

## Experimental Climate Monitoring and Prediction

by: Ruchira Lokuhetti, Prabodha Agalawatte, Manusha Lakmali, Zeenas Yahiya,  
Lareef Zubair and Michael Bell (FECT and IRI<sup>1</sup>)

13 October 2016

### Highlights

Drought conditions were seen throughout the country with only less than 10 mm/day rainfall received mostly by the south-western region of the country. WRF, CFS and GFS rainfall prediction models predict high rainfall after the 15<sup>th</sup> October. High rainfall (up to 125 mm) is expected in south-western, western and eastern regions of the country. During 12<sup>th</sup>- 17<sup>th</sup> very heavy rainfall is expected close to Pottuvil. The tropical pacific SST anomaly is close to -0.5 °C (weak La Niña threshold). A La Niña in October- November period usually results in very dry weather in Sri Lanka. MJO shall be in the western-Pacific during the next 15 days and shall suppress rainfall in Sri Lanka.

#### Monitoring

##### Rainfall

**Weekly Monitoring:** On 5<sup>th</sup> of October up to 20 mm rainfall was observed in surrounding areas of Balangoda and Horana. On the same day coastal areas of Galle received up to 20 mm rainfall while adjacent southern sea received rainfall up to 30 mm. On 6<sup>th</sup> north eastern sea near the island received up to 20 mm rainfall. No rainfall was recorded in any part of the island on 7<sup>th</sup>. On 8<sup>th</sup> surrounding areas of Kalupahana, the meeting point of Nuwara Eliya, Ratnapura and Badulla district borders received up to 20 mm rainfall. Also several areas in Colombo, Kalutara, Galle, Matara and nearby southern sea received up to 10 mm rainfall. No significant rainfall was observed during the period 9<sup>th</sup> - 11<sup>th</sup>. For the past week, the RFE 2.0 tool shows rainfall up to 25 mm for Matugama, Kalawana, Madampe, Mahiyangana areas and for the southern sea near the island. Up to 10 mm rainfall is shown for Trincomalee and Batticaloa including the adjacent sea regions. A below average rainfall of 10-25 mm is shown for Kilinochchi, Mullaitivu, Jaffna, Batticaloa, Ampara and Matara districts. For the rest of the country a below average rainfall of 25-50 mm is shown except for Gampaha region where a below average rainfall between 50-100 mm is shown.

**Monthly Monitoring:** Below average rainfall conditions were experienced in the entire island in the month of September. Monthly average amount to 120 mm/month in Ahungalla and Ratnapura town while everywhere else the rainfall did not exceed 60 mm/month. The CPC Unified Precipitation Analysis tool shows ~75 mm of total rainfall in Ratnapura, ~25 mm of rainfall in Colombo, Kegalla, Nuwara Eliya, Bandarawela and Matara areas.

##### Temperature

During the period from October 2<sup>nd</sup>-8<sup>th</sup> the lowest temperature of 15-20 °C was recorded in Nuwara Eliya. The maximum temperature to be recorded was between 35-40 °C in the north eastern coastal belt. The maximum temperature of Kandy, Kegalla and Badulla areas was 25-30 °C. The maximum temperature of rest of the country was between 30-35 °C. During this period an above average temperature of 0-1 °C was observed by Kandy, Kegalla, Ratnapura, Badulla districts and the coastal region of Mannar district. The rest of the island experienced an above average temperature of 0-3 °C.

##### Wind

At 850 mb level up to 30 km/h north westerly wind was experienced by the entire island except for the Northern province which experienced wind in the same direction with speed less than 20km/h. At 700 mb level southern regions of the island experienced north westerly winds with speed up to 20 km/h while northern and central regions experienced wind with speed less than 18 km/h in the same direction.

##### Ocean State

###### **Pacific sea state: September 15, 2016**

During mid-September 2016 the tropical Pacific SST anomaly was close to -0.5C, the weak La Niña threshold. However, not all of the atmospheric variables support weak La Niña conditions. Although the upper level winds in the tropical Pacific are somewhat suggestive of La Niña, the lower level winds remain near average. The Southern Oscillation index and the pattern of cloudiness and rainfall in the equatorial Pacific are somewhat suggestive of weak La Niña conditions, but could also be interpreted as being in the cool-neutral range. The collection of ENSO prediction models indicates SSTs hovering at levels near borderline La Niña during fall, then weakening to cool-neutral in late fall and into winter. (Text Courtesy IRI).

###### **Indian Ocean State**

0.5 °C below average sea surface temperature was observed in the western sea of Sri Lanka.

