Progress with the Space-based Weather and Climate Extremes Monitoring (SWCEM) Demonstration Project (SEMDP)

WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

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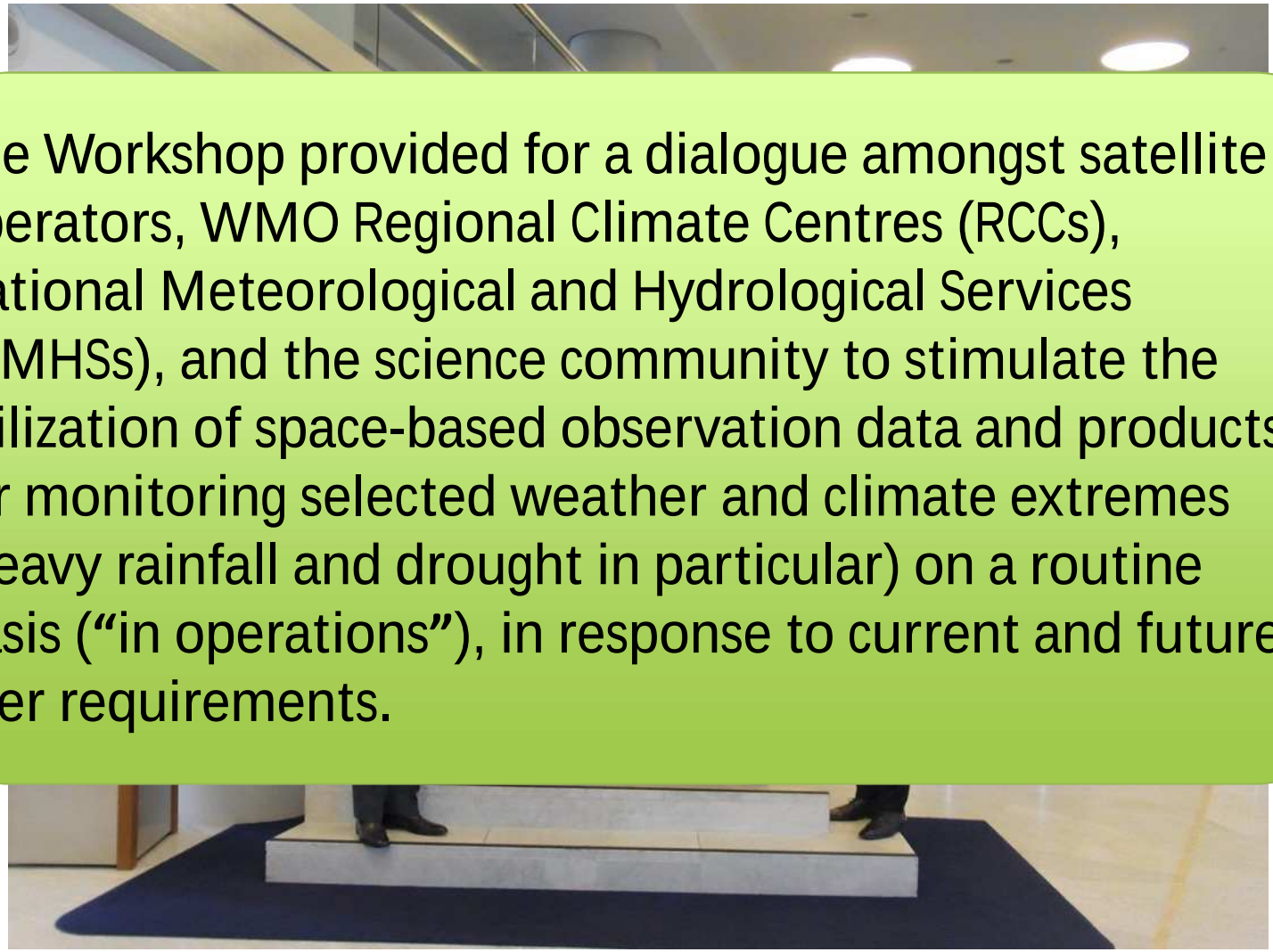
The Workshop on Operational Space-based Weather and Climate Extremes Monitoring (SWCEM) was held in Geneva, Switzerland on 15-17 February, 2017.



The Workshop provided for a dialogue amongst satellite operators, WMO Regional Climate Centres (RCCs), National Meteorological and Hydrological Services (NMHSs), and the science community to stimulate the utilization of space-based observation data and products for monitoring selected weather and climate extremes (heavy rainfall and drought in particular) on a routine basis (“in operations”), in response to current and future user requirements.

After the successful workshop, the WMO Secretariat submitted the meeting report to the 69th WMO Executive Council (EC-69) in May 2017.

(a) Establish a demonstration project on space-based weather and climate extremes monitoring (SEMDP) and decide on priority WMO Region(s) starting in 2018 for a two year duration;
(b) Identify the deliverables of the demonstration project, concentrating on products at national and regional levels:

i. Monitoring accumulated heavy precipitation and droughts;
ii. Making best use of existing and newly developed satellite derived products and time series of measurements;
iii. Making best use of products that combine satellite information with in situ and/or model reanalysis data;

(c) Assess the SEMDP products and other results, and recommend which should be transitioned from research to operations;

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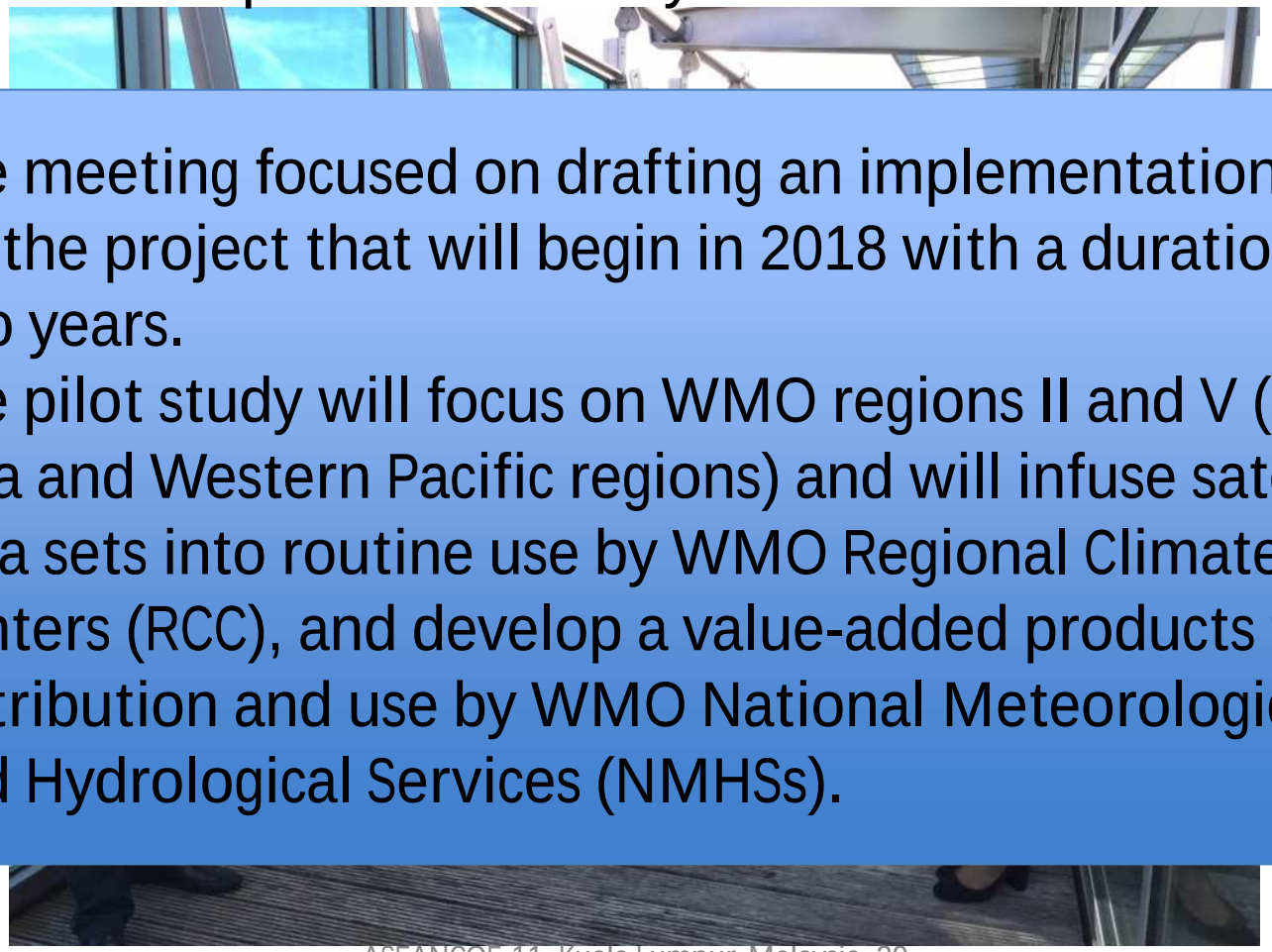
- NOAA/NESDIS to support the Space-based Monitoring of Weather and Climate Extremes project by providing satellite observations of heavy precipitation events, and land surface parameters for monitoring droughts. The observations are required with a short latency of about one day. Furthermore the project requires the creation of climate reference data sets which will be used by the RCCs to classify observations as extreme event or not. (A45.05)

