The Meting of Regional Sub-project Management Team
of the WMO's SWFDP-SeA

Review on RFSC Hanoi's activities in 2016 & 2017

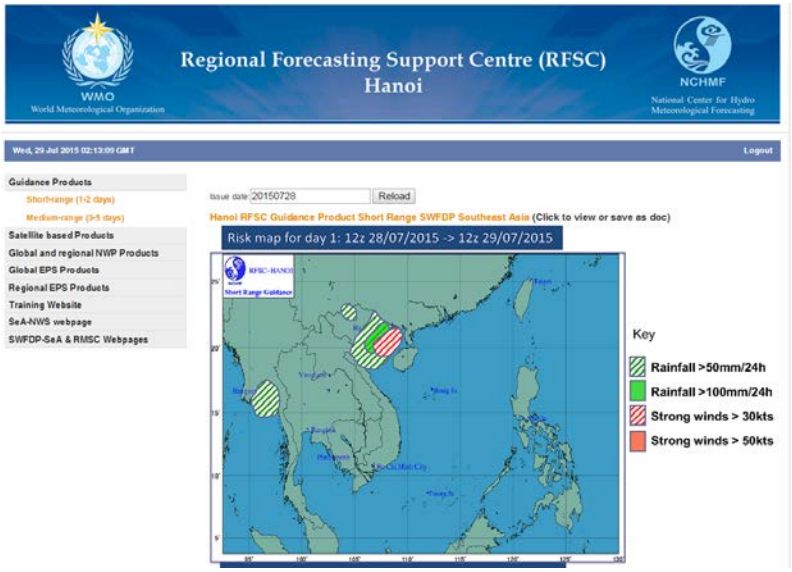
NWP and Remote Sensing Division
NCHMF

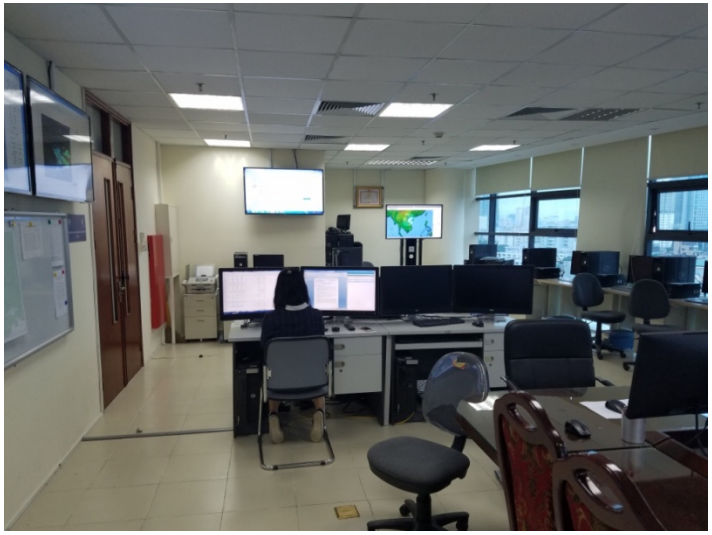
Contents

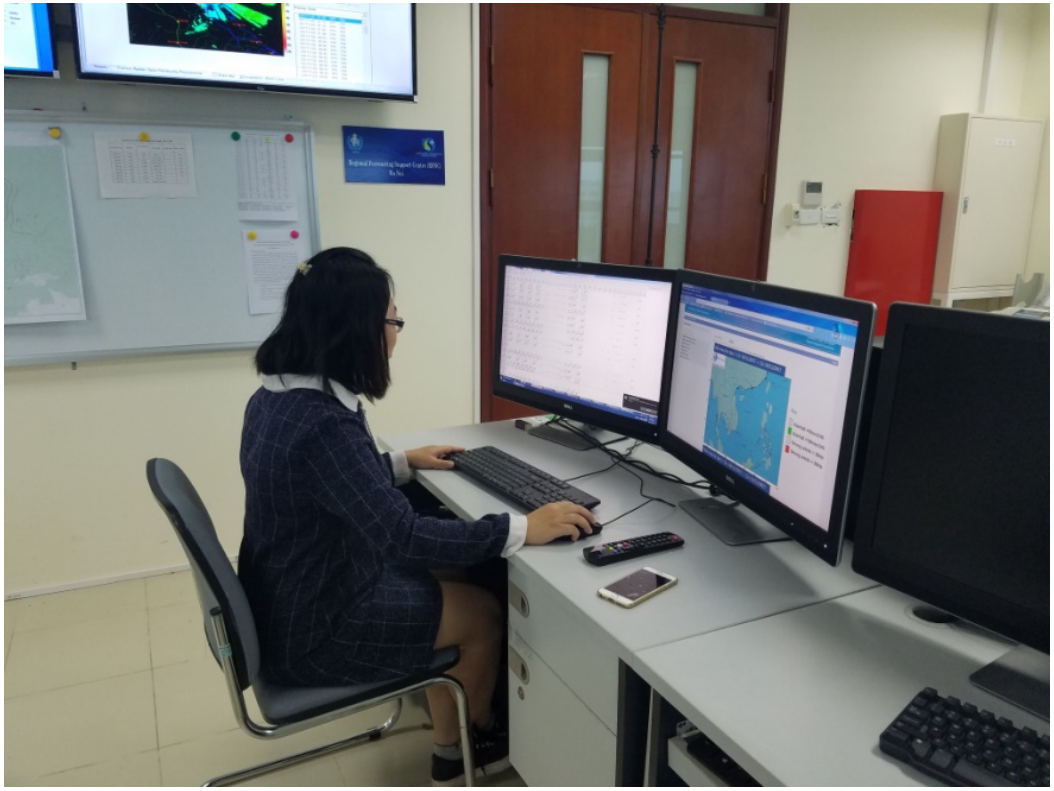
- Brief overview of SWFDP-SeA RFSC Hanoi
- Activities in 2016 and 2017
- Fellowships in ECMWF on NWP verification
- Future plans

Brief overview of SWFDP-SeA RFSC Hanoi

- Sharing at password protected www.swfdp-sea.com.vn website
- Sharing global and regional forecast products (including both deterministic and ensemble)
- Sharing observations over the Southeast Asia domain: satellite data, satellite based products
- Issuing 1-5 days guidance for heavy rainfall and strong wind areas based on NWP products
- **Responsibilities:** NCHMF divisions: i)Numerical weather prediction and remote sensing division; ii) Short range meteorological forecasting division; and iii) Medium and Long range meteorological forecasting division







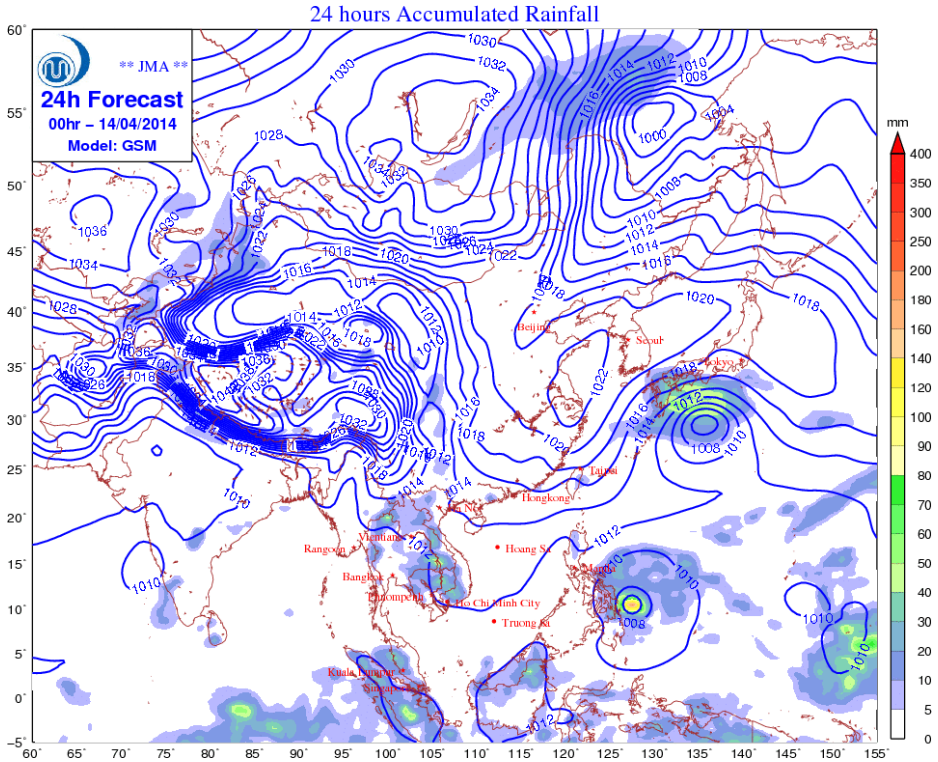
The SWFDP-SeA working desk at main forecasting room, NCHMF

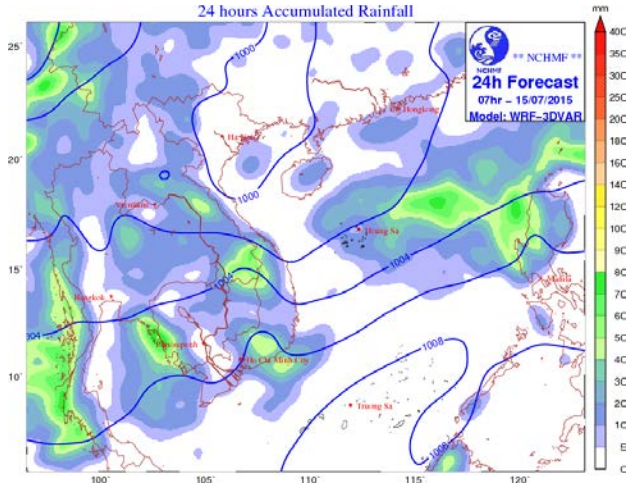
Global and regional forecast products

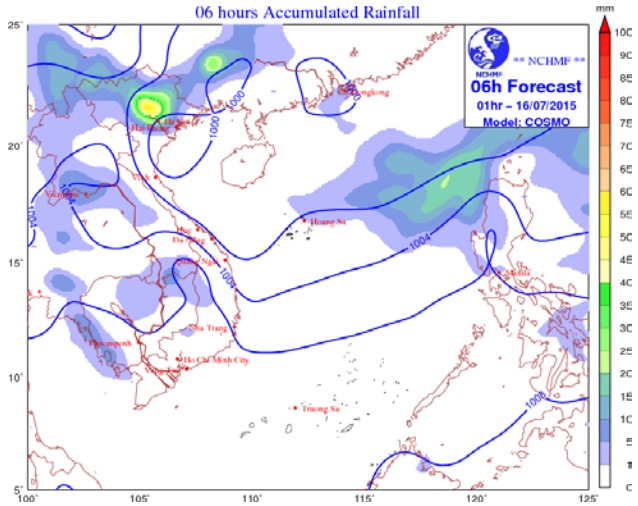
- Global forecast products:
  - GSM (JMA); GME/ICON (DWD); GFS (NCEP); NAEFS (NCEP)
- Regional forecast products:
  - WRF-ARW (15km) and COSMO (7km)
  - Ensemble:
    - SREPS: Short range EPS (1-3 days) based on running HRM, WRF-ARW, and WRF-NMM models with 5 difference global models for boundary conditions (GME/ICON, GEM, GFS, GSM, NAVGEM), 15kmx15km