#### Predictions

##### Rainfall

**14-day prediction:** NOAA NCEP models predicts total rainfall between 35-45 mm in Galle, Matara districts including the adjacent

sea regions during 12<sup>th</sup>-18<sup>th</sup> October. For the same period total rainfall between 25-35 mm is expected for Ratnapura district and the area along the district border of Hambantota and Monaragala. For the period 19<sup>th</sup>-25<sup>th</sup> October total rainfall between 65-75 mm is expected in Galle and Matara districts with adjacent sea expected to receive 75-85 mm total rainfall. Kalutara, Ratnapura, Hambegamuwa and Yala areas are expected to receive total rainfall between 45-55 mm while Colombo, Avissawella, Nuwara Eliya, Bandarawela and Monaragala areas expected to receive total rainfall between 35-45 mm. A total rainfall between 25-35 mm is expected for Gampaha, Kegalla, Kandy, Badulla and Ampara regions.

**Weekly prediction:** IMD GFS model predicts rainfall between 20-40 mm in surrounding areas of Mullaitivu and adjacent sea area on 13<sup>th</sup> of October. Rainfall between 10-20 mm is expected for rest of the Northern province and North Central province including several areas of Trincomalee, Ratnapura, Kalurara and Galle districts. During 14<sup>th</sup> and 15<sup>th</sup> Western and Eastern sea regions near the island are expected to receive rainfall between 40-70 mm. On 14<sup>th</sup> coastal regions of Trincomalee, Gampaha, Colombo, Kalutara are expected to receive rainfall between 20-40 mm with rest of the island expected to receive rainfall between 10-20 mm except for Kurunegala and Hambantota areas. Western and Eastern sea regions near the island are expected to receive rainfall between 40-70 mm. Rainfall between 20-40 mm is expected in Batticaloa, Trincomalee, Polonnaruwa and Bibile areas on 15<sup>th</sup> with rest of the country expected to receive rainfall between 10-20 mm. On 16<sup>th</sup> Ampara district is expected to receive rainfall between 20-40 mm with adjacent sea receiving rainfall between 40-70 mm. Rest of the island except for Kilinochchi and Jaffna districts is expected receive up to 10-20 mm rainfall. On 17<sup>th</sup> south eastern sea near the island is expected to receive rainfall between 40-70 mm with most of the island except for Jaffna, Kilinochchi, Mannar, Kurunegala, Kegalla, Kandy and Hambantota areas expected to receive rainfall between 10-20 mm. On 18<sup>th</sup> the western and south eastern sea near the island is expected to receive rainfall between 40-70 mm. The whole island except for Kurunegala is expected to receive rainfall between 10-20 mm. On 19<sup>th</sup> the rainfall is expected to be increased with western sea receiving rainfall between 70-130 mm and also eastern sea receiving rainfall between 20-40 mm.

**IMD WRF & IRI Model Forecast:** According to the IMD WRF model up to 35 mm of rainfall is expected in the Western province including coastal regions of Puttalam and Galle on 14<sup>th</sup>. Several other eastern and western coastal and central regions of the country is expected to receive up to 10 mm rainfall. On 15<sup>th</sup> the rainfall is expected to be increased with surrounding areas of Kalutara and Trincomalee areas and eastern sea near the island receiving rainfall up to 124 mm. Colombo and Kegalla areas are expected to receive rainfall up to 65 mm.

**Seasonal Prediction:** As per IRI Multi Model Probability Forecast for October to December, the total 3-month precipitation shall be climatological in the northern half of the island. However the southern half of the island has 30-40% likelihood of being in the below-normal tercile. The 3-month temperature has more than 70-80% likelihood in the entire country of being in the above-normal tercile during this period.

### Temperature

NOAA CPC GFS model predicts 40-45 °C maximum temperature in Monaragala. The maximum temperature along the coastal belt in the Northern and Eastern sides of the country and in Vavuniya, Mannar, Polonnaruwa, Anuradhapura and Badulla districts will be between 35-40 °C. The maximum temperature of Ratnapura area will be between 25-30°C while in Kandy, Matale, Puttalam, Galle and Matara districts the maximum temperature will be between 30-35 °C. For the same period minimum temperature is expected in Nuwara Eliya to be between 15-20 °C.

### Wind

The 850 mb level predicts up to 30 km/h north westerly wind in the Southern province. Up to 18 km/h westerly wind is expected for the central part of the country with northern region expected to receive northerly wind with speed less than 15 km/h. The 700 mb level predicts up to 18 km/h north westerly wind for the southern half of the country while rest of the island is expected to receive wind with speed less than 10 km/h in the same direction.

### MJO based OLR predictions

MJO shall suppress the rainfall in Sri Lanka in the next 15 days.

<sup>1</sup> International Research Institute for Climate and Society, Earth Institute at Columbia University, New York.

Official hydro-meteorological statements are provided by the Sri Lanka Department of Meteorology and Department of Irrigation.