- JAXA to support the Space-based Monitoring of Weather and Climate Extremes project by providing a short term (from 5-day up to monthly) climate normal from GSMaP data archives as a reference precipitation data set for the initial SEMDP areas, i.e. East Asia and Western Pacific regions. JAXA is also requested to set-up the on-line environment to provide GSMaP data with short latency to be utilized in the SEMDP. (A45.06)

- IPWG co-chairs and rapporteur to provide guidance on the estimation of uncertainties and representativeness of the short-latency precipitation products related to the Space-based Monitoring of Weather and Climate Extremes project. (A45.07)

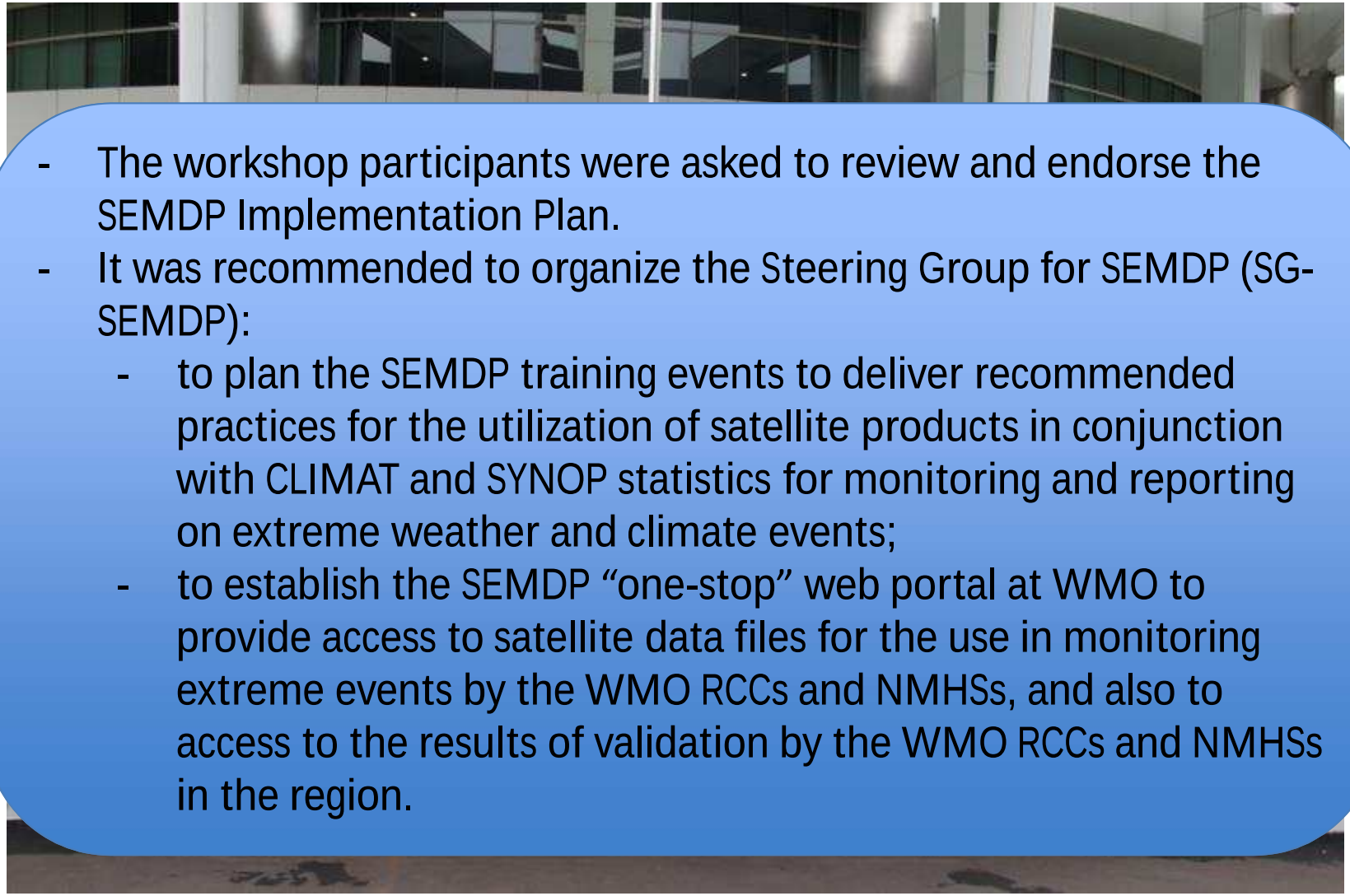
- CEOS/CGMS Working Group on Climate to provide feedback on the proposed definition for ICDR. (A45.08)

The ad-hoc meeting for drafting the Space-based Weather and Climate Extremes Monitoring (SWCEM) Demonstration Project (SEMDP) Implementation Plan was held in Geneva, Switzerland on 25-29 September, 2017 as a follow up to the kick-off workshop on SWCEM that took place in February 2017.



- The meeting focused on drafting an implementation plan for the project that will begin in 2018 with a duration of two years.
- The pilot study will focus on WMO regions II and V (East Asia and Western Pacific regions) and will infuse satellite data sets into routine use by WMO Regional Climate Centers (RCC), and develop a value-added products for distribution and use by WMO National Meteorological and Hydrological Services (NMHSs).

The SEMDP Workshop was held 19-22 March 2018 at Bagan Meteorologi, Klimatologi, dan Geofisika (BMKG) in Jakarta, Indonesia



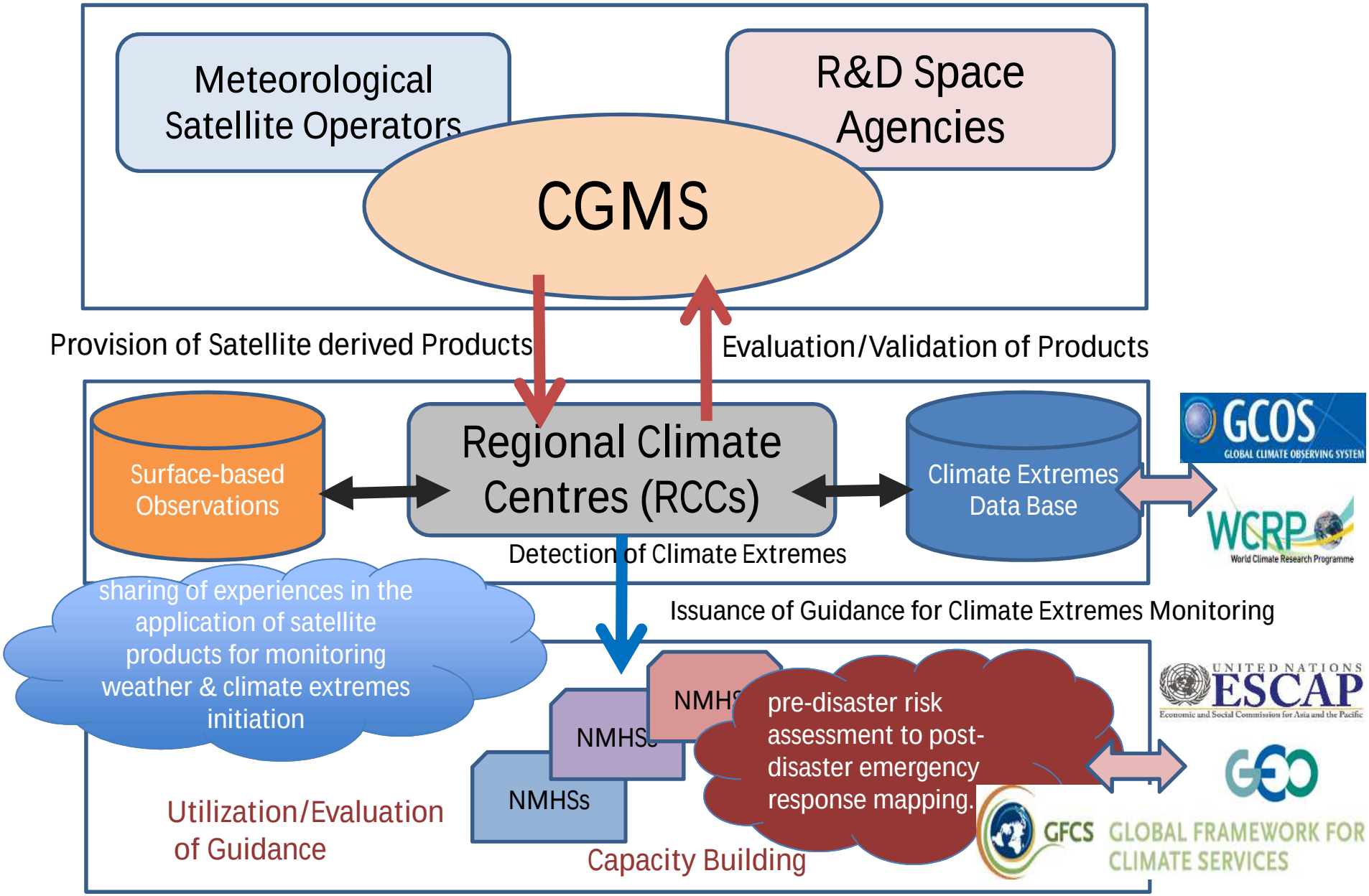
- The workshop participants were asked to review and endorse the SEMDP Implementation Plan.
- It was recommended to organize the Steering Group for SEMDP (SG-SEMDP):
  - to plan the SEMDP training events to deliver recommended practices for the utilization of satellite products in conjunction with CLIMAT and SYNOP statistics for monitoring and reporting on extreme weather and climate events;
  - to establish the SEMDP “one-stop” web portal at WMO to provide access to satellite data files for the use in monitoring extreme events by the WMO RCCs and NMHSs, and also to access to the results of validation by the WMO RCCs and NMHSs in the region.