STT	Scale	Type	Model name	resolution	Center	Ranges	cycles
1	Global	Deterministic	GFS	50km	Mỹ (NCEP)	1-5 days	4 cyc (00z, 06z, 12z, 18z)
2		Ensemble	GEFS/NAEFS	110km		1-10 days	2 cyc (00z, 12z)
3		Deterministic	GSM	50km	JMA	1-3 days	4 cyc (00z, 06z, 12z, 18z)
4		Deterministic	GSM	25km		1-3 days	2 cyc (00z, 12z)
5		Deterministic	IFS	14km	ECMWF	1-10 days	2 cyc (00z, 12z)
6		Ensemble	VarEPS	50km		1-10 days	2 cyc (00z, 12z)
7		Deterministic	GEM	50km	Canada (CMC)	1-3 days	4 cyc (00z, 06z, 12z, 18z)
8		Deterministic	GME/ICON	50km	DWD	1-3 days	4 cyc (00z, 06z, 12z, 18z)
9		Deterministic	NAVGEM	50km	US-Navy	1-3 days	4 cyc (00z, 06z, 12z, 18z)
10	Regional	Deterministic	WRF-ARW	15km	NCEP	1-3 days	4 cyc (00z, 06z, 12z, 18z)
11		Deterministic	HRM	14km	DWD	1-3 days	4 cyc (00z, 06z, 12z, 18z)
12		Ensemble	SREPS (HRM, WRF-ARW, WRF-NMM, MM5, BOLAM)	15km	NCHMF	1-3 days	4 cyc (00z, 06z, 12z, 18z)
13		Deterministic	COSMO	7km	DWD	1-2 days	1-2 cyc (00z, 12z)

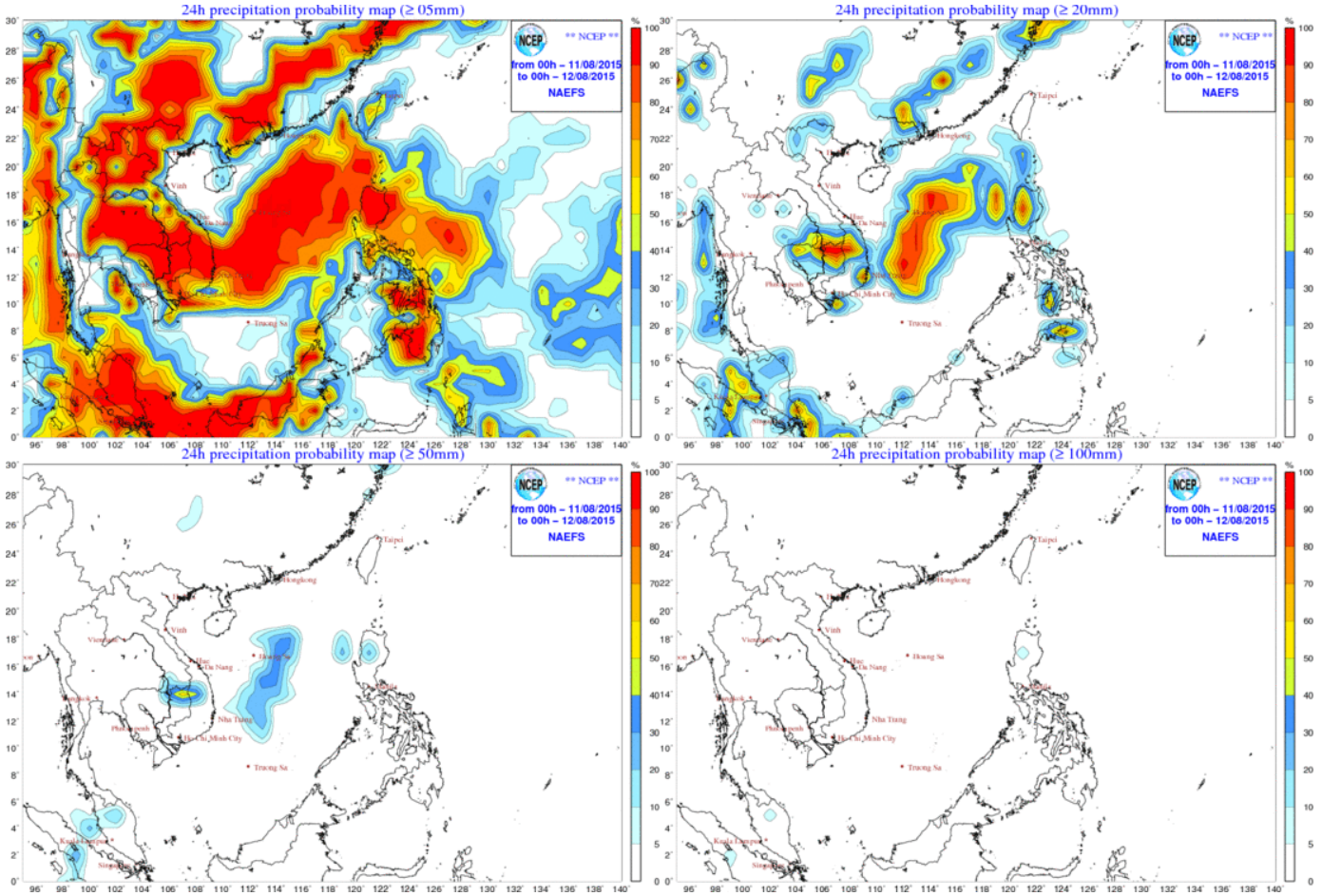
Examples of deterministic products





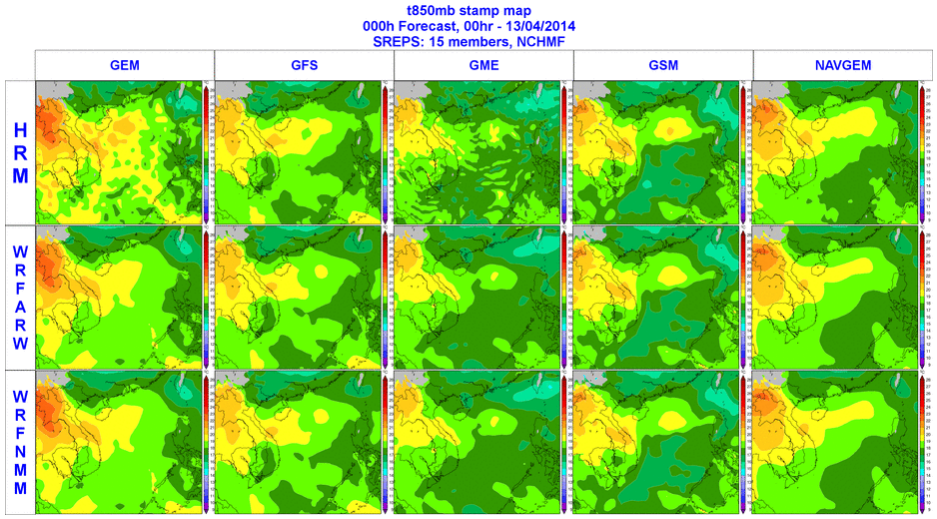


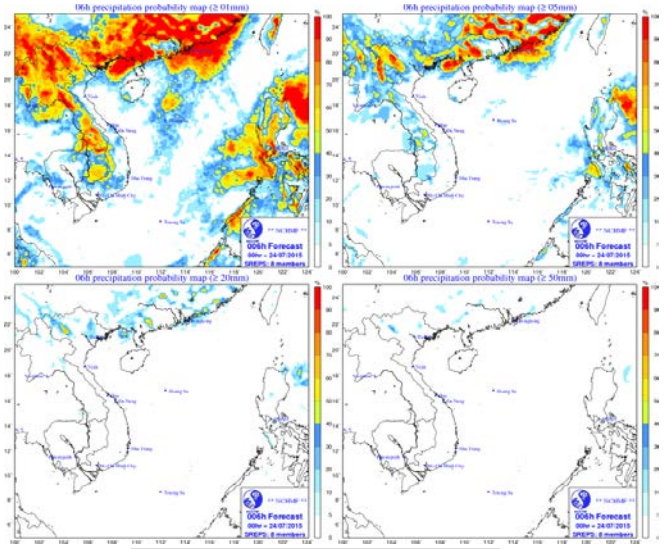
Example of global ensemble forecasts: GEFS/NCEP (21 members)



