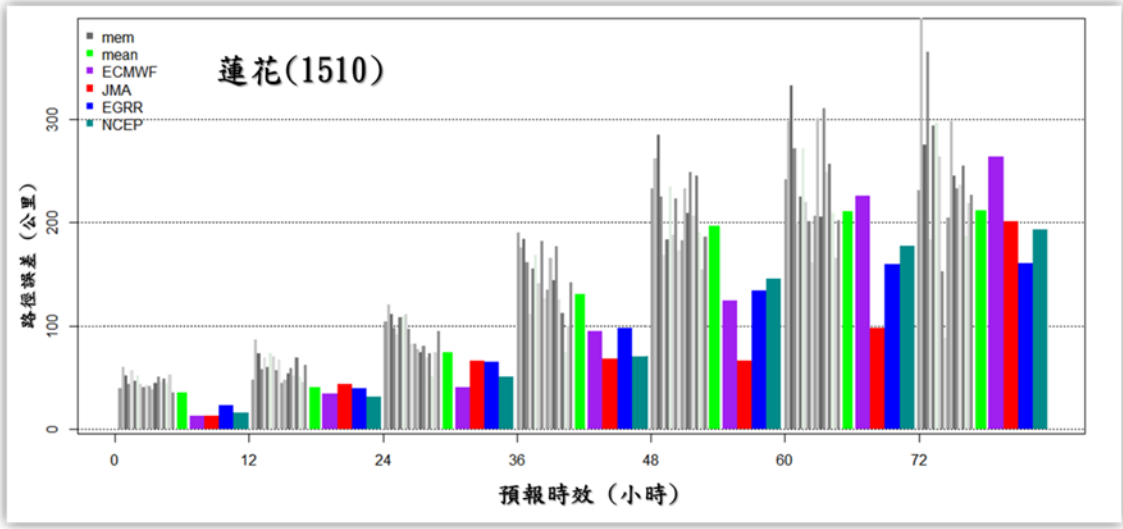


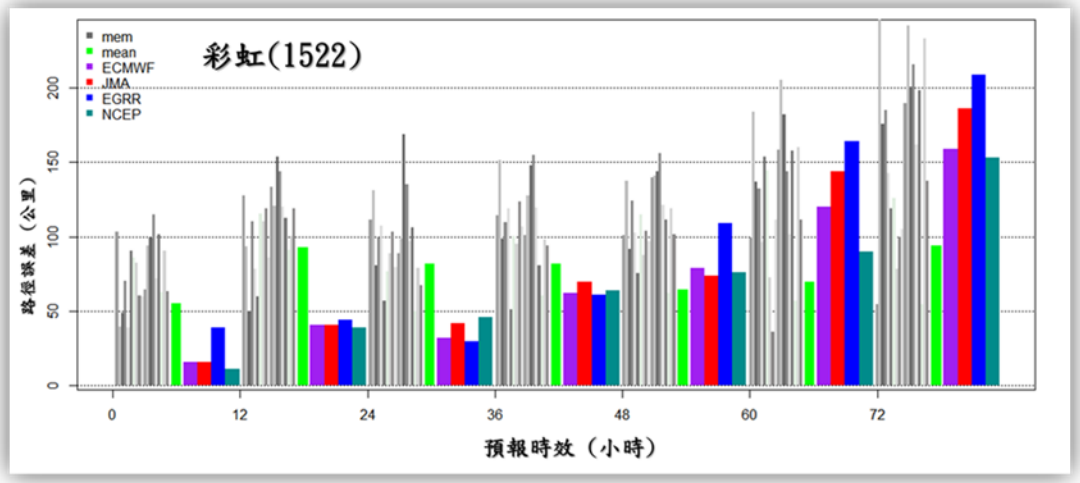


TC Strike Probability – Mujigae (2015)