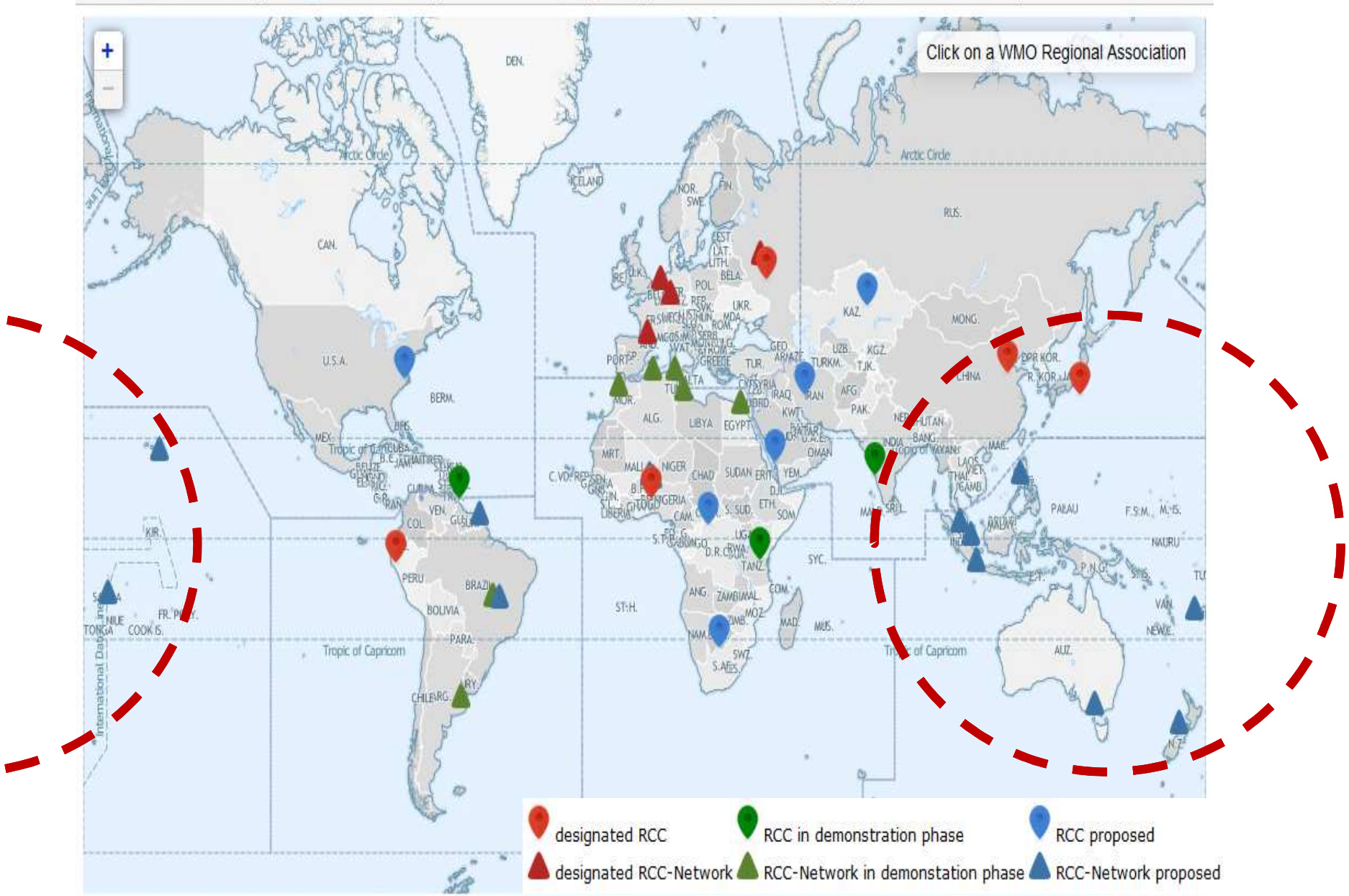
The 70th WMO Executive Council (EC-70) in June 2018 recognized the progress in SEMDP after EC-69, and endorsed the following developments;

The EC-70 decides:
(1) To request the Commission for Climatology (CCl) and Commission for Basic Systems (CBS) to review the SEMDP Implementation Plan in East Asia and Western Pacific Regions with the goal to have it updated in advance of the Eighteenth World Meteorological Congress (Cg-18) to reflect feedback from Members during its demonstration phase;

(2) To consider that the Cg-18 decides on matters concerning:
    (a) Implementation of the SEMDP in East Asia and Western Pacific Regions in operation phase;
    (b) Implementation of the SEMDP in other regions.

A Conceptual Scheme for Implementing Space-based Weather and Climate Extremes Monitoring Demonstration Project (SEMDP)





The GPCLRFs and the RCCs constitute integral components of WMO's Global Data Processing and Forecasting System (GDPFS) underpinning the generation of climate information products by the NMHSs.

The SEMDP Training Event is planned to be held in ASEANCOF-11, Kuala Lumpur, Malaysia, 29 October - 1 November 2018

- The SEMDP Training Event is to validate SEMDP products and develop utilization in WMO Regional Climate centres (RCCs) and National Meteorological and Hydrological Services (NMHSs) for monitoring extreme events of persistent heavy rainfall and drought;
- The Training Event participants are asked to review and validate the Satellite derived Rainfall Estimations for the following three cases;

  Case1: Persistent Heavy Rainfall
  2014/Nov-Dec: Singapore, Malaysia, Thailand

  Case2: Persistent Heavy Rainfall
  2016/Aug: LAO People Democratic Republic

  Case3: Drought)
  2014/JAN-MAR: Singapore, Malaysia, Indonesia

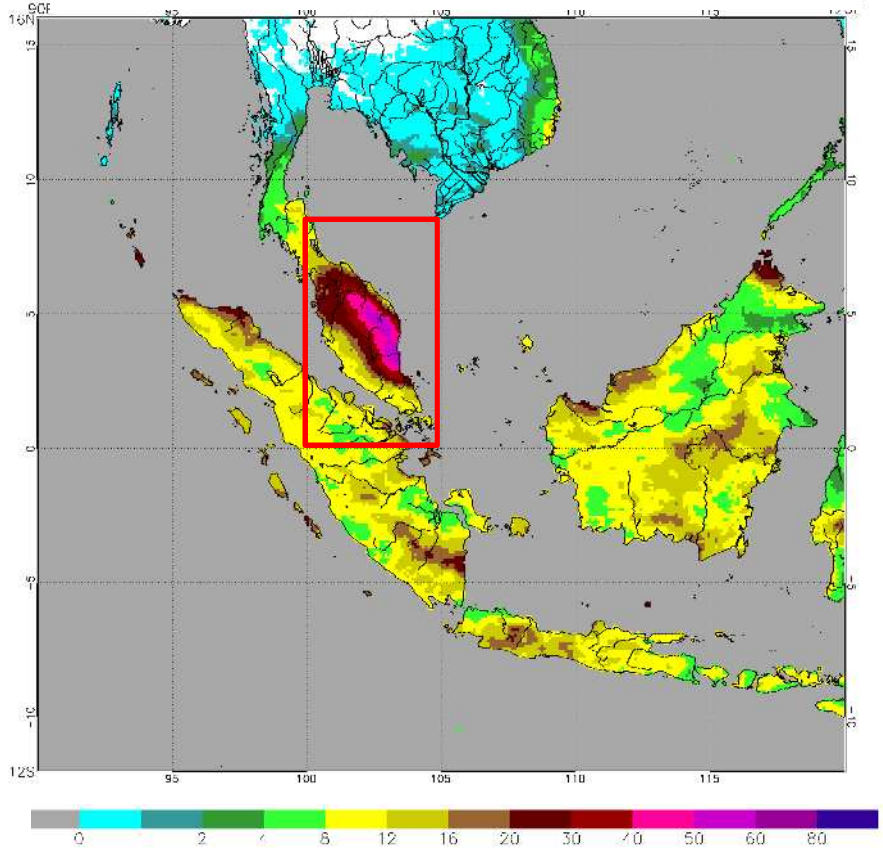
The following Preliminary Estimations and Analyses were provided by JAXA in advance of the SEMDP Training Events