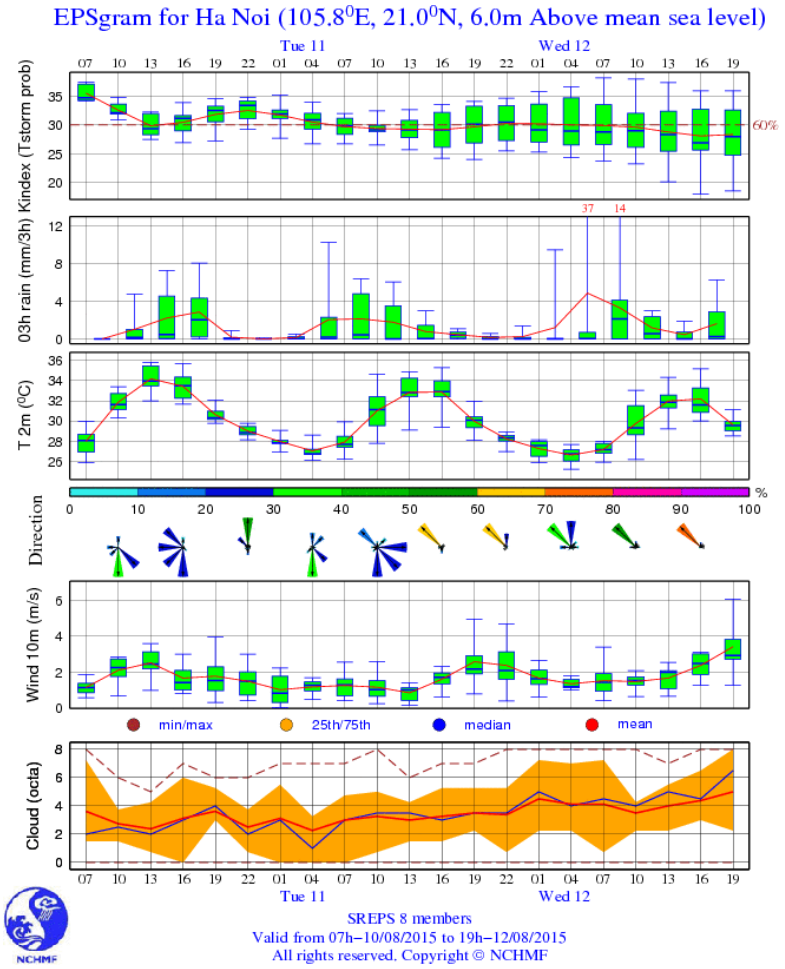
24h precipitation probability maps at different thresholds

Example of regional ensemble forecasts: SREPS



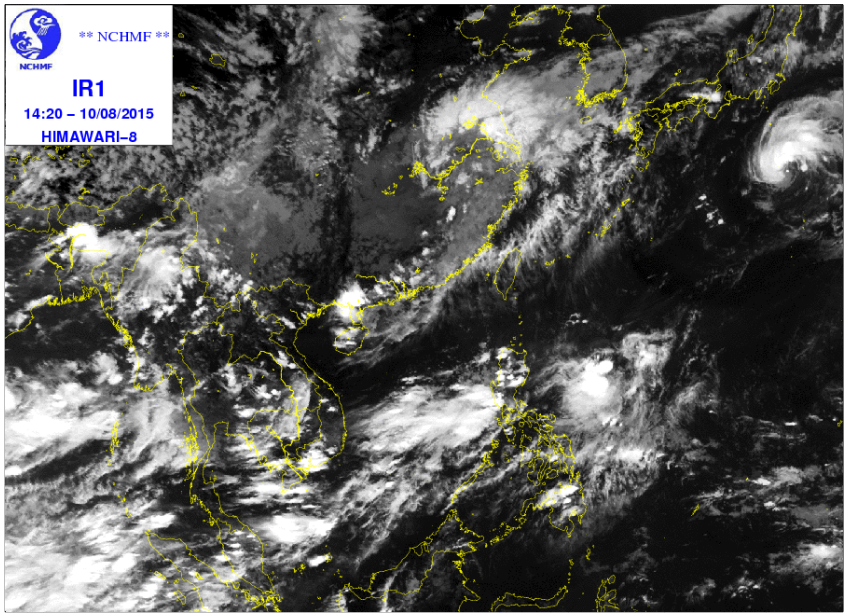


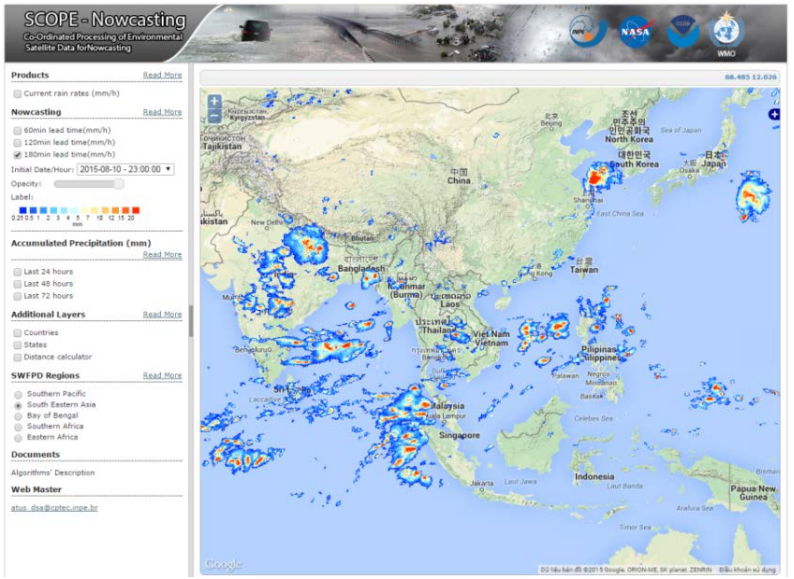
Probability maps



EPSgram for specific locations

Satellite products: Himawari 8/9 and SCOPE NWC nowcasting products





Current and 1-3h nowcasting

Guidance products

- One of the main purposes of SWFPD-SeA is to provide the guidance (summarizing the NWP products) up to 5 days related to severe weather phenomena
- The NHMs can use the SWFDP-SeA guidance to enhance their forecasts
- Two kind of guidance products:
  - The short range guidance: from 1 to 2 days
  - The medium range guidance: from 3 to 5 days
- Criteria are used:
  - Heavy precipitation: > 50mm/24h & > 100mm/24h
  - Strong Winds: > 30 Knots (over land and Sea) > 50 Knots (over Sea)

Guidance products

- Main contents of the guidance:
  - Current synoptic situations (1-2 days, supplementing with current satellite images and surface analysis maps of NCHMF) and longer expectations (3-5 days, analyzing the large scale trends from global model systems (GFS, GSM and ECMWF))
  - The risk situations for strong wind and heavy rainfall with above criteria for each day.
  - The comments about the degree of confidence for risk areas (high, medium and low)
  - The risk maps and risk table for each day

Guidance products

- ***The synoptic situations*** are focused on the following items:
  - The activities of sub tropical high system, the western heat low system, the Inter Tropical Convergence Zone (ICTZ) and South west monsoon
  - Enhanced monsoon flow across the NE Sea.
  - Equatorial Rossby Wave.
  - An extending upper trough enhancing the cold surge.
- ***The degree of confidence:***
  - Based on agreements of the different models and agreements of the latest running cycles and other previous running cycles
  - The low confidence related to the high variable weather situations
  - The medium/high confidence related to the medium/high probability in forecasting for the heavy rain or strong wind phenomena

Example of short range guidance for SWFDP-SeA

Annex - C: Example of short range guidance for SWFDP-SEA

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Regional Forecasting Support Centre (RFSC)
Hanoi

WMO World Meteorological Organization

NCHMF National Center for Hydro Meteorological Forecasting

RFSC Guidance Product for SWFDP-Southeast Asia

SHORT-RANGE (DAY 1 and DAY 2)

***Issue time*: 0800Z Tue 28th July, 2015**

***Valid time*: DAY1: 1200Z Tue 28th to 1200Z Wed 29th July 2015**
DAY2: 1200Z Wed 29th to 1200Z Thu 30th July 2015

Preamble

RFSC Guidance Products are based on a skillful evaluation of both Global and Regional model outputs for the domain area, satellite imagery at the hour of the issue and, expert interpretation that takes into consideration interactions with the local features. For generating the guidance products, the following criteria are used:

- Heavy precipitation: > 50mm/24h & > 100mm/24h (the risk over 200mm/24 shall be described in discussion text)
- Strong Winds: > 30 Knots (over land and Sea) > 50 Knots (over Sea)

Assessment Scale for the Degree of Confidence of Forecast:

Confidence Level >75% (High); Confidence Level 50-75% (Medium); and Confidence Level <50% (Low)

Synoptic Situation BOTH DAYS:

Over the Southeast Asia domain:

- A trough having axis along 21°N – 23°N is across the north of Vietnam with a low pressure area during next 24 and 48 hours.
- The southwest monsoon prevails over the Andaman Sea and Thailand Gulf.

Risk over Southeast Asia domain next 24h and 48h

- The risk of heavy rain is expected over:
  - The northeast of Vietnam and Tonkin Gulf in DAY 1 and DAY 2.
- The risk of strong wind is expected over:
  - The Tonkin Gulf of Vietnam in DAY 1 and DAY2.

Degree of Confidence for DAY ONE:

- The northeast of Vietnam area and the Tonkin Gulf area are high haevy rain confidence coming from all the models with threshold 50 – 160mm/24h.
- The Tonkin Gulf area is medium strong wind confidence coming from 50% models with threshold >30kts.