### FECT BLOG

Past reports available at <http://fectsl.blogspot.com/> and <http://fectsl.wordpress.com/>

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## Weekly Hydro- Meteorological Report for Sri Lanka

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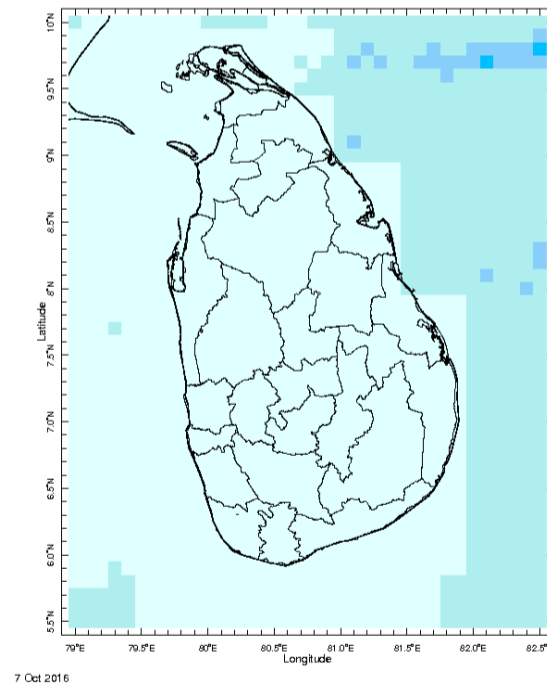
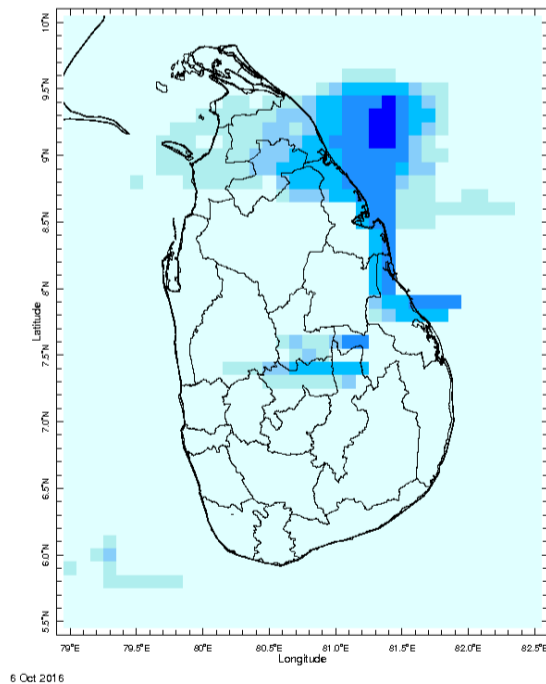
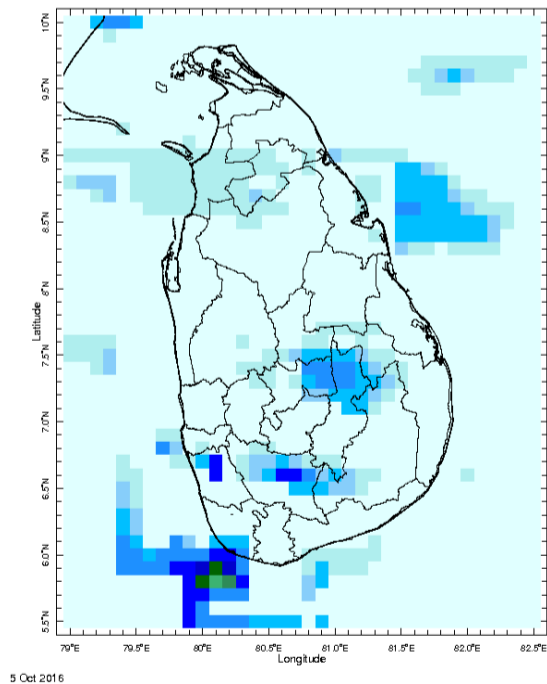
#### 2. Predictions