Detection of Extremes from satellite derived Rainfall Estimations

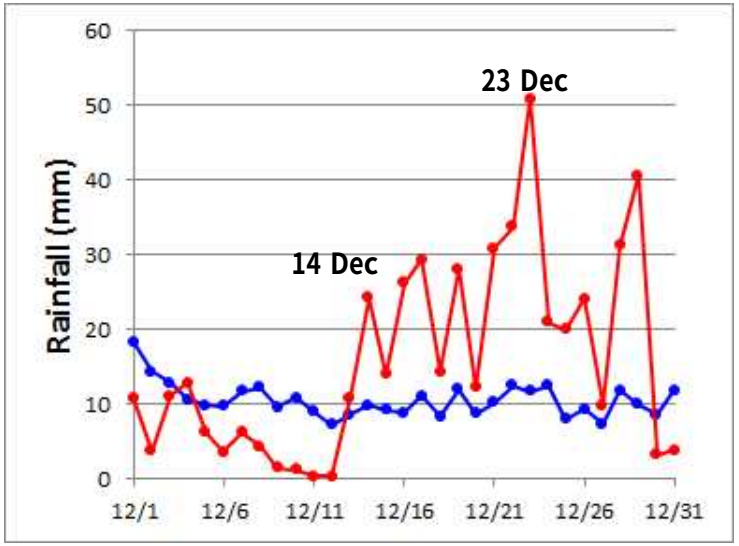
(provided by JAXA in advance of the SEMDP Training Events)

Case1: Persistent Heavy Rainfall
2014/Nov-Dec: Singapore, Malaysia, Thailand

Monthly Rainfall (December 2014)



Timeseries of daily rainfall
area ave.(100°E-105°E; 0°N-8°N)



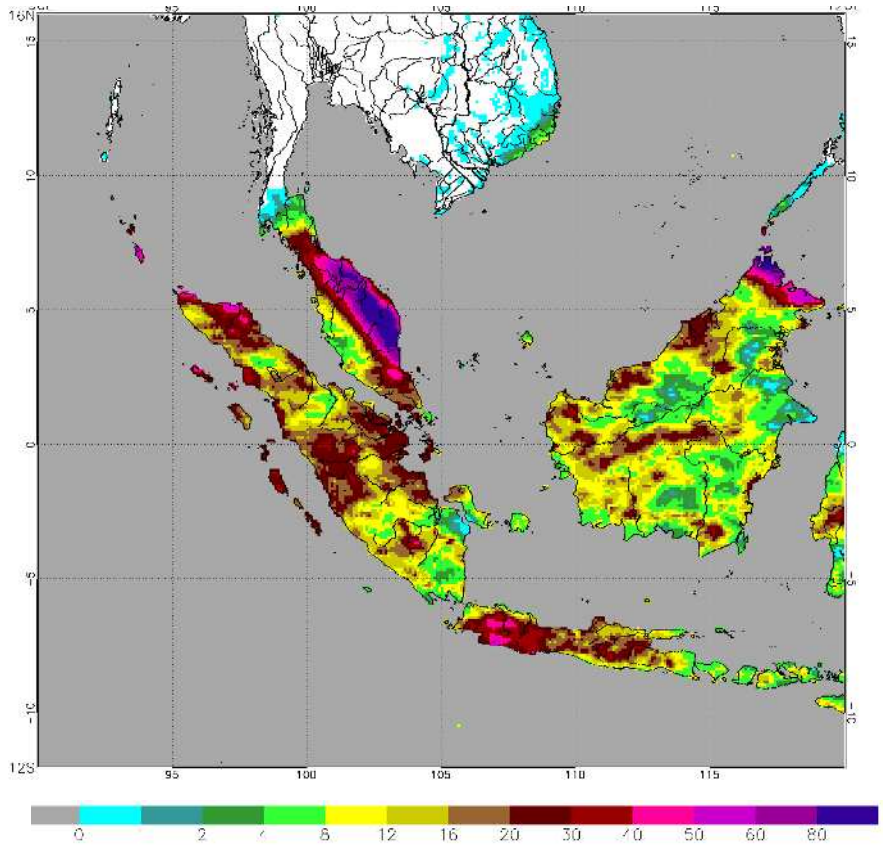
Gauge NRT

Climate normal for daily

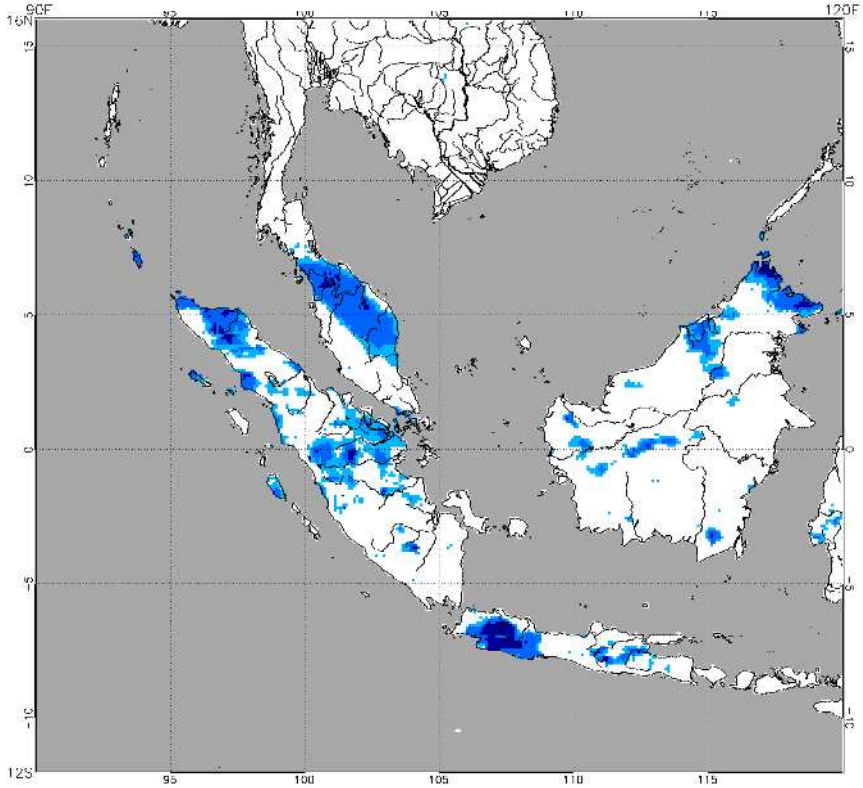
- Beginning on 14 December 2014, heavy rainfall that exceeds the climate normal continued.
- On 23 December, the area average was highest.

Case1: Persistent Heavy Rainfall
2014/Nov-Dec: Singapore, Malaysia, Thailand
(provided by JAXA in advance of the SEMDP Training Events)

Pentad Rainfall (pentad 71: 17-21 Dec)