Degree of Confidence for DAY TWO:

- The northeast of Vietnam area and the Tonkin Gulf area are high haevy rain confidence coming from all the models with threshold 50 – 160mm/24h.
- The Tonkin Gulf area is medium strong wind confidence coming from 50% models with threshold >30kts

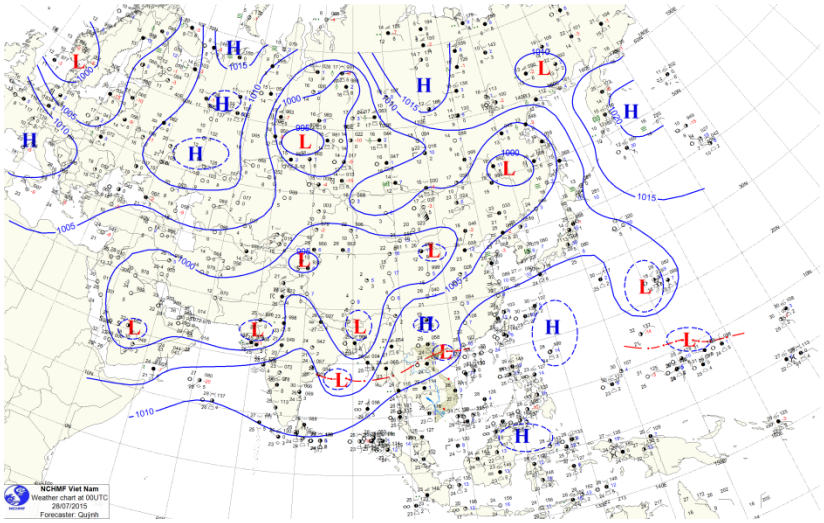
Surface analysis maps:

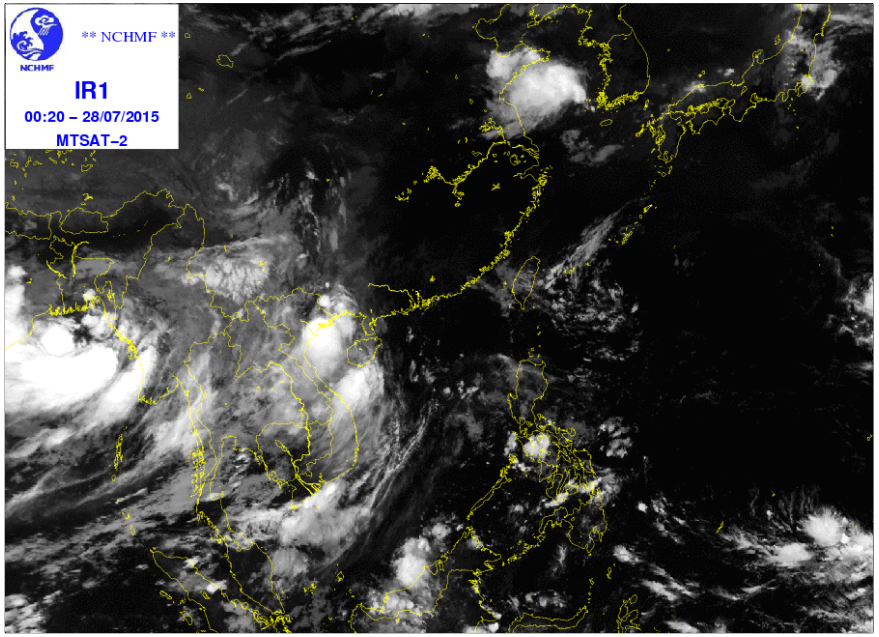
***Issue time*: 0800Z Tue 28th July, 2015**

***Valid time*: DAY1: 1200Z Tue 28th to 1200Z Wed 29th July 2015**
DAY2: 1200Z Wed 29th to 1200Z Thu 30th July 2015

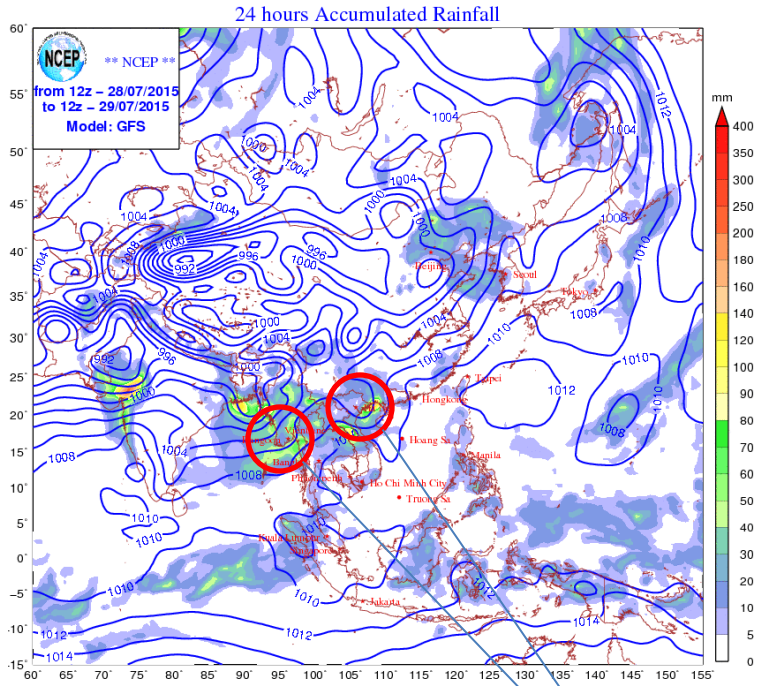
Example of discussion on current synoptic situation and supplment maps for the guidance on Tue 28th July, 2015

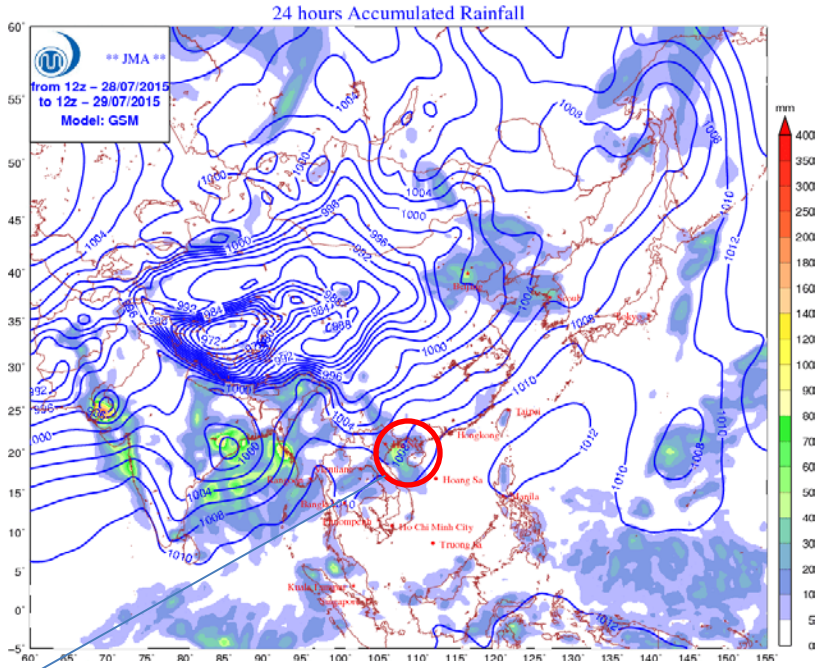
- **Synoptic situation BOTH DAYS:**
  - Over the Southeast Asia domain:
  - A trough having axis along 21^{O}N – 23^{O}N is across the north of Vietnam with a low pressure area during next 24 and 48 hours.
  - The southwest monsoon prevails over the Andaman Sea and Thailand Gulf.





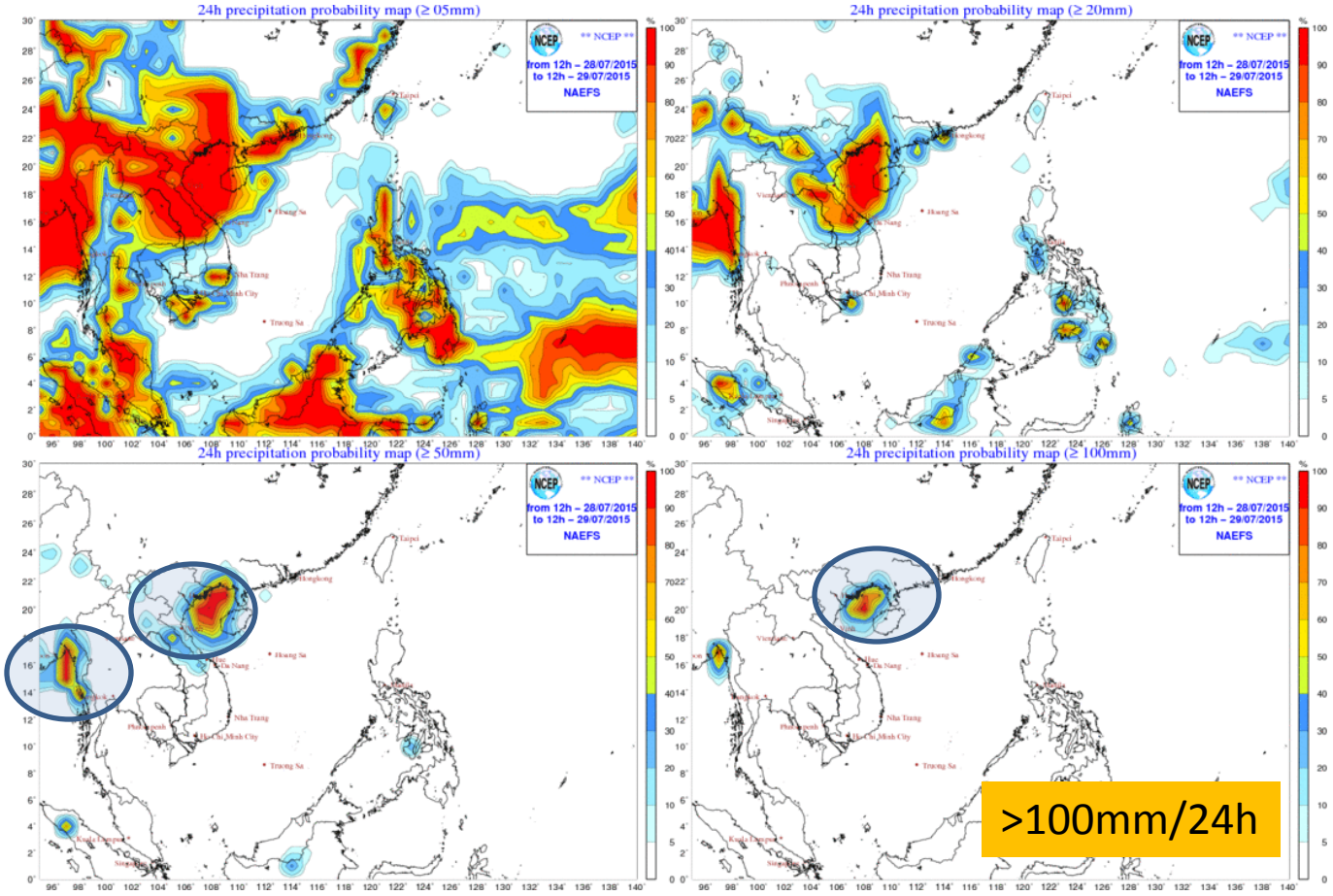
Global deterministic forecasts





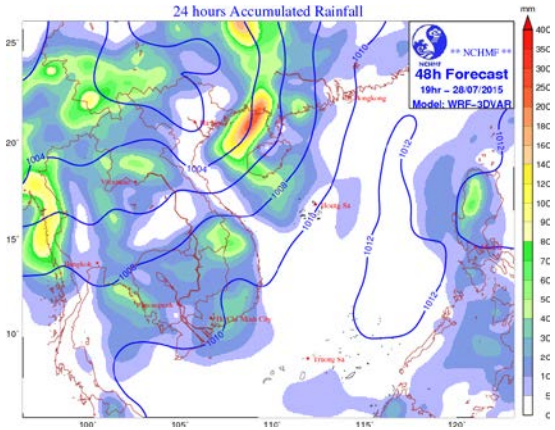
Two areas in GFS and one area in GSM forecasts