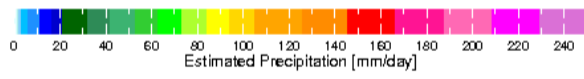
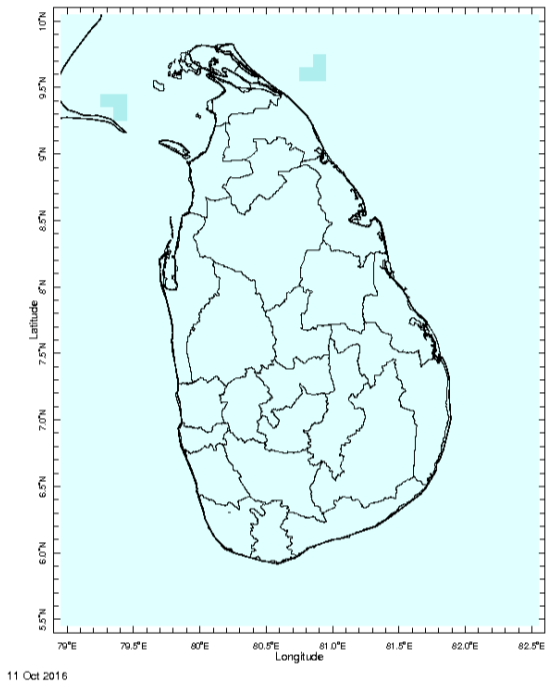
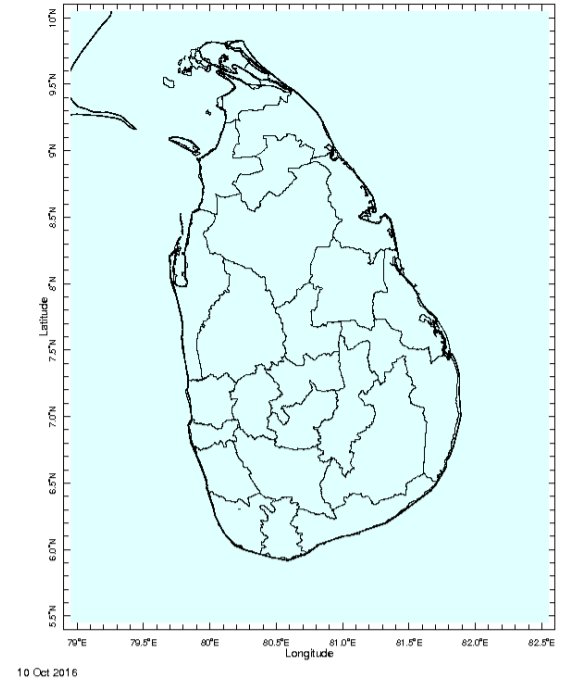
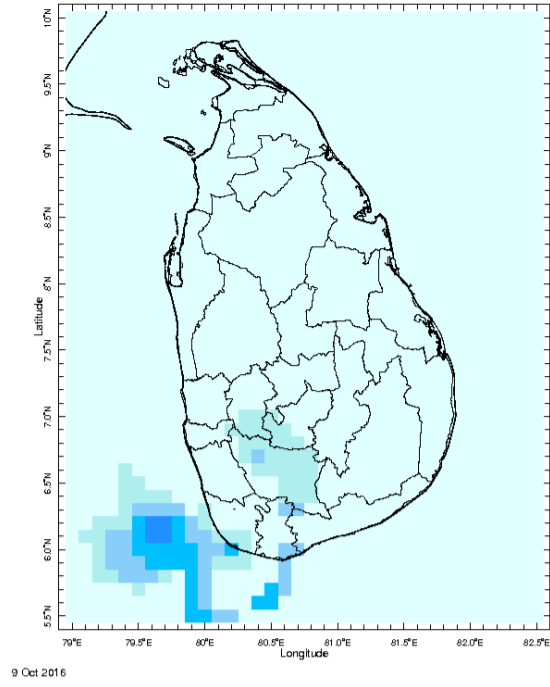
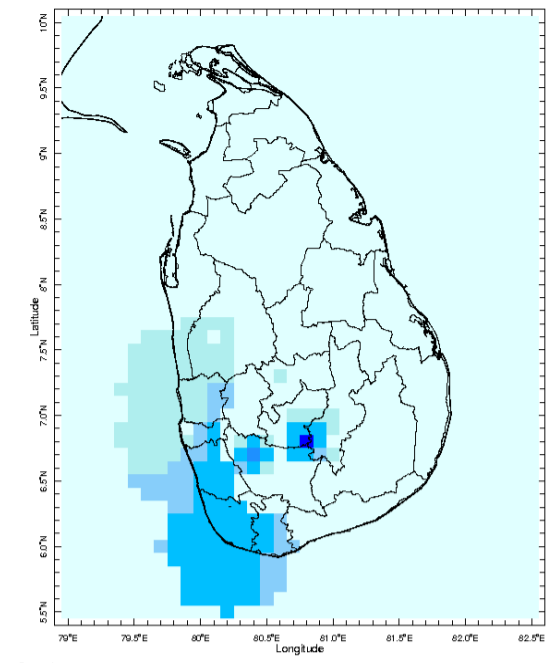
- a. NCEP GFS Ensemble 1-14 day Rainfall Predictions
- b. GFS (T574) Model Rainfall Forecast from RMSC New Delhi
- c. WRF Model Rainfall Forecast from IMD Chennai
- d. MJO Related OLR Forecast
- e. Weekly Precipitation Forecast from IRI
- f. Weekly Temperature Forecast
- g. Weekly Wind Forecast
- h. Seasonal Predictions from IRI