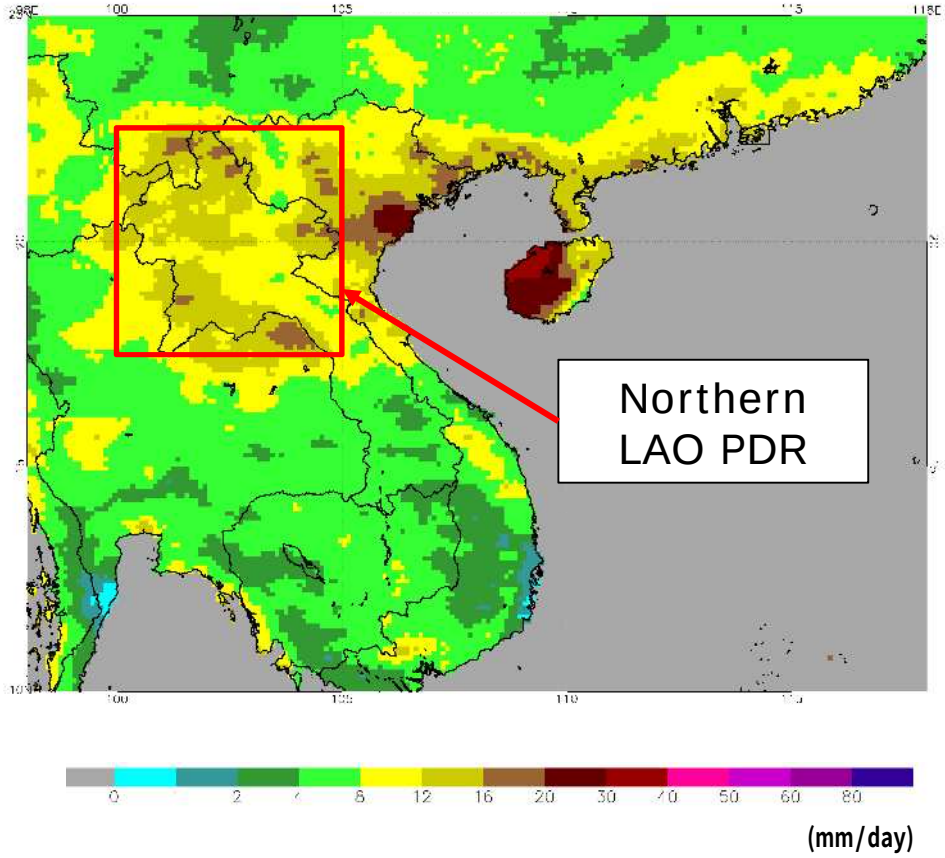
Detected Extreme Heavy Rainfall



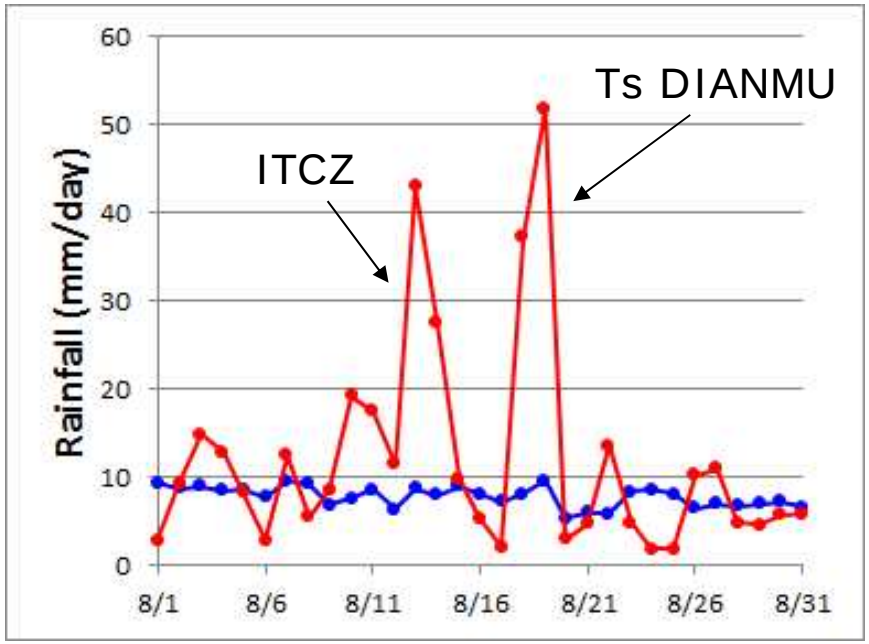
Pentad Rainfall > 90th > 95th > 99th

Case2: Persistent Heavy Rainfall
2016/Aug: LAO People Democratic Republic
(provided by JAXA in advance of the SEMDP Training Events)

Mean Precipitation over Aug 2016



Time series of daily rainfall
Area ave. (100°E-105°E; 17.5°N-22.5°N)

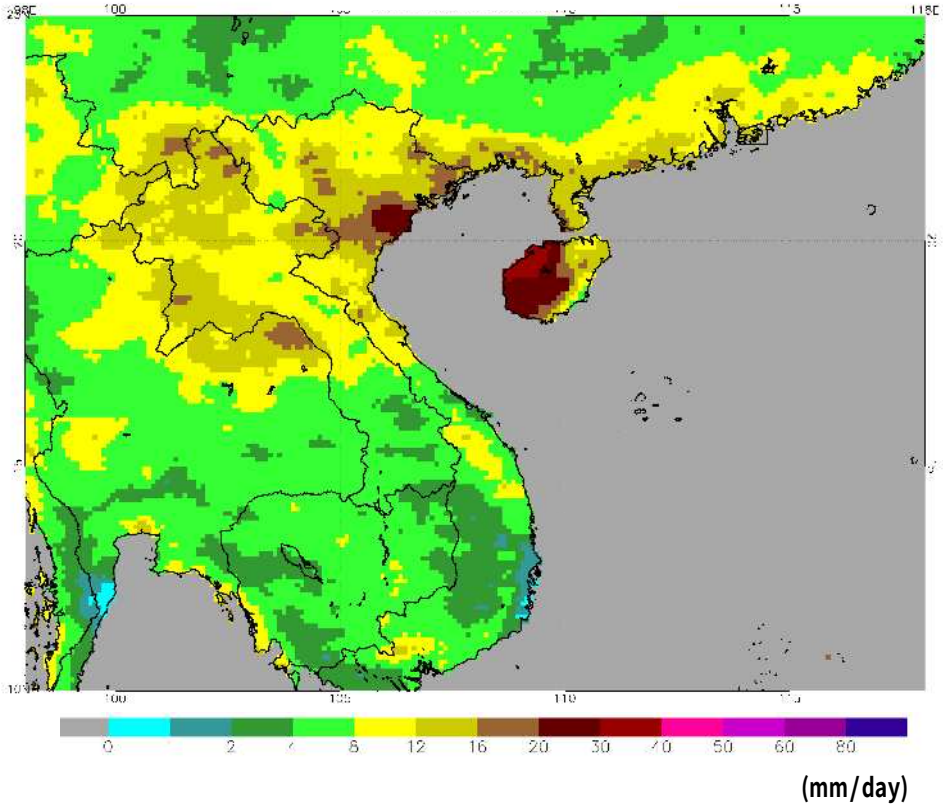


GSMaP (v6) Gauge-NRT Climate Normal

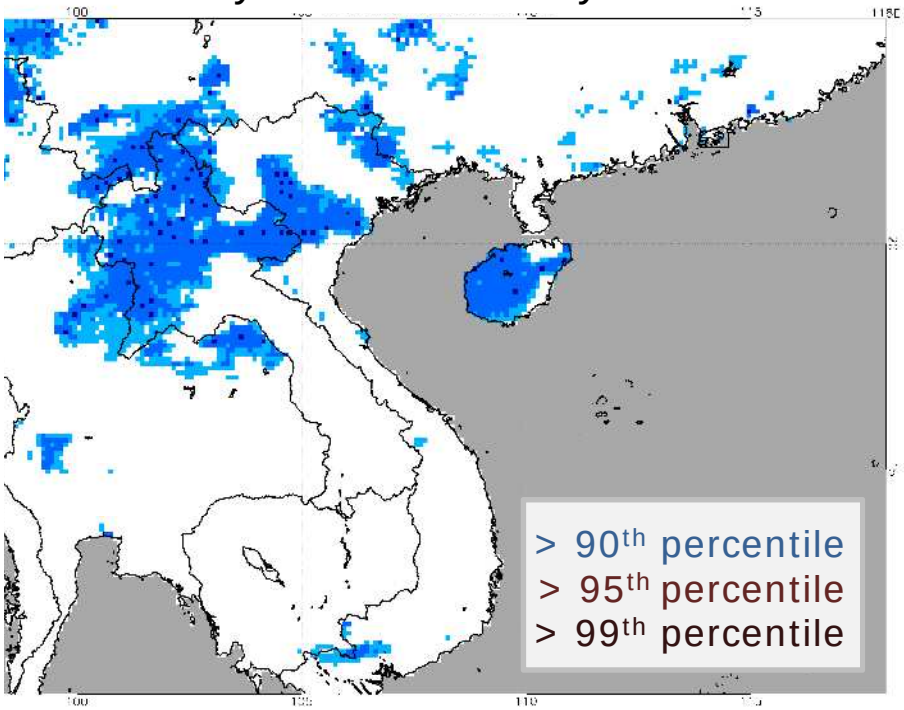
After heavy rains caused by ITCZ from Aug 09-13, another heavy rain was caused by Ts DIANMU from Aug 18-19.

Case2: Persistent Heavy Rainfall
2016/Aug: LAO People Democratic Republic
Satellite Derived Monthly Precipitation
(provided by JAXA in advance of the SEMDP Training Events)

Mean Precipitation over Aug 2016



Satellite Detected Region of Monthly Extreme Heavy Rainfall

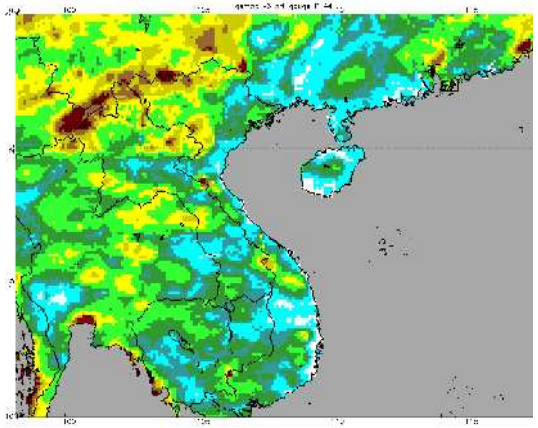


Mean precipitation over Aug 2014 is higher than the 95 percentile over a wide area over Northern Lao PDR.

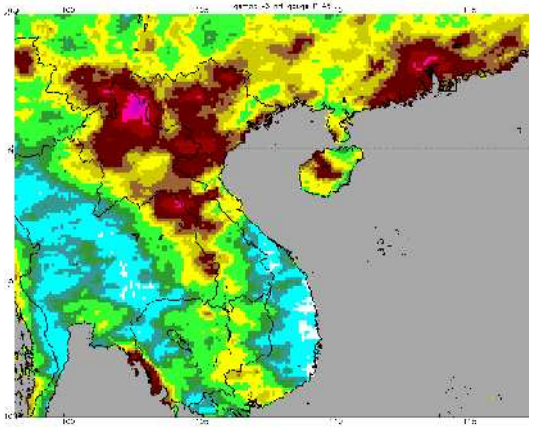
Case2: Persistent Heavy Rainfall
2016/Aug: LAO People Democratic Republic
Satellite Derived Pentad Precipitation
(provided by JAXA in advance of the SEMDP Training Events)

- **Pentad Precipitation**

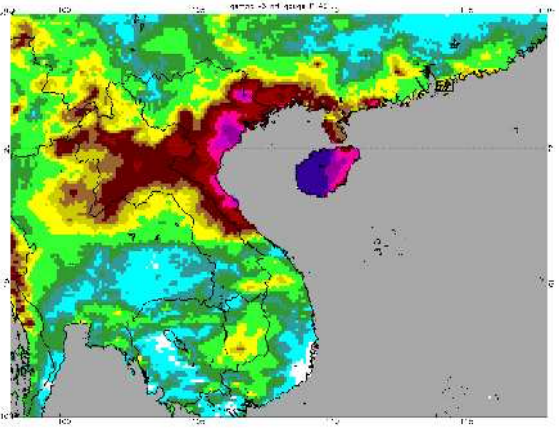
Pentad 44 (Aug 4-8)