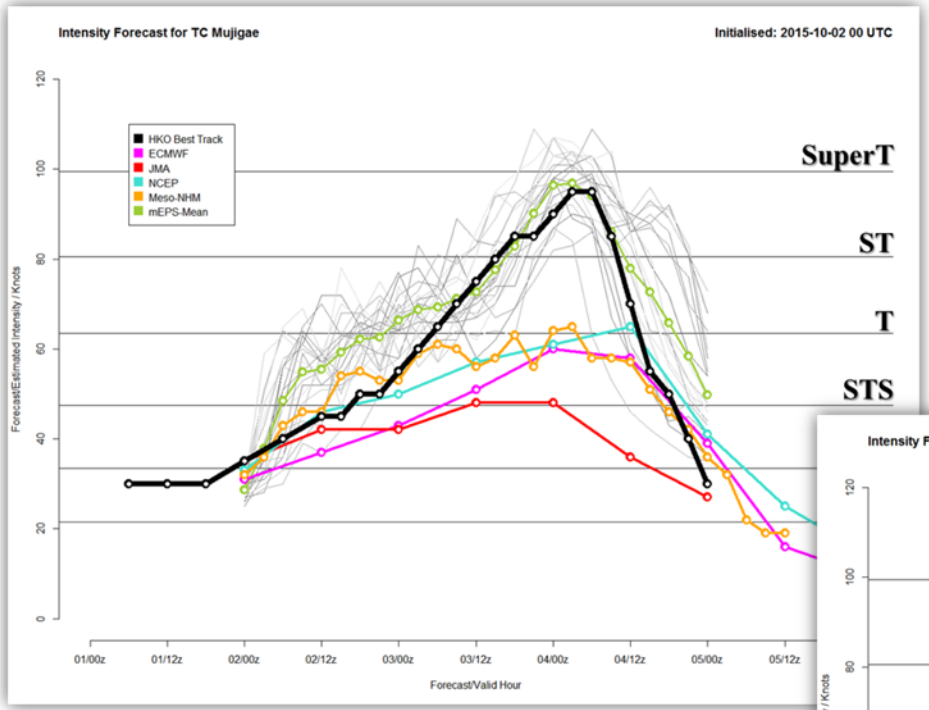


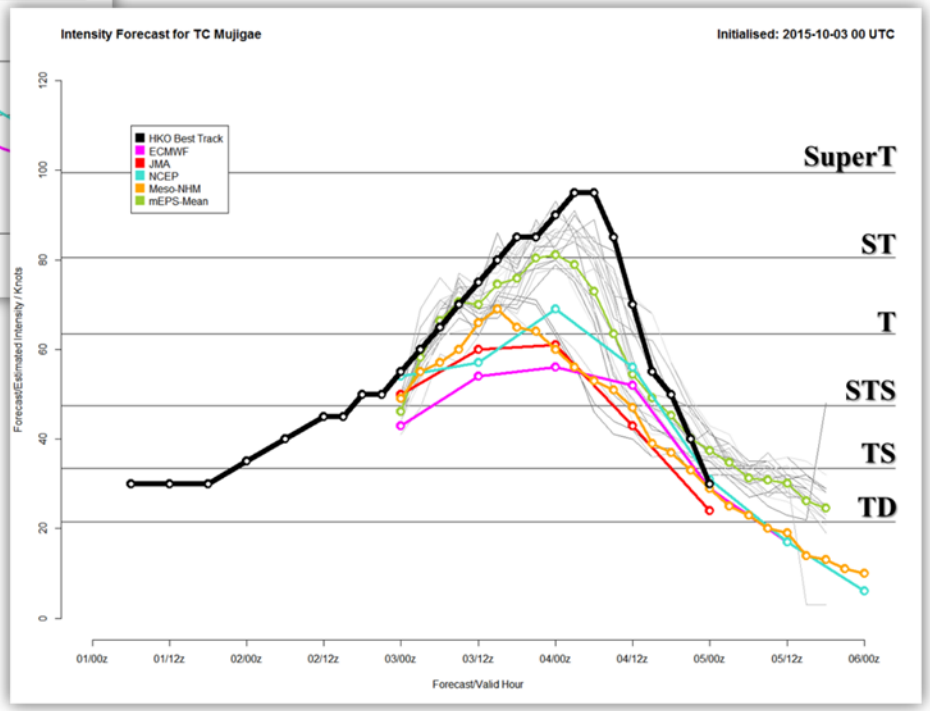
Track Forecast Verification



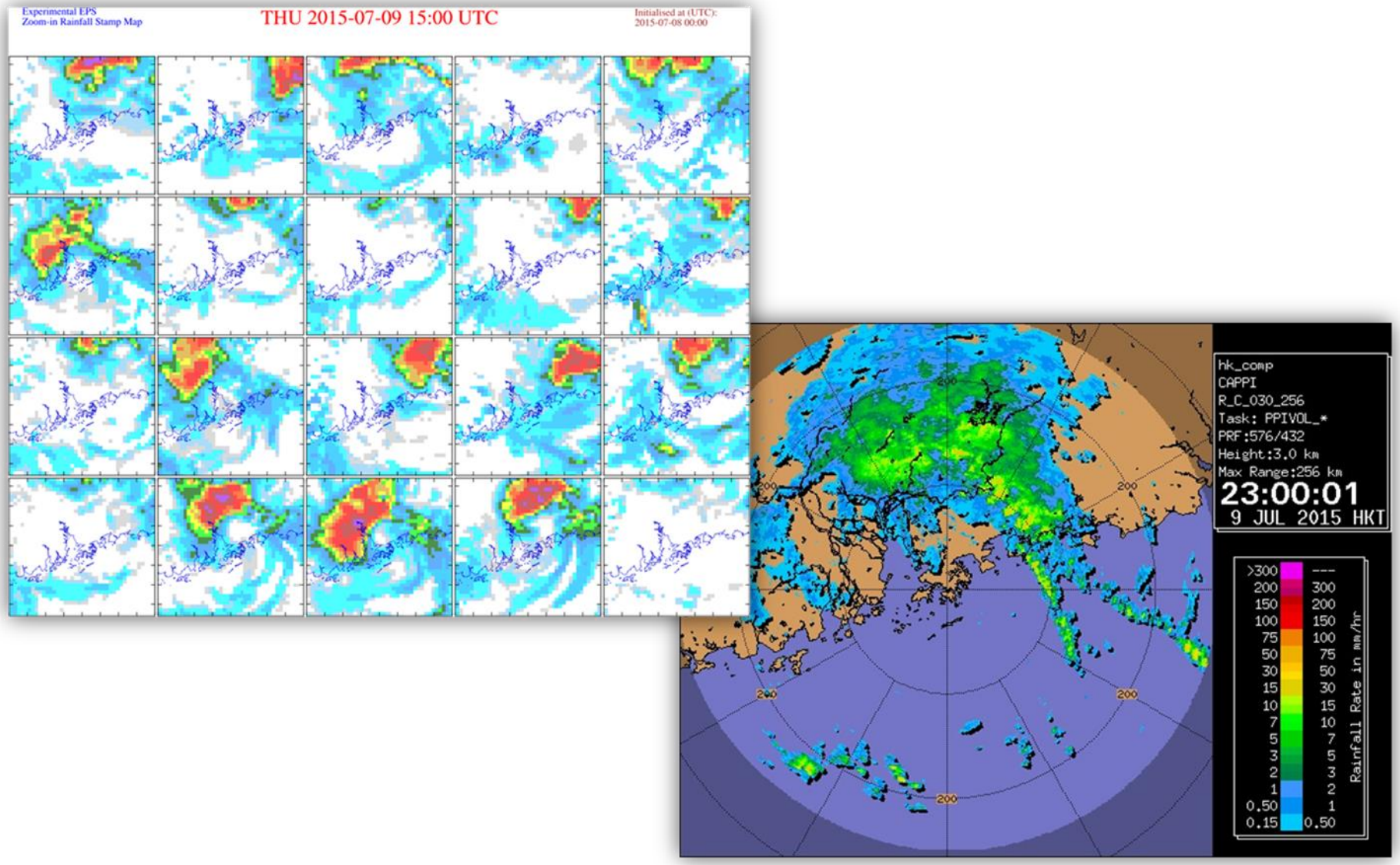