### MONITORING

#### Daily Rainfall Monitoring

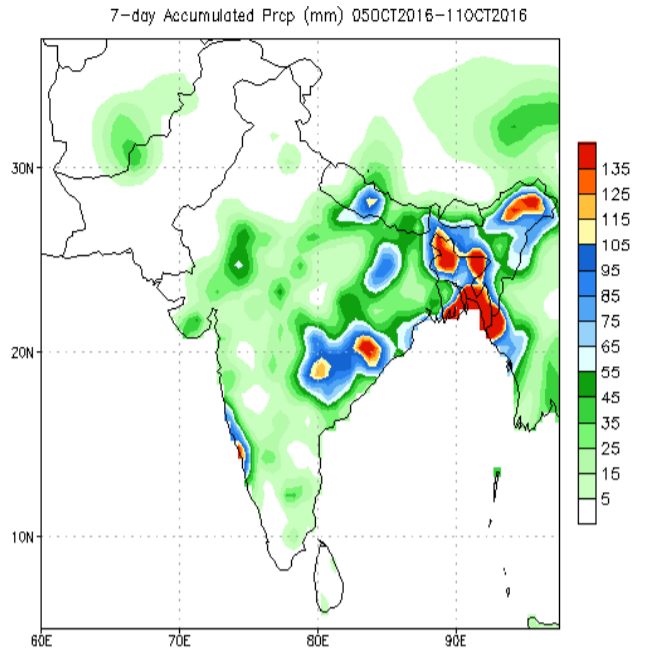
The following figures show the satellite observed rainfall in the last 7 days in Sri Lanka.



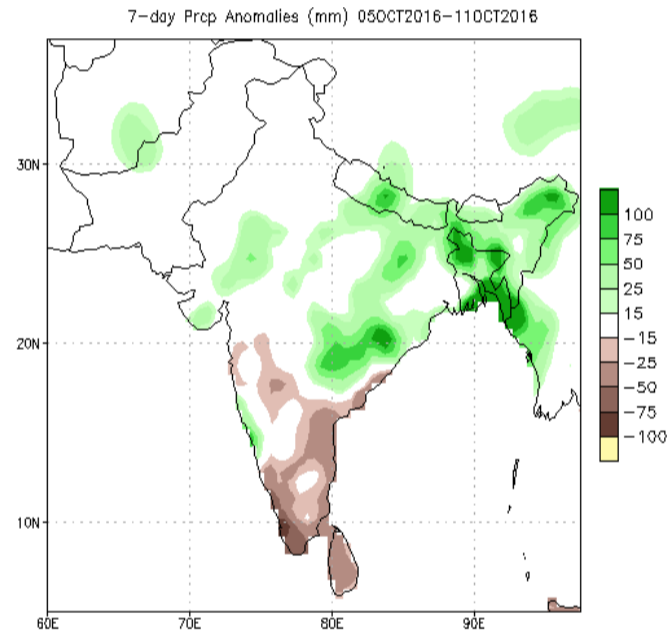
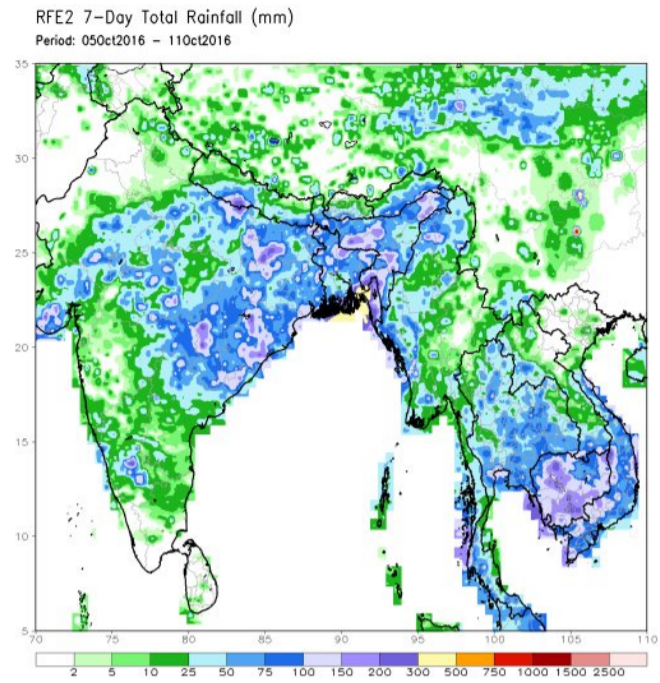