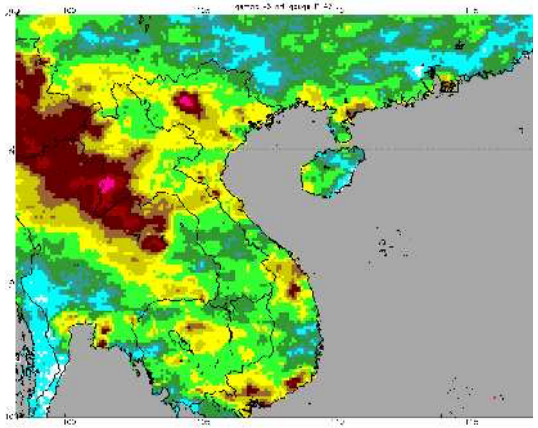
Pentad 45 (Aug 9-13)



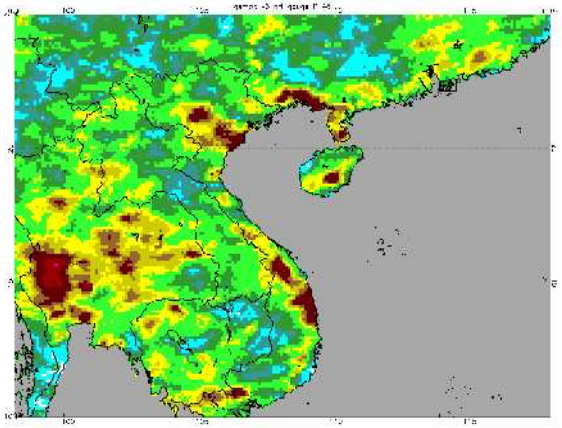
Pentad 46 (Aug 14-18)

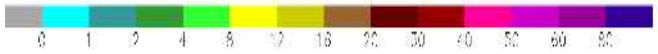


Pentad 47 (Aug 19-23)



Pentad 48 (Aug 24-28)



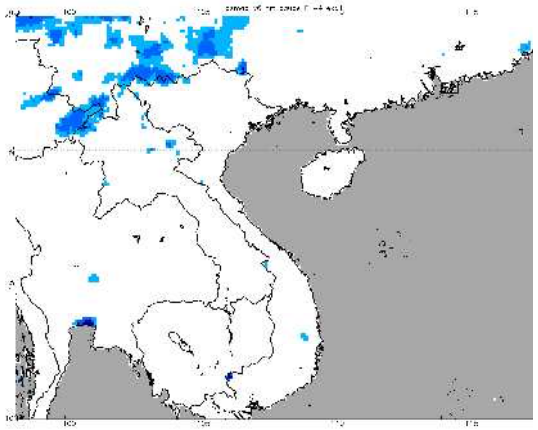


(mm/day)

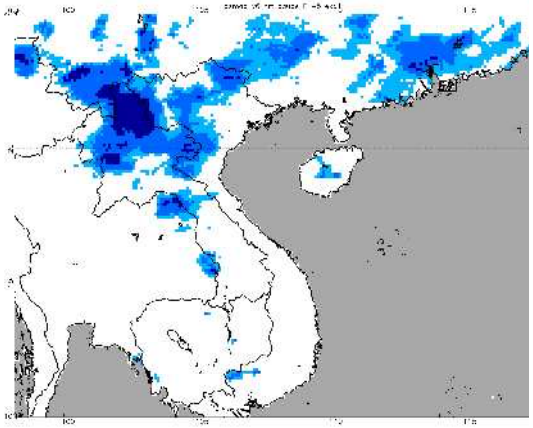
Case2: Persistent Heavy Rainfall
2016/Aug: LAO People Democratic Republic
Satellite Derived Pentad Precipitation
(provided by JAXA in advance of the SEMDP Training Events)

- Satellite Detected Region of Pentad Extreme Heavy Rainfall

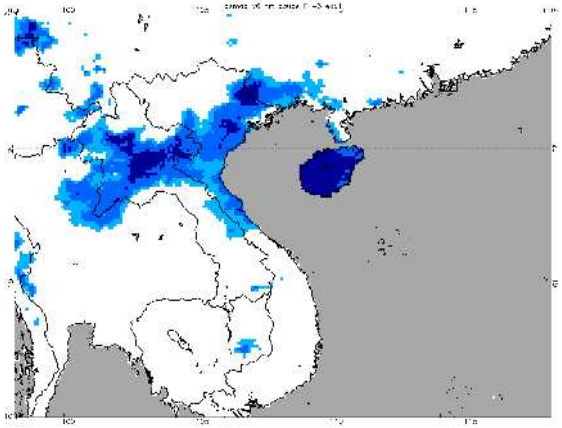
Pentad 44 (Aug 4-8)



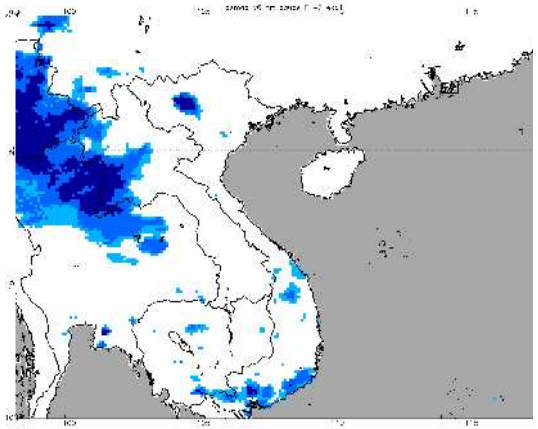
Pentad 45 (Aug 9-13)



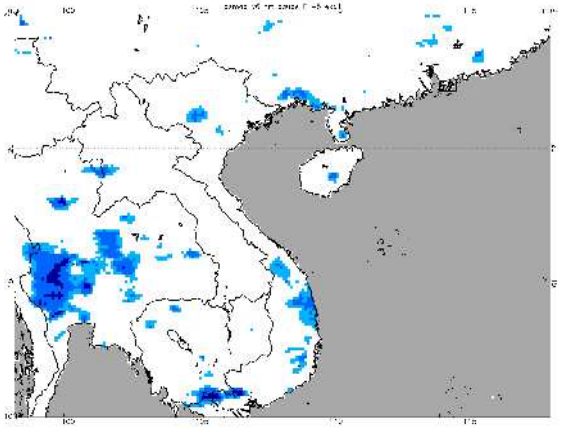
Pentad 46 (Aug 14-18)



Pentad 47 (Aug 19-23)



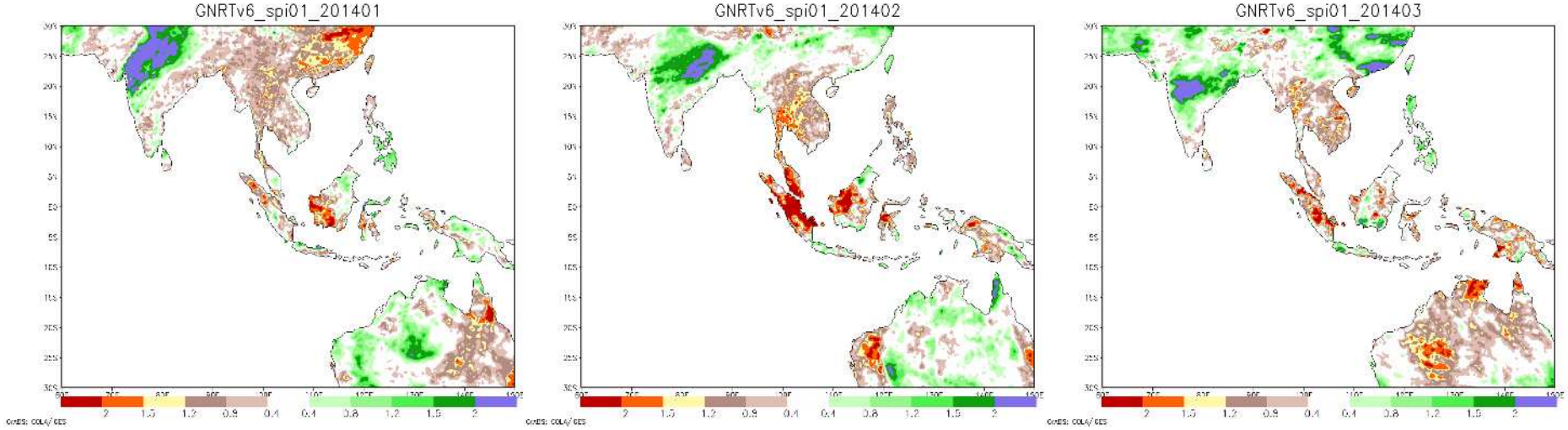
Pentad 48 (Aug 24-28)