Rapid Intensification of Mujigae





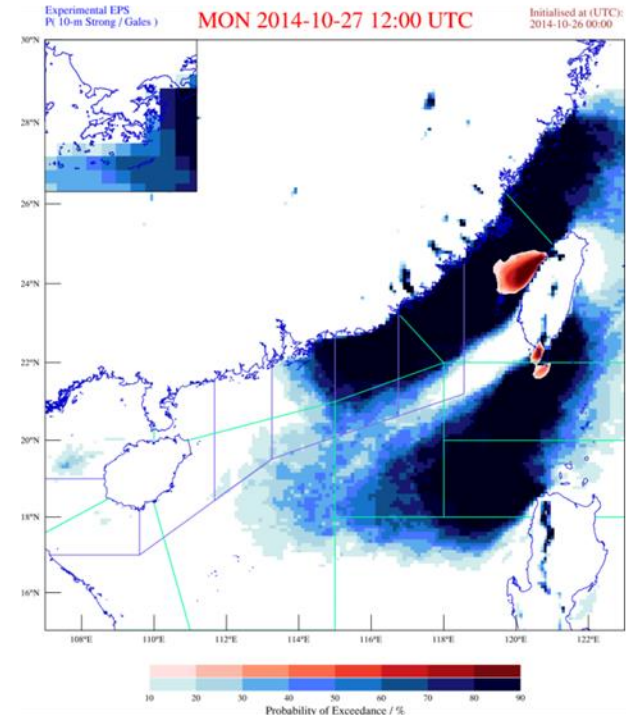
Asymmetric Structure of Linfa (2015)