## Weekly Rainfall Monitoring

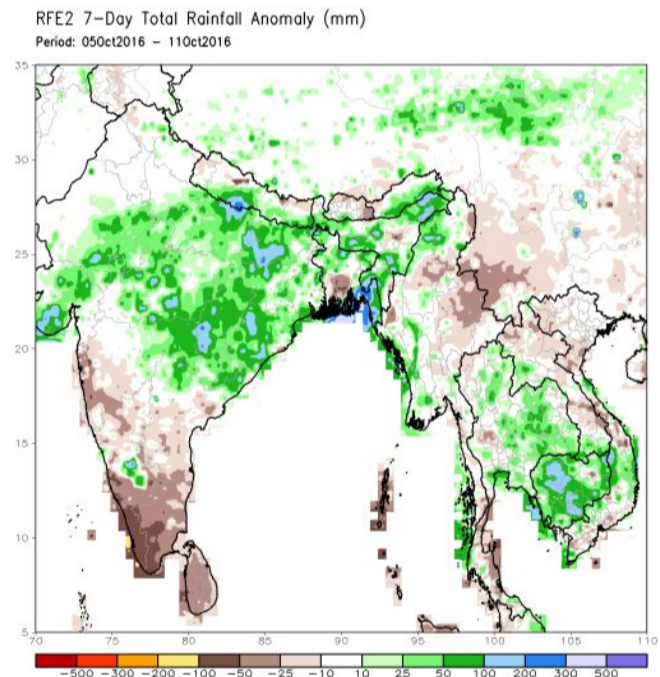
The following figures show the total satellite observed rainfall in the last week in Sri Lanka. The figure in the left is the total 7-day rainfall from NOAA Climate Prediction Center (CPC) Unified Precipitation Analysis and the figure in the right is the total 7-day rainfall from CPC RFE 2.0 Satellite Rainfall Estimates. The bottom two figures are the respective anomalies.



Data Source: CPC Unified (gauge-based & 0.5x0.5 deg resolution) Precipitation Analysis

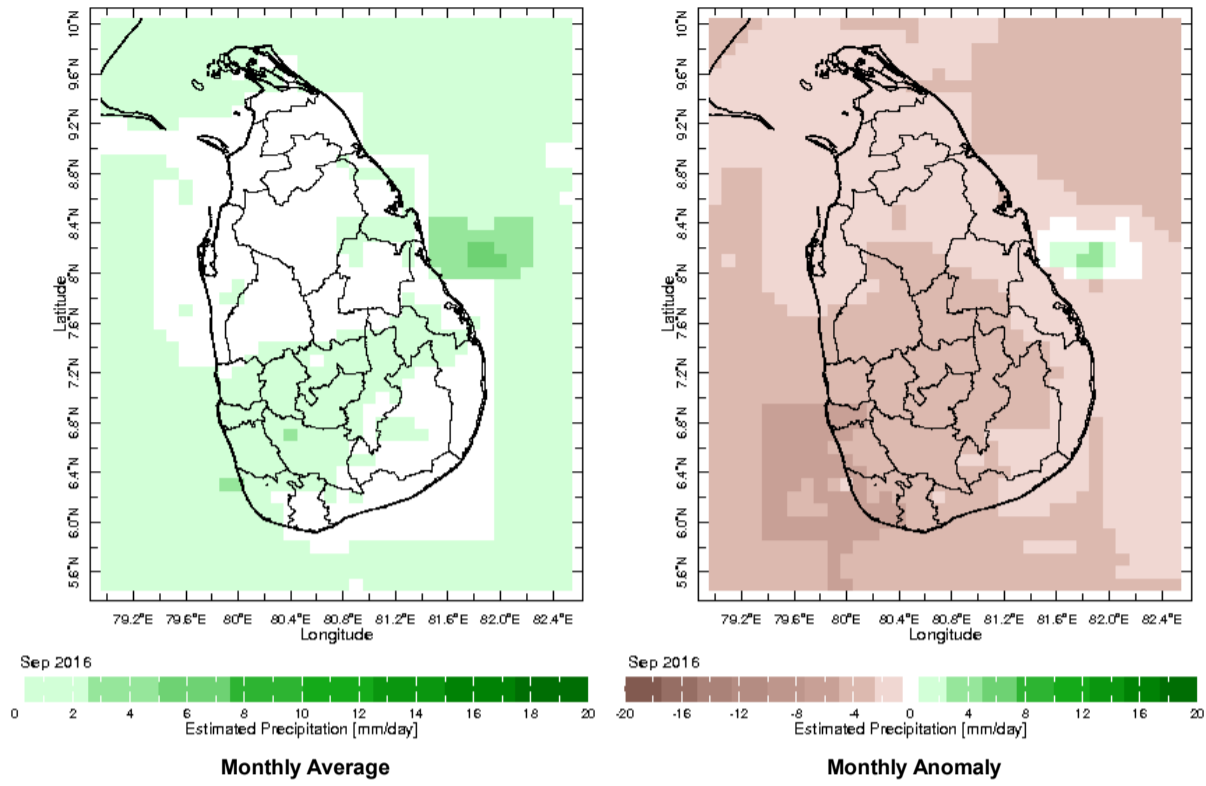


Data Source: CPC Unified (gauge-based & 0.5x0.5 deg resolution) Precipitation Analysis  
Climatology (1981-2010)