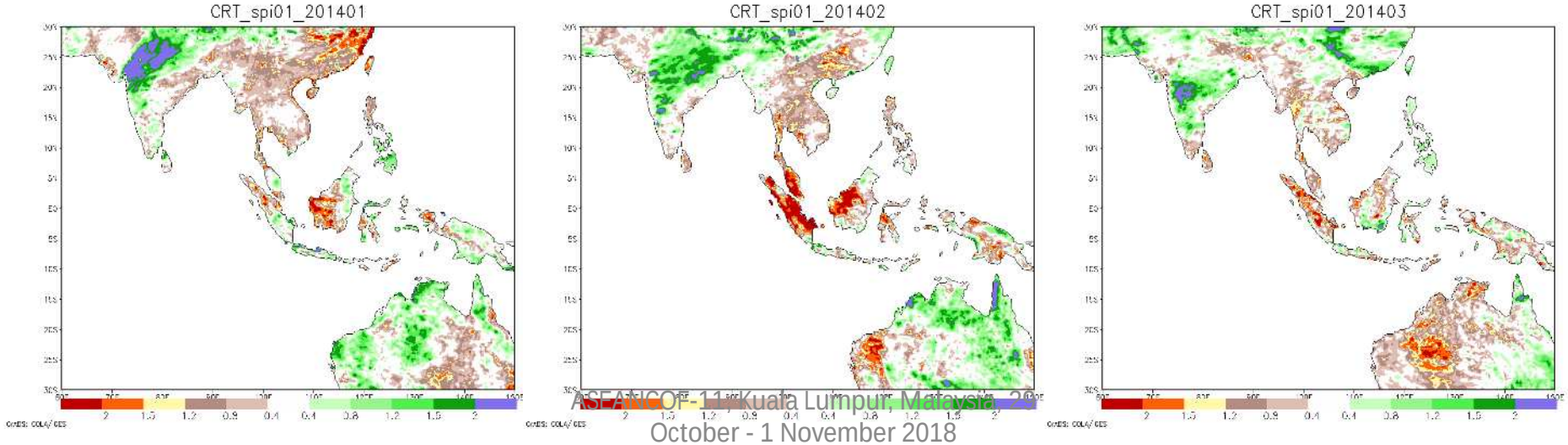
> 90th percentile
> 95th percentile
> 99th percentile

Case Study (Case3: Drought)
2014/JAN-MAR: Singapore, Malaysia, Indonesia
(provided by JAXA in advance of the SEMDP Training Events)

- 1-month SPI (GSMaP : 18-years; 2000 Apr – 2018 Mar)

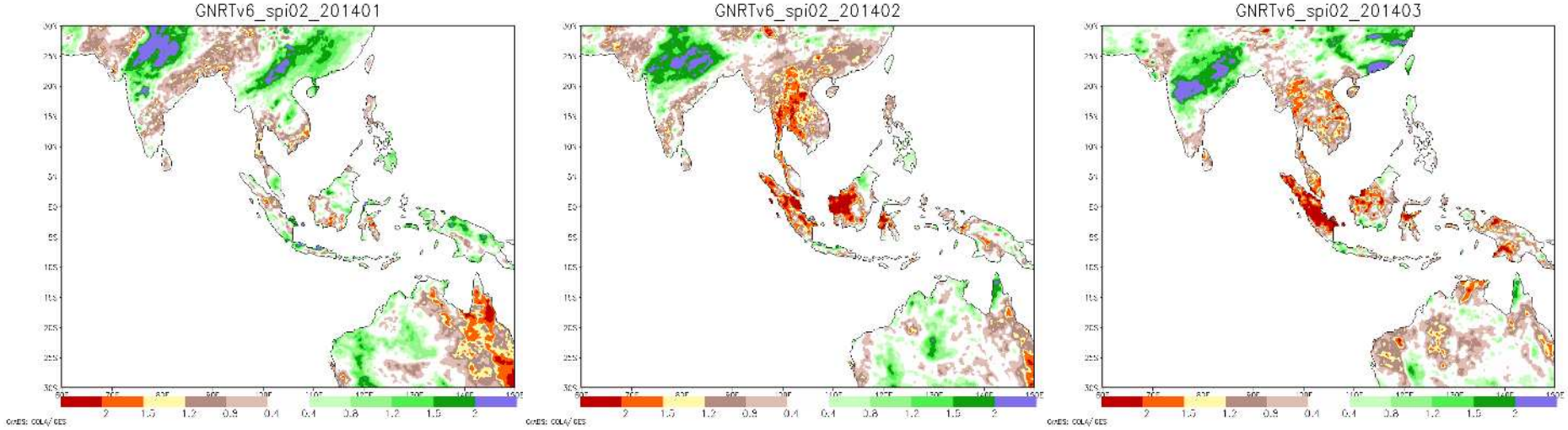


- 1-month SPI (CMORPH : 20-years; 1998 Jan – 2017 Dec)

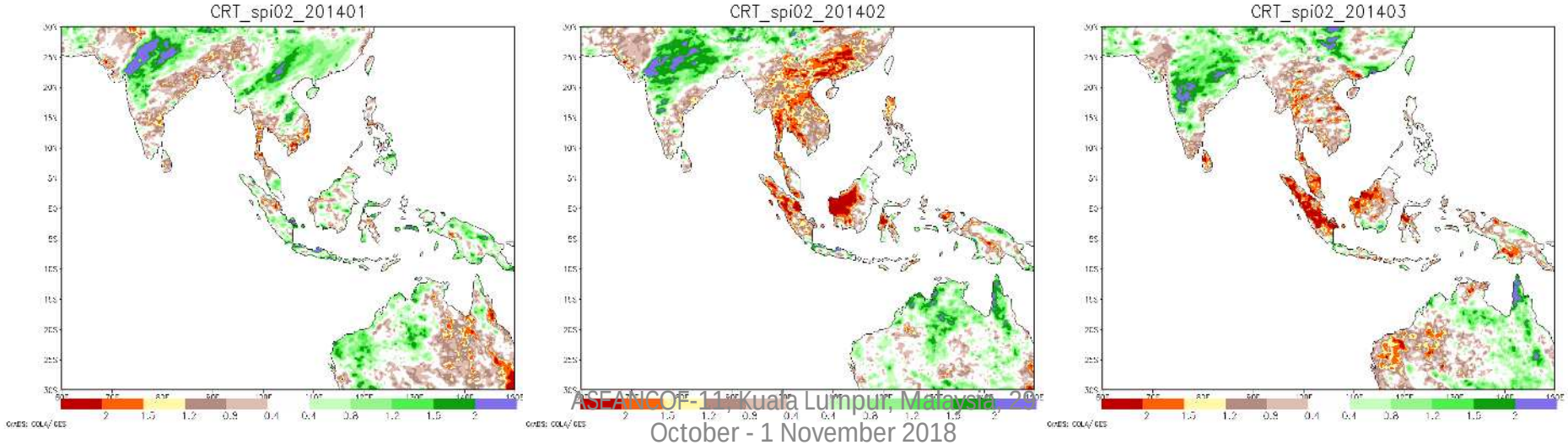


Case Study (Case3: Drought)
2014/JAN-MAR: Singapore, Malaysia, Indonesia
(provided by JAXA in advance of the SEMDP Training Events)

- 2-month SPI (GSMaP : 18-years; 2000 Apr – 2018 Mar)

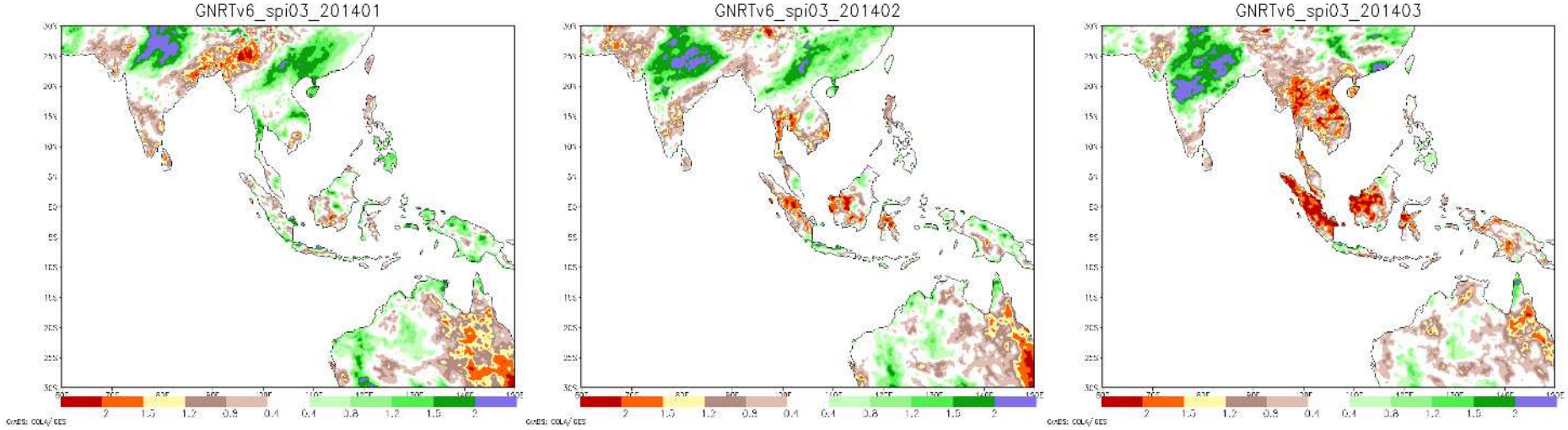


- 2-month SPI (CMORPH : 20-years; 1998 Jan – 2017 Dec)