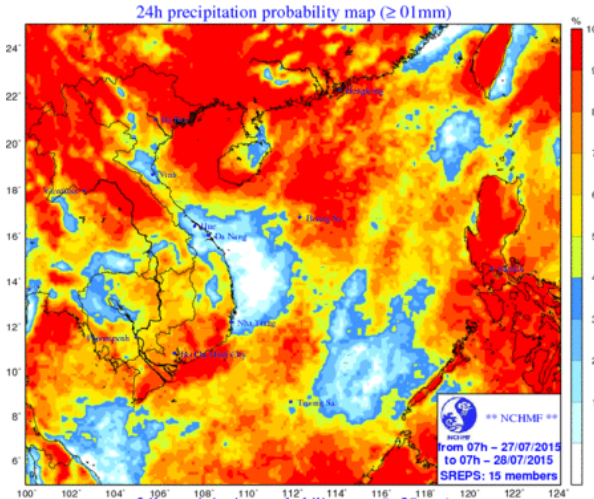
Global ensemble forecasts

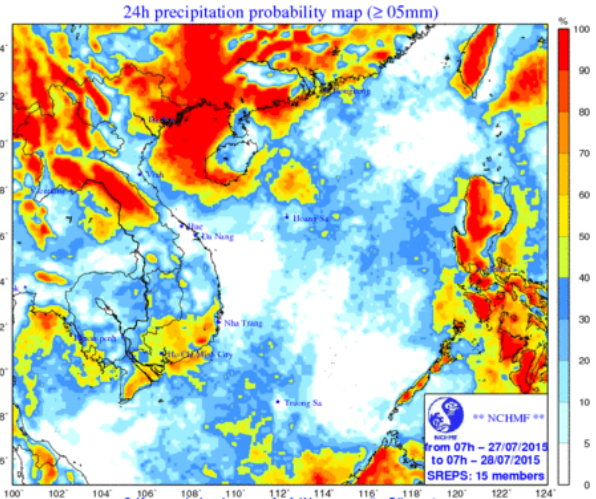


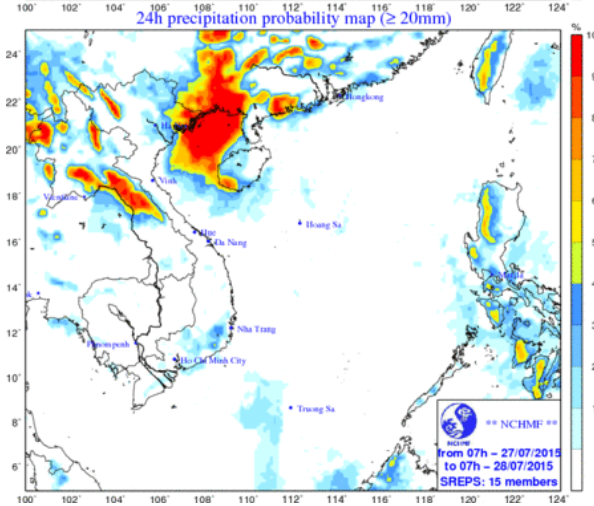
High probability for two areas over 50 mm/24h and one area over 100 mm/24h