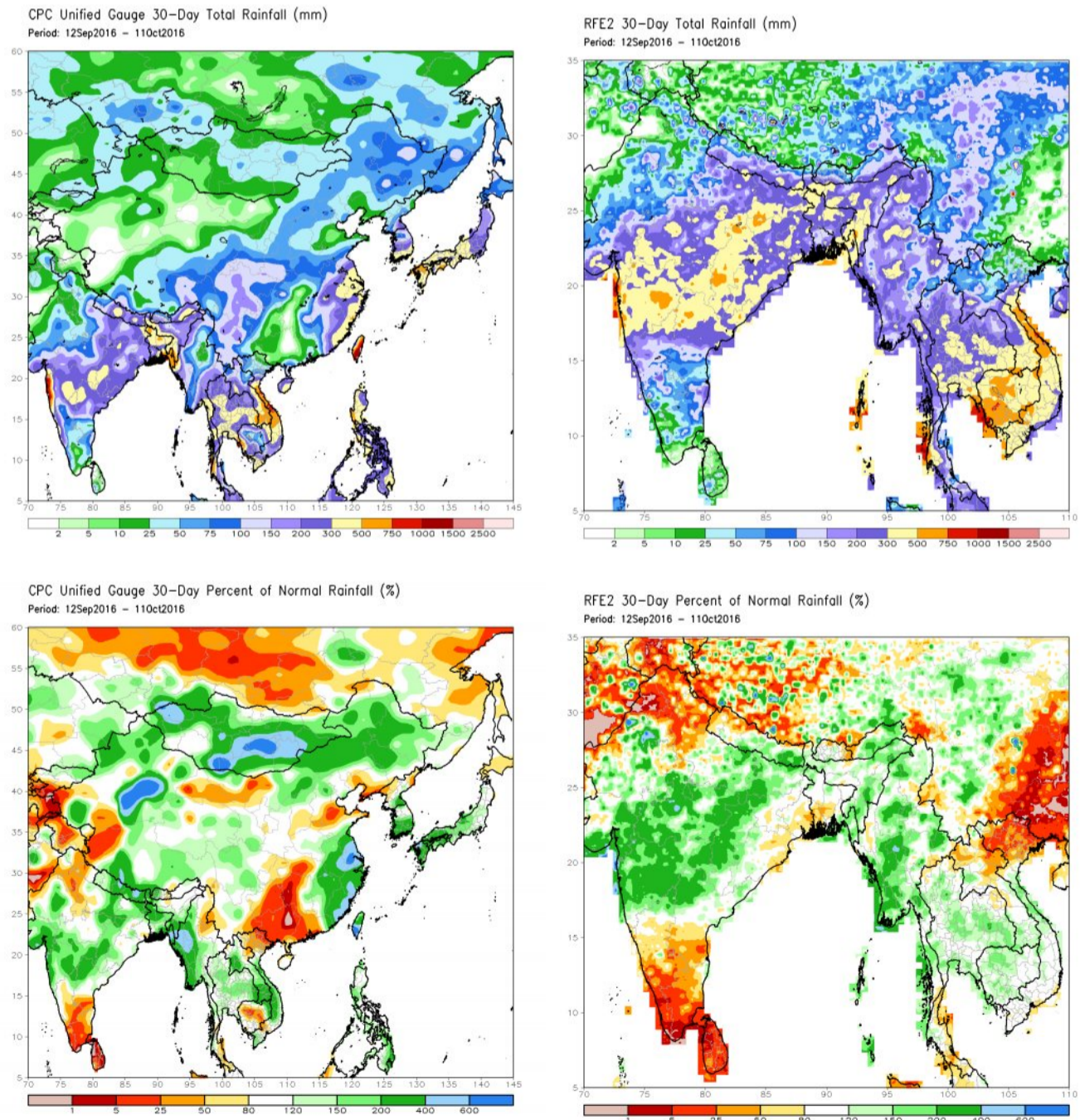


## Monthly Rainfall Monitoring

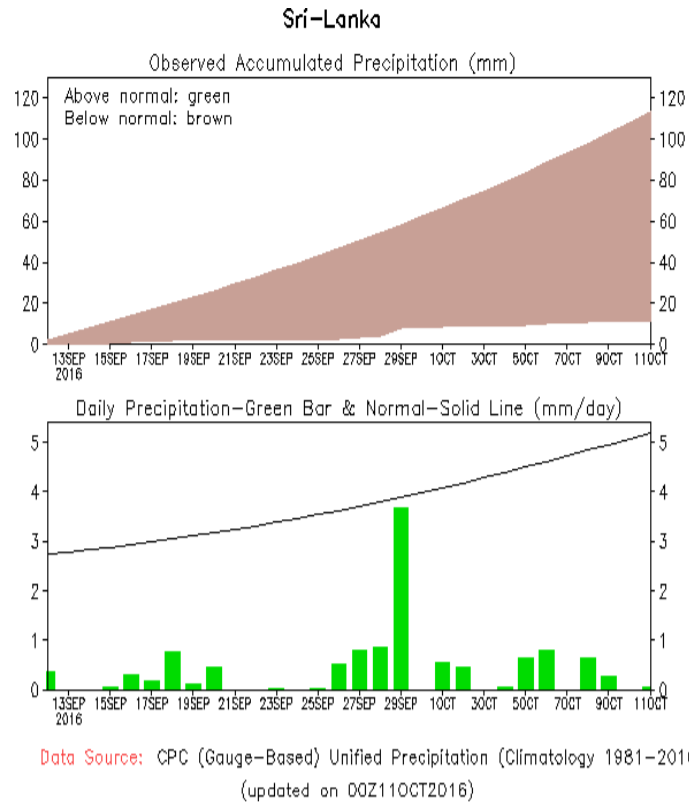
The figure in the left shows the average observed rainfall in the previous month. The rainfall anomaly in the previous month is shown in the figure to the right. The brown color in the anomaly figure shows places which received less rainfall than the historical average while the green color shows places with above average rainfall. Darker shades show higher magnitudes in rainfall