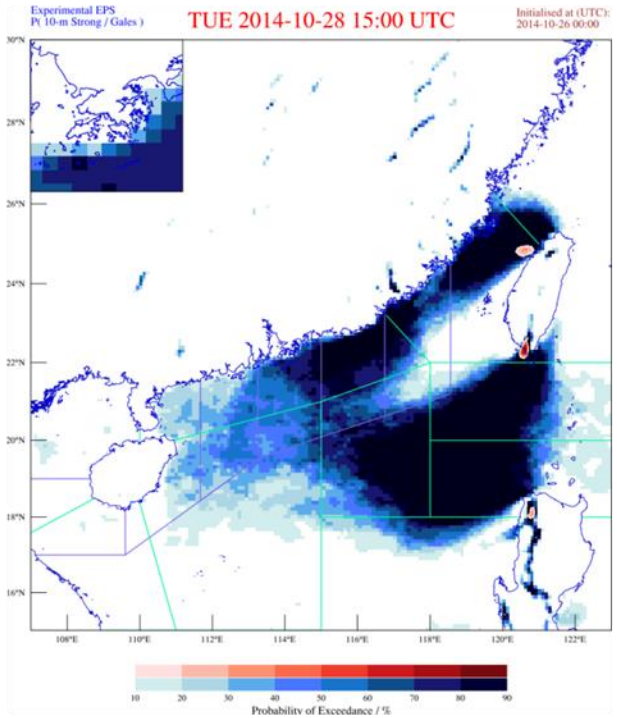


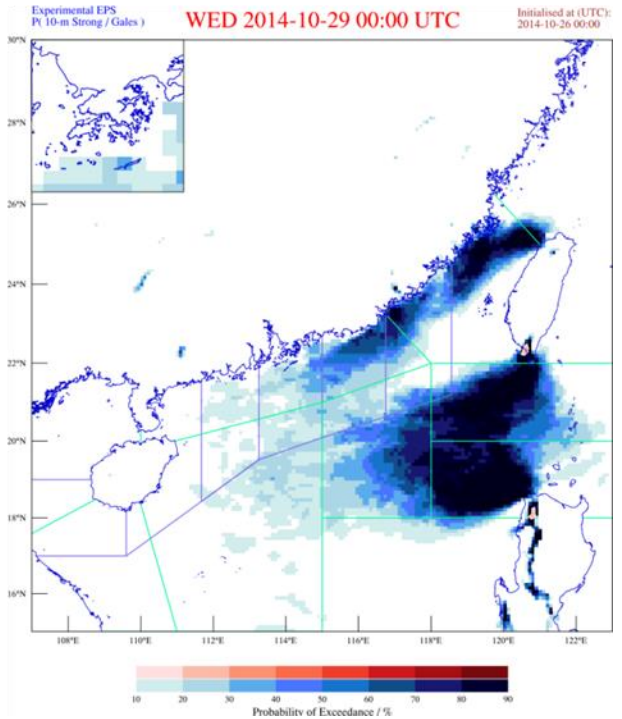
Probabilistic Guidance on Strong/Gale Winds

$$\text{强(烈)风概率} = \frac{\text{该格点10米风速达强(烈)风程度的成员数}}{\text{集合预报总成员数}}$$

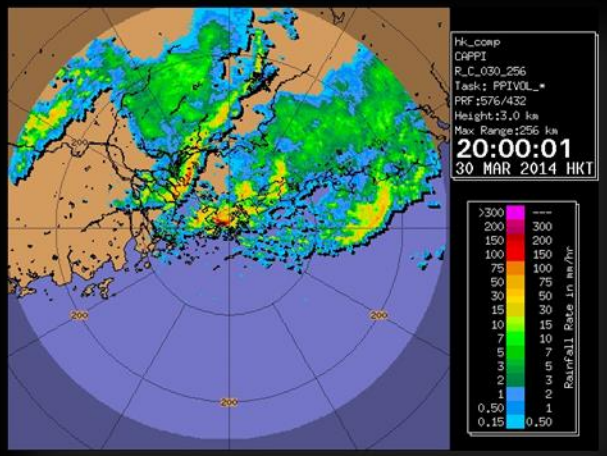
季候風 Monsoons	10月27日 20:10
--	10月29日 09:20