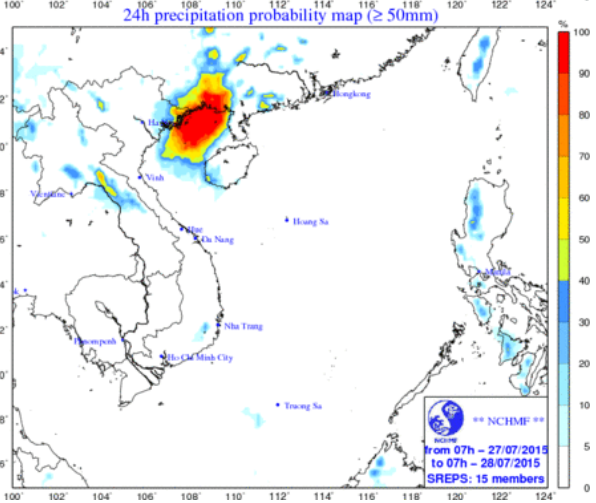
Regional forecasts



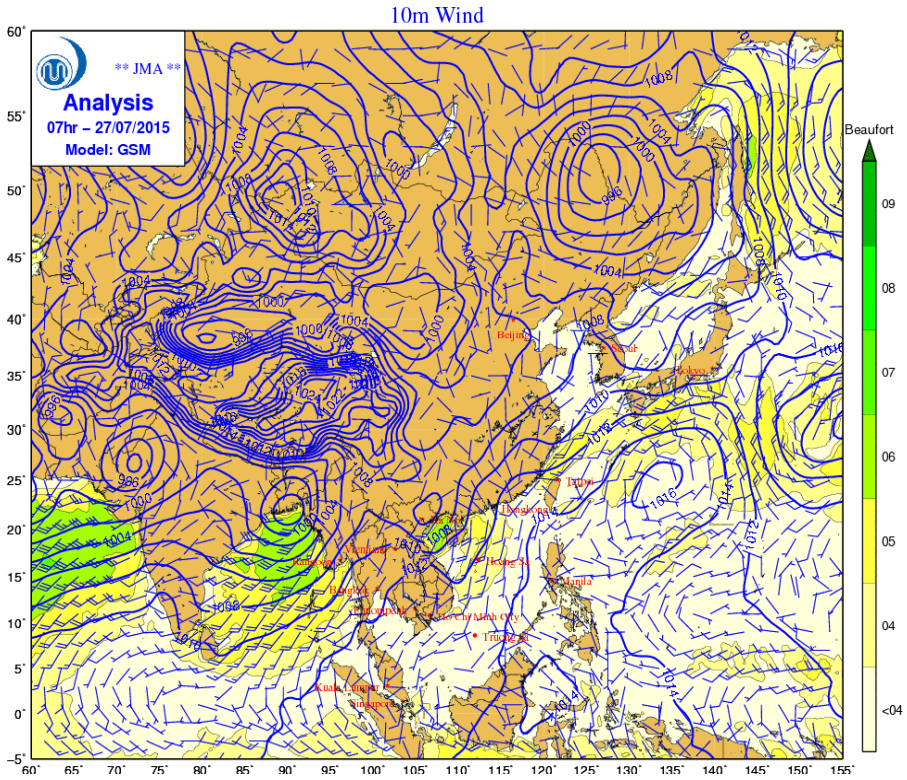


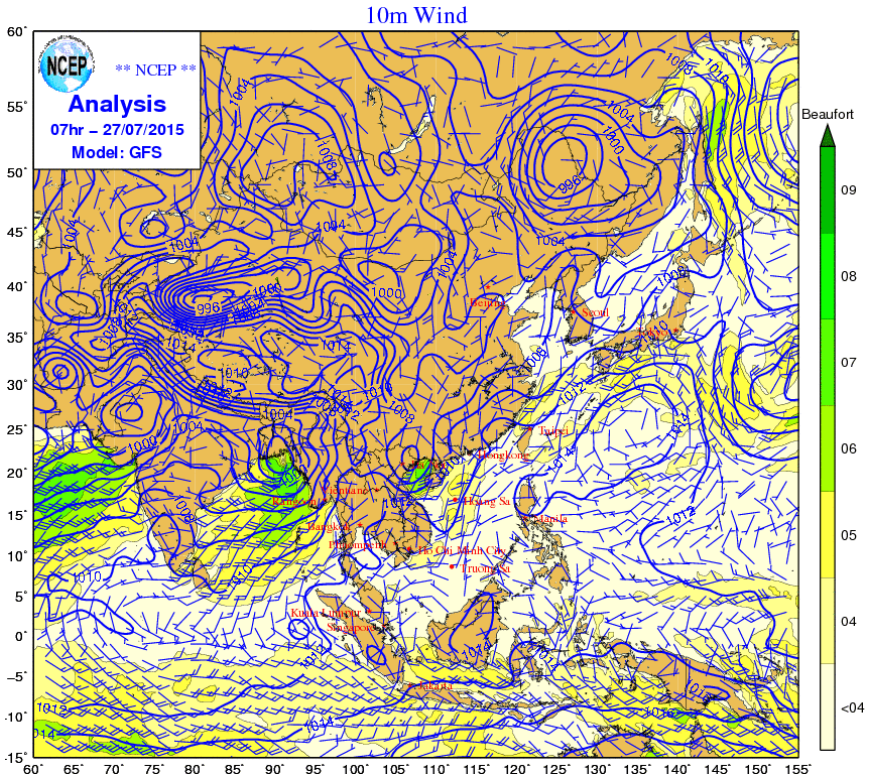




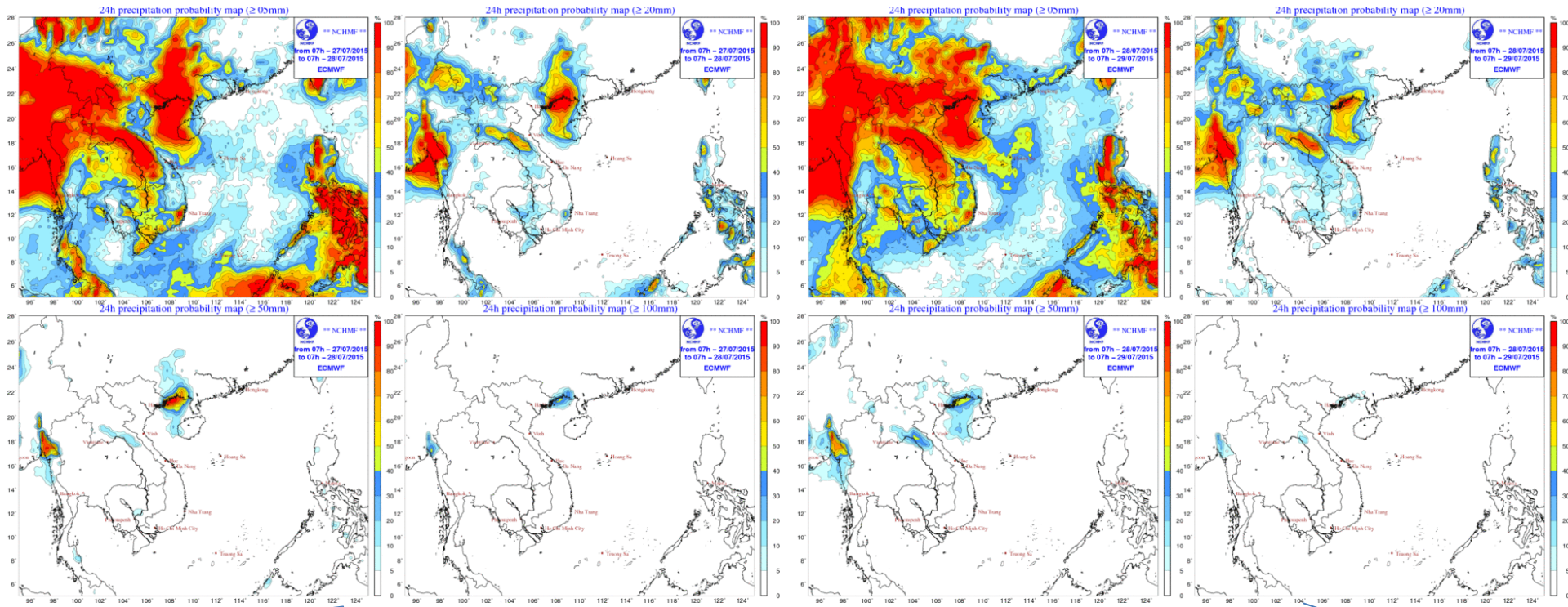


Surface wind forecast from global systems





24h acc. Prec.
from ECMWF ensemble system

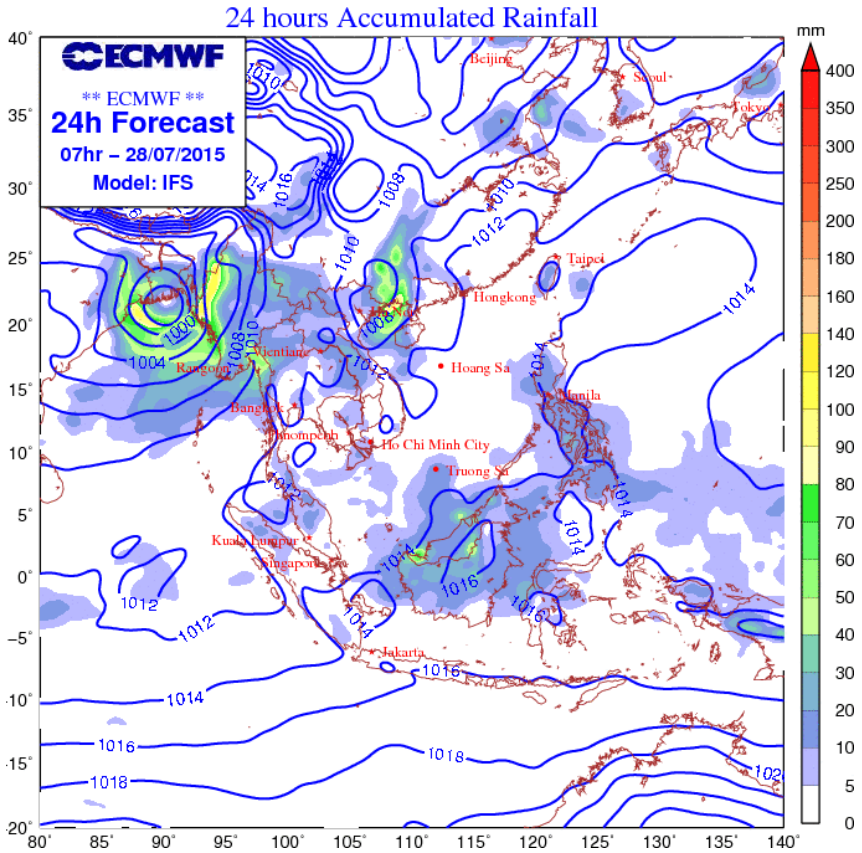


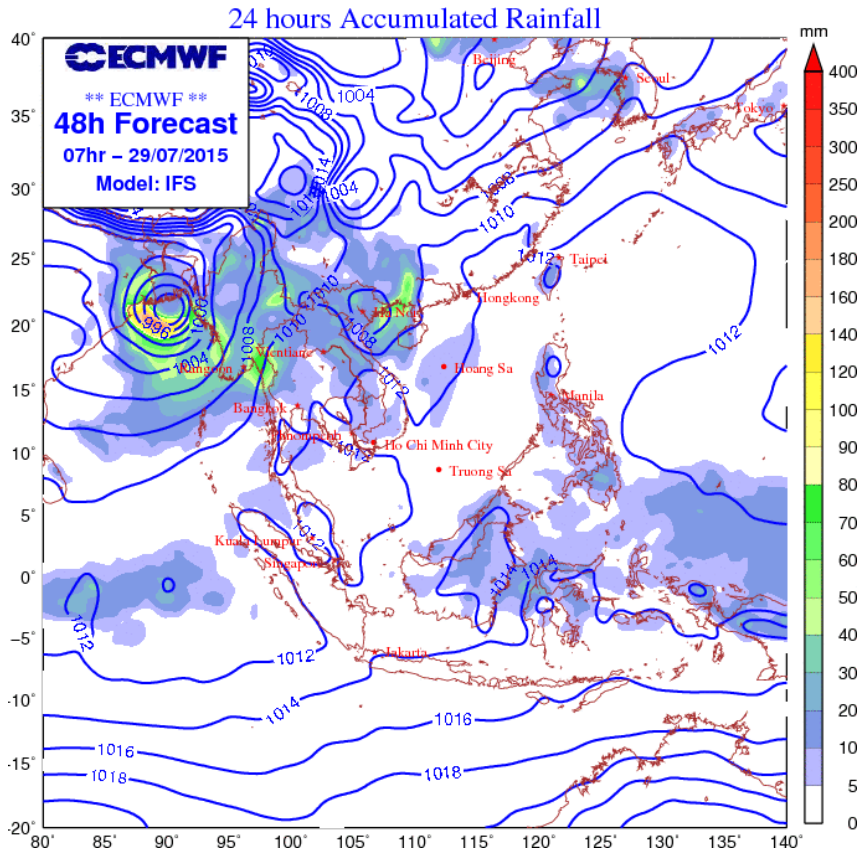
00Z 27-28/7

00Z 28-29/7

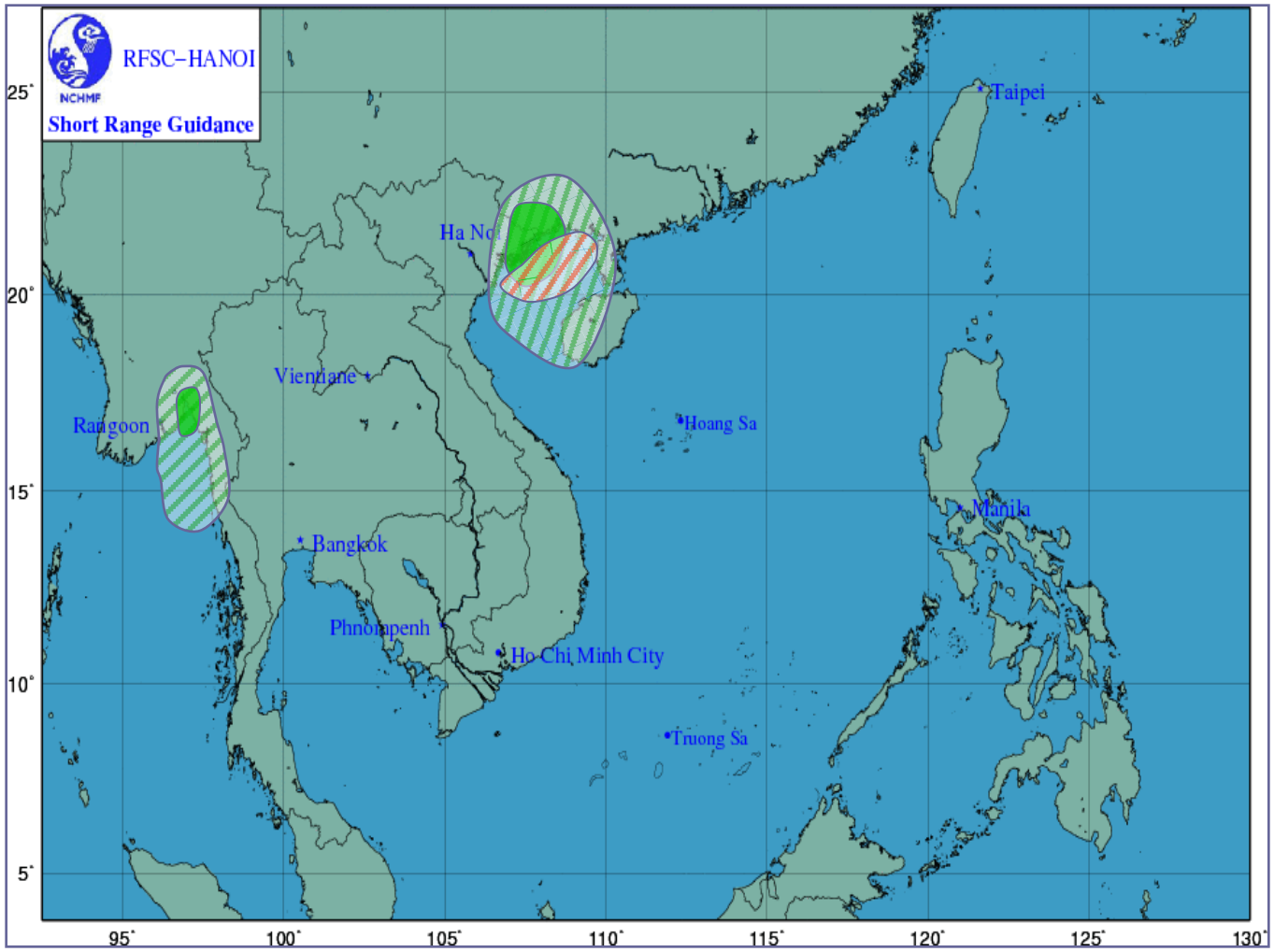
> 50mm/24h & >100 mm/24h thresholds

24h acc. Prec. from ECMWF





Risk map for day 1: 12z 27/07/2015 -> 12z 28/07/2015



Key

- **Rainfall >50mm/24h**
- **Rainfall >100mm/24h**
- **Strong winds > 30kts**
- **Strong winds > 50kts**

Analysis map by forecaster

Example of the medium range guidance

Medium synoptic situation expectations:

Over the Southeast Asia domain:

- A trough having axis along 21°N – 23°N is across the north of Vietnam with a low pressure area. The activity of this trough is expected to be stronger next few days.
- The southwest monsoon prevails over the Andaman Sea and Thailand Gulf

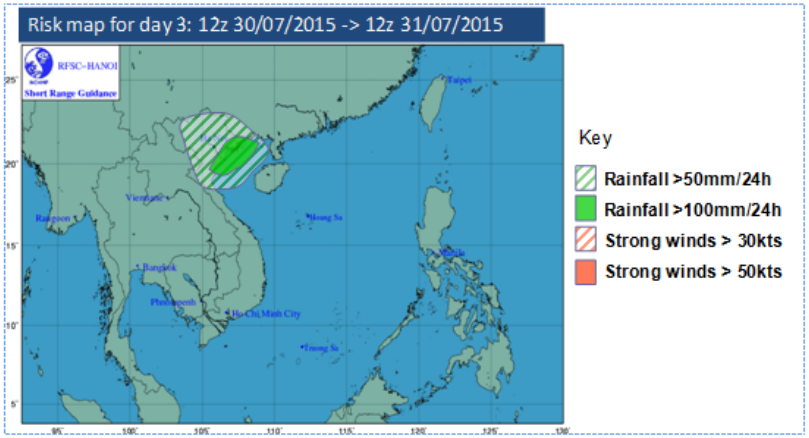
Risk over Southeast Asia domain next 72h, 96h and 120h

- The risk of heavy rain is expected over the northeast of Vietnam and Tonkin Gulf (northeast of Vietnam) in DAY 3, DAY 4 and DAY 5.

Degree of Confidence:

- The northeast of Vietnam and the Tonkin Gulf area are medium heavy rain confidence coming from 50% forecast models with threshold 50 – 120mm/24h in DAY 3.
- The north of Vietnam and the Tonkin Gulf area are medium heavy rain confidence coming from 50% forecast models with threshold 40 – 100mm/24h in DAY 4 and DAY 5.

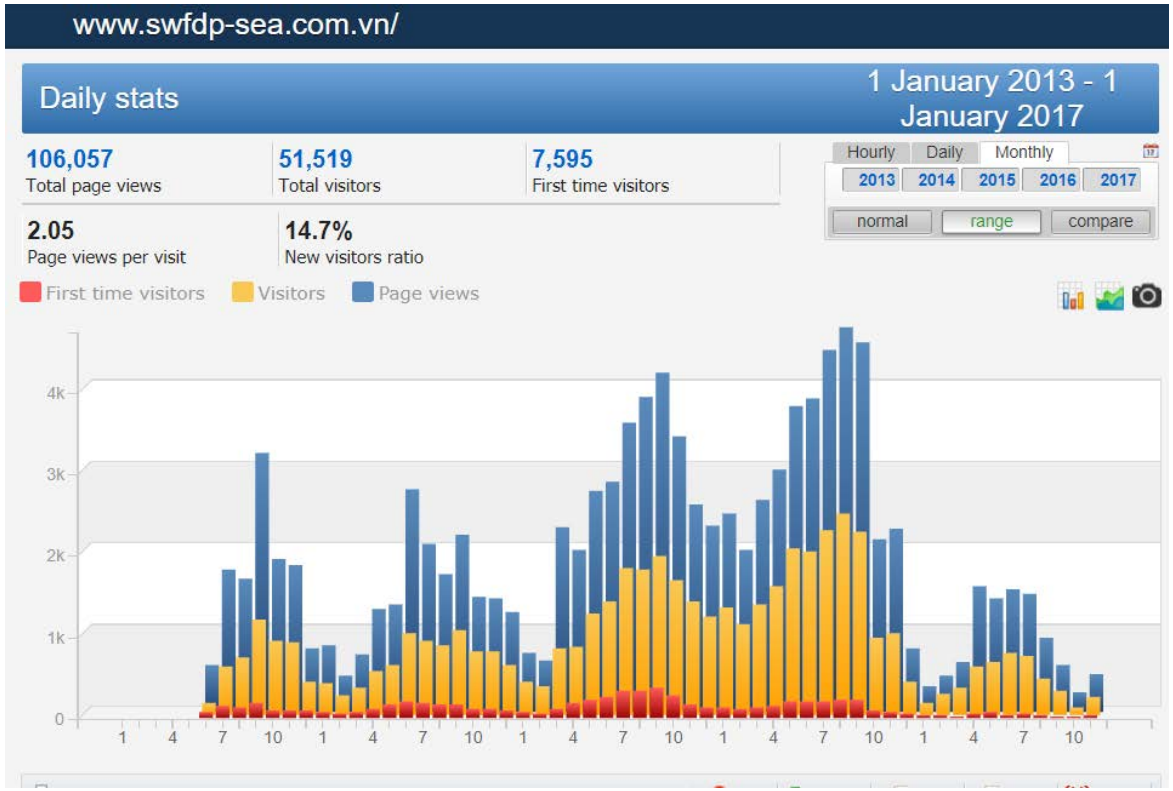
Risk maps:



Main activities in 2016 and 2017

- Moving to the third phase or demonstration phase of the project: the guidance has been providing operationally everyday since 1/1/2016 for short range guidance and medium range
- Restricting access of swfdp-sea web portal to the SWFDP-SeA's members only (Sep-2016)
- The HimawariCast receiving and processing System:
  - installed in NHMSs in 2015 under the support of WMO and JMA
  - re-locating system helping in the new building in 2017 (Oriental Electronics, JMA, WMO)

Acessing swfdp-sea.com.vn website from 1/2013 to 11/2017



2013 2014 2015 2016 2017

End of 2016: building moving
10/2017:maintenance

9/2016: restrict users with new passwords for each member

WMO Fellowship in ECMWF: 2016-2017

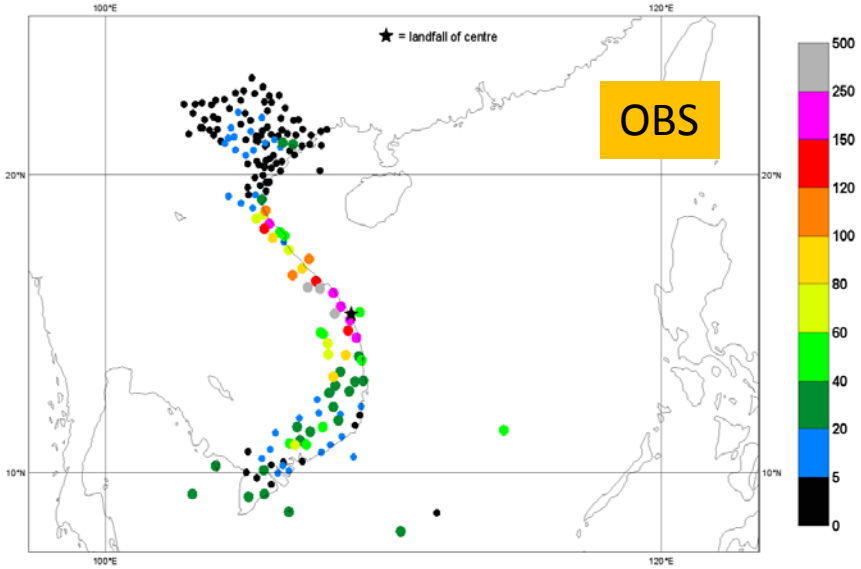
- NCHMF's staff: Mr. Nguyen Thanh Tung

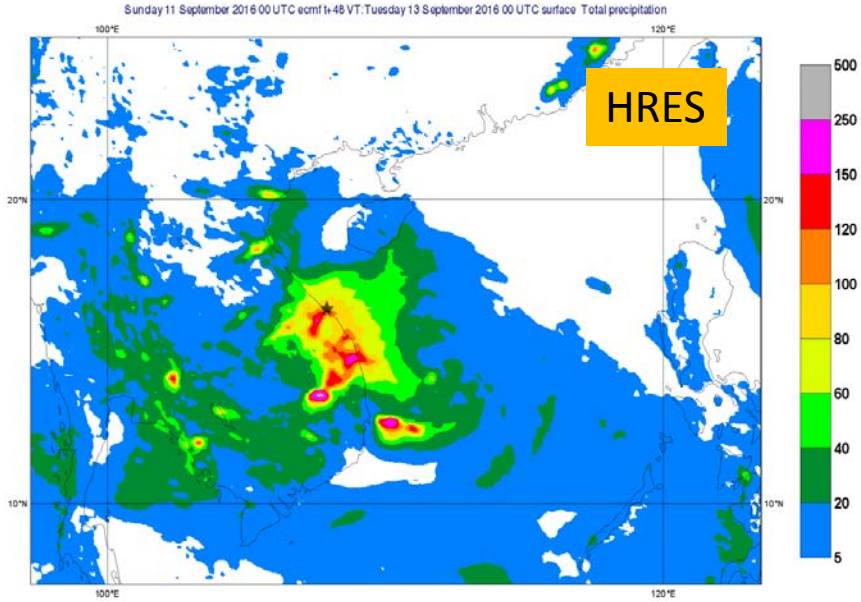
- Time: From 1 September 2016 to 31 August 2017