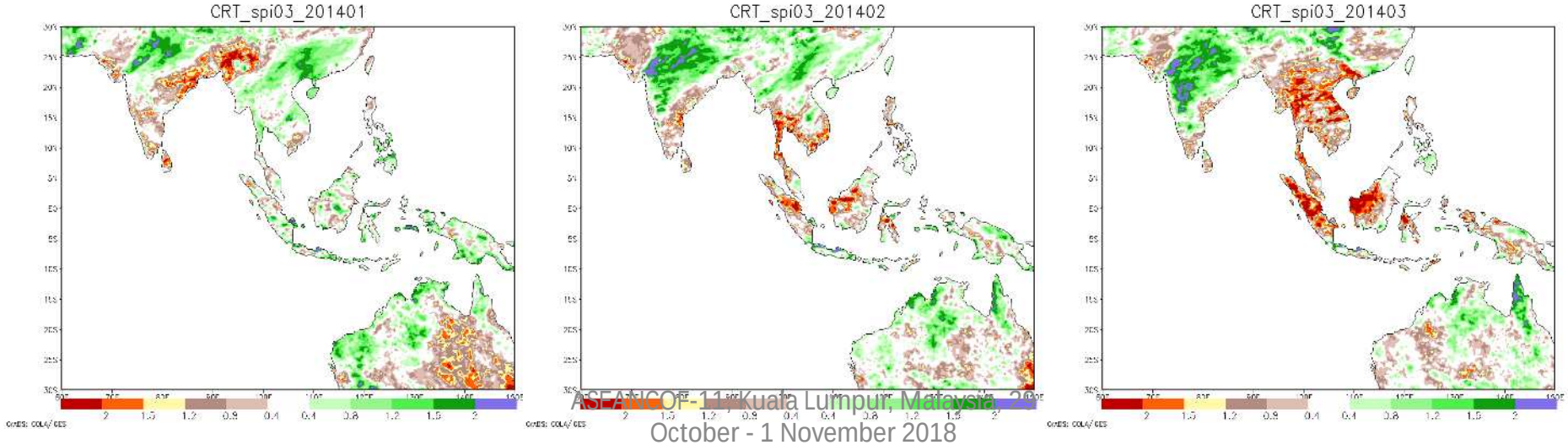


Case Study (Case3: Drought)
2014/JAN-MAR: Singapore, Malaysia, Indonesia
(provided by JAXA in advance of the SEMDP Training Events)

- 3-month SPI (GSMaP : 18-years; 2000 Apr – 2018 Mar)



- 3-month SPI (CMORPH : 20-years; 1998 Jan – 2017 Dec)

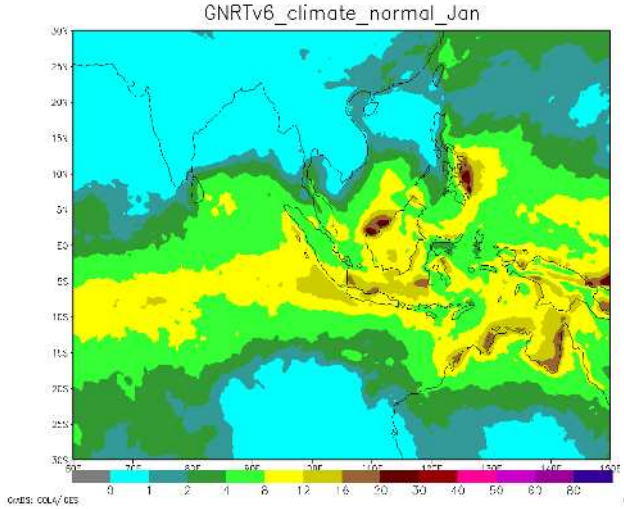


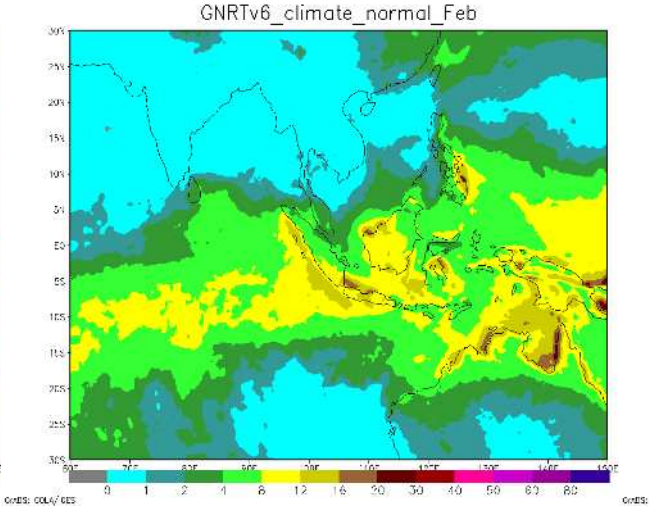
Case Study (Case3: Drought)

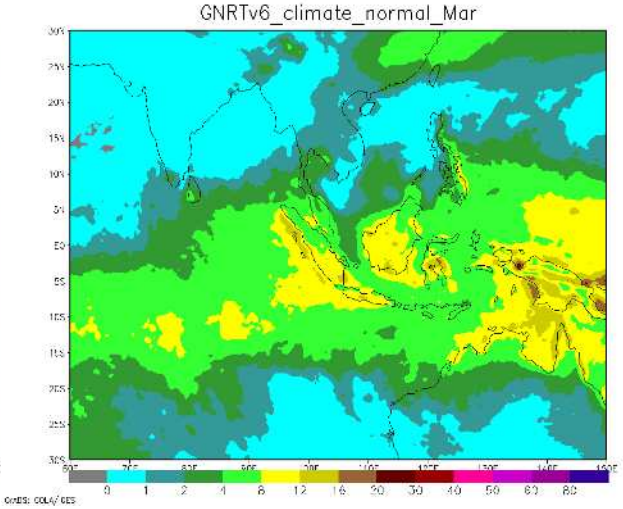
2014/JAN-MAR: Singapore, Malaysia, Indonesia

(provided by JAXA in advance of the SEMDP Training Events)

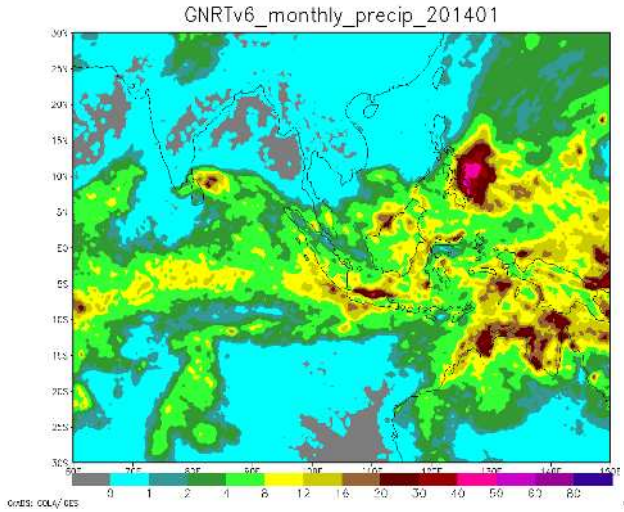
- Climate Normal for Monthly (GSMaP : 18-years; 2000 Apr – 2018 Mar)

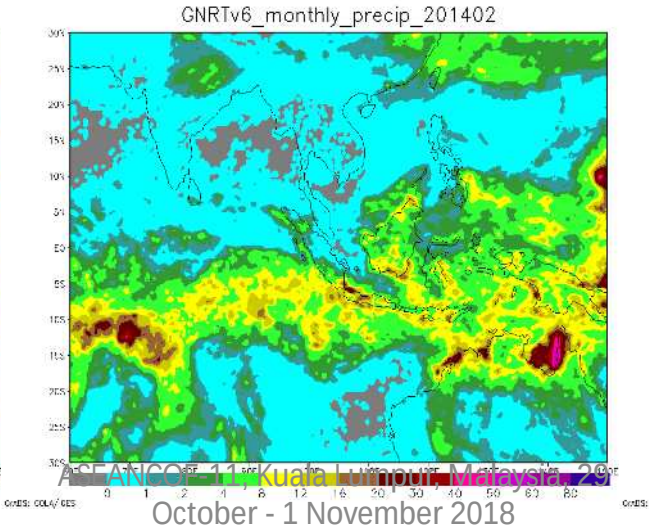


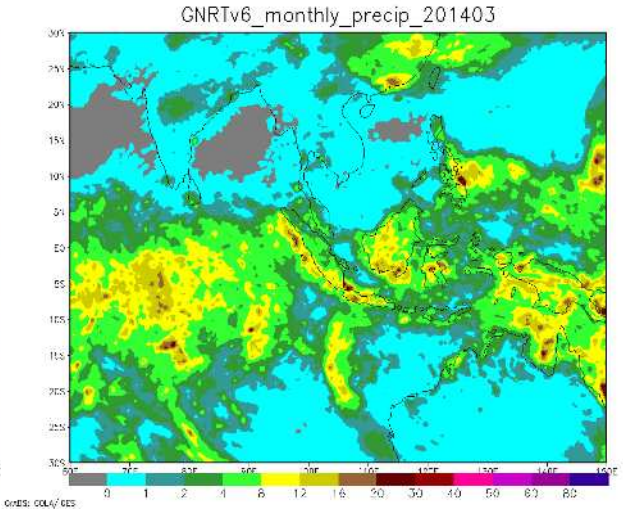




- **Monthly Precip (GSMaP: 2014/JAN-MAR)**







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Thank you

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