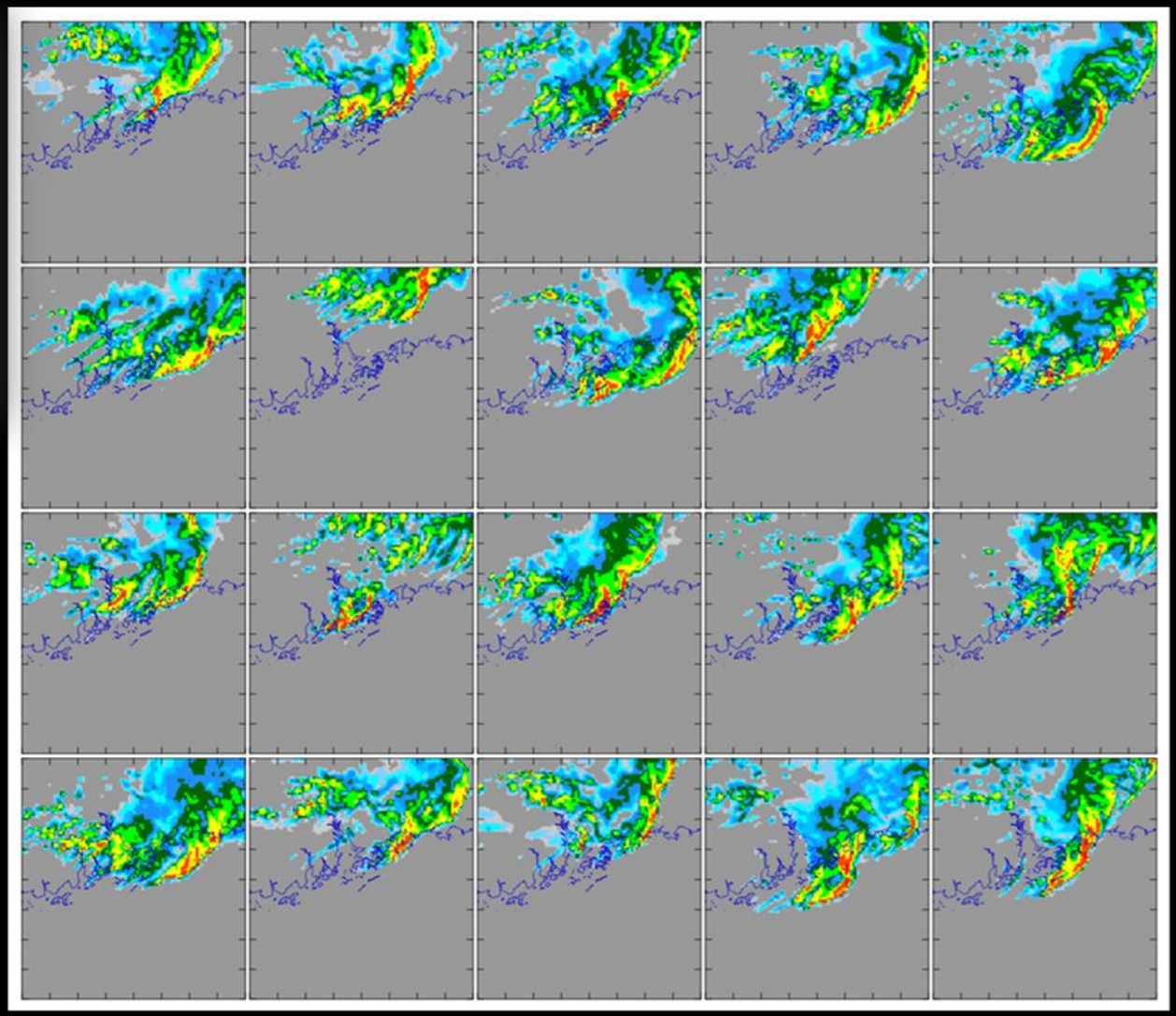


Looking Ahead…



Cloud-resolving EPS:

- **Improved prediction of convective phase**
- **Assimilation of remote-sensing obs.**



Hon (2016): Feasibility studies on cloud-resolving EPS over S. China. Guangdong-Hong Kong-Macau Seminar on Meteorological Technologies, Apr 2016.

香港天文台
HONG KONG OBSERVATORY