- Familiarisation with ECMWF's tools (metview, ecCharts...)
- Occasionally attendance at the ECMWF Annual Seminar – 5-8 Sep
- Full attendance at Visualisation training course at ECMWF (26-30 Sep)
- Full attendance at products training course at ECMWF (3-6 Oct)

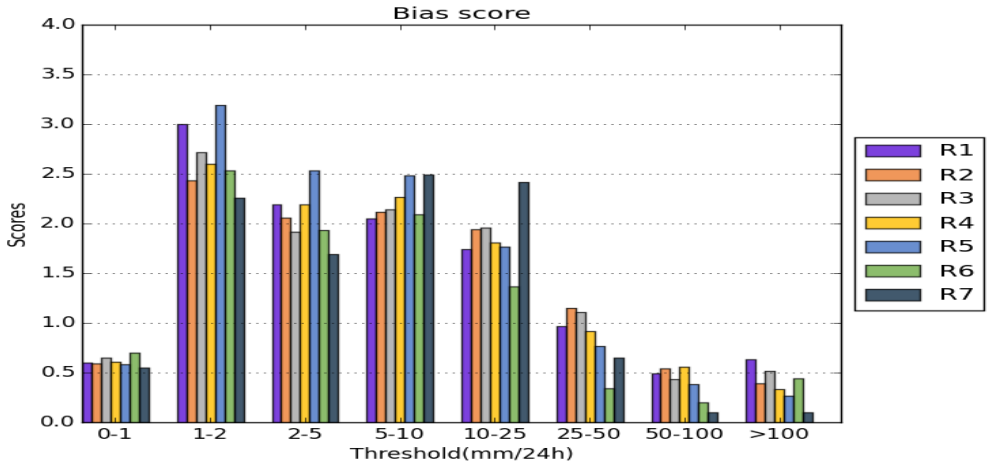
- Developing the mechanism for storing old and real-time Vietnamese rainfall reports at ECMWF
- Investigating biases and characteristics of HRES and Control run in rainfall forecasts for Vietnam, in time ranges of 0-6 days.
- Making plans for training activities for colleagues at the NMHS in Vietnam and to the wider community of the SWFDP SEAsia

Vietnam rainfall data display with Metview (24 hours observation rainfall at 00Z, 11th September, 2016)

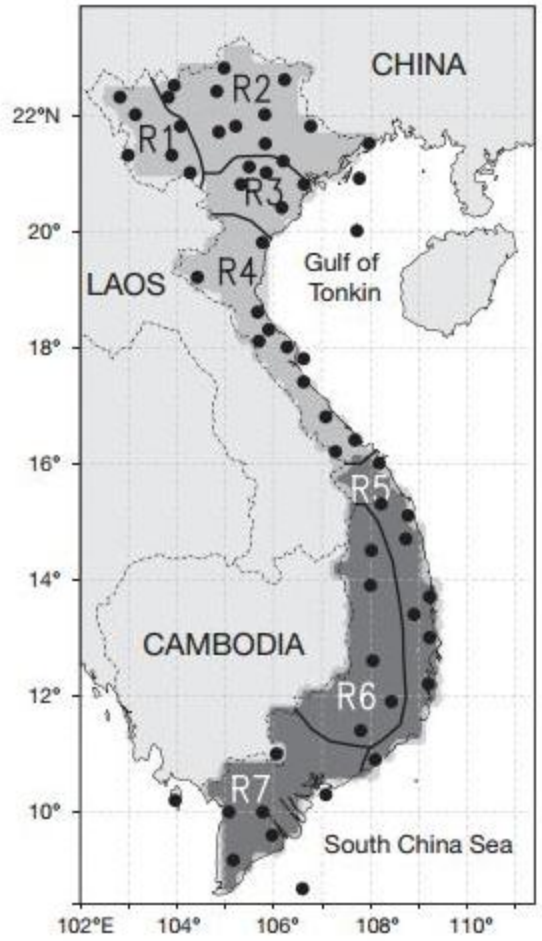




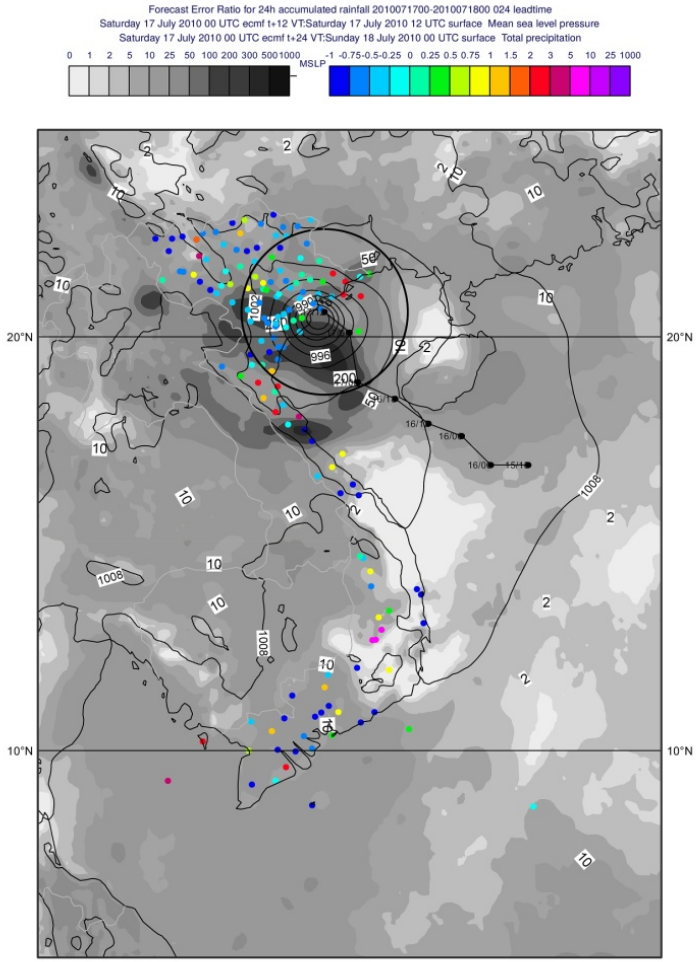
Precipitation 24h accumulated bias and skill scores between HRES and observation with 7 sub-regions from Vietnam in 10 years (2007-2016) in different thresholds

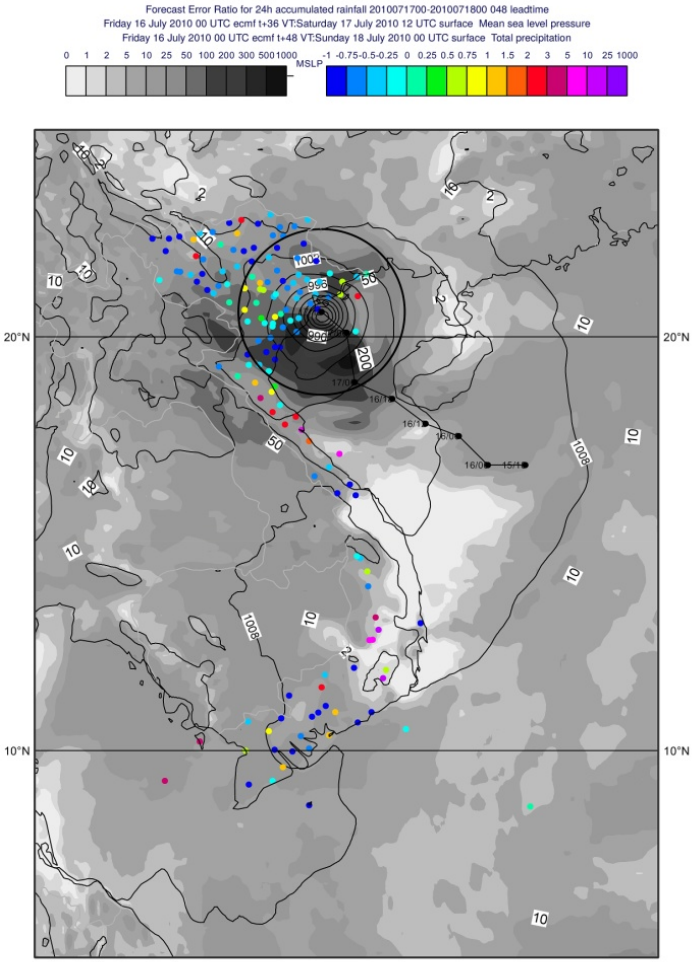


Skill scores of heavy rainfall forecast for 7 sub-regions in Vietnam (period 2007-2016)			
	PC	**HSS**	**PSS**
R1	**0.44**	**0.21**	**0.28**
R2	**0.41**	**0.19**	**0.26**
R3	**0.47**	**0.21**	**0.28**
R4	**0.44**	**0.20**	**0.27**
R5	**0.41**	**0.19**	**0.26**
R6	**0.46**	**0.23**	**0.28**
R7	**0.40**	**0.19**	**0.25**



Forecast Error Ratio (~ {OB-FC}/FC) distribution for HRES day 1 and day 2 rainfall on tropical cyclone day in Vietnam





Future plans

- Training desk in 2017:
  - Enhance the knowledge of forecast experiences over different countries in Southeast Asian
  - Experiences of NCHMF on the use of NWP to forecast strong wind and heavy rain
  - Verification problems
- HPC upgrade in 2018 (100 TFLOPS):
  - Replacement of SREPS and LEPS with WRF-LETKF (21 members at 10-15km horizontal resolution)
  - High resolution products of WRF-ARW/COSMO for Southeast Asia domain

Thank you very much