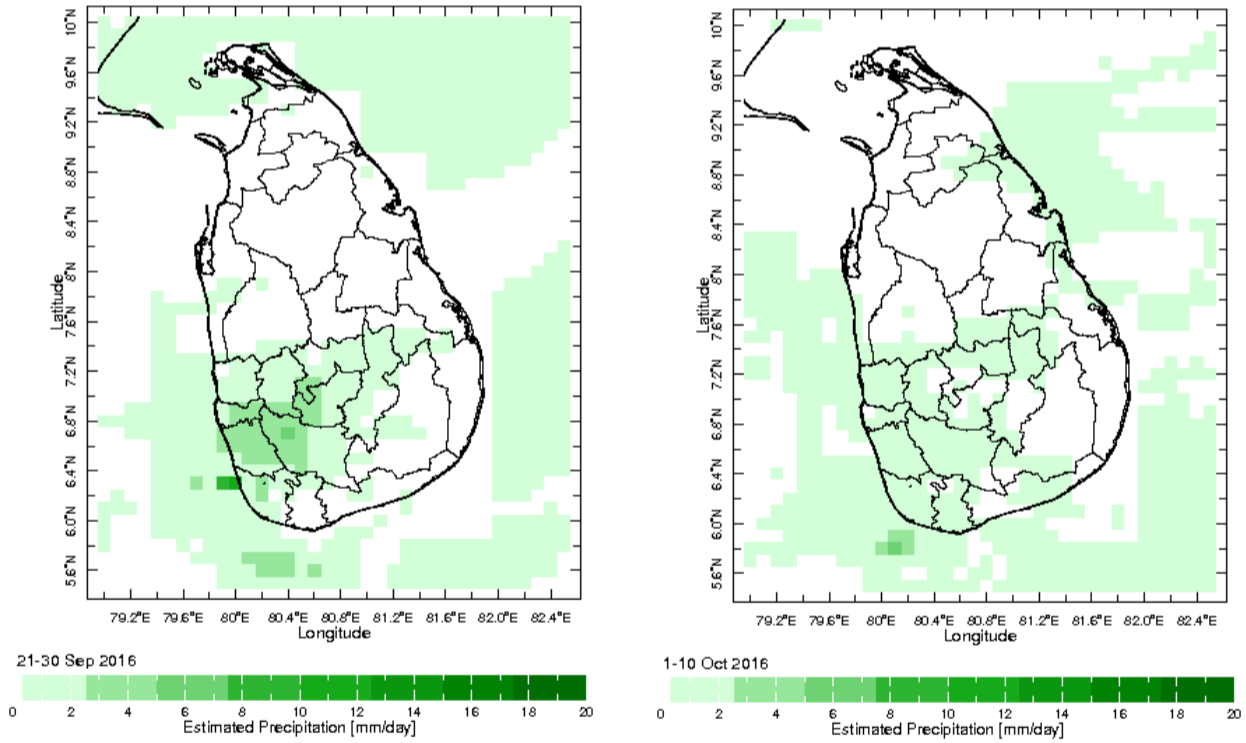
The figure in the top-left shows the total rainfall in the past 30 days from CPC Unified Precipitation Analysis while the figure in the top-right shows the total rainfall for the same period from RFE 2.0 Satellite Rainfall Estimates. The bottom two figures show the percentage of rainfall received in the past 30 days compared to normal rainfall in this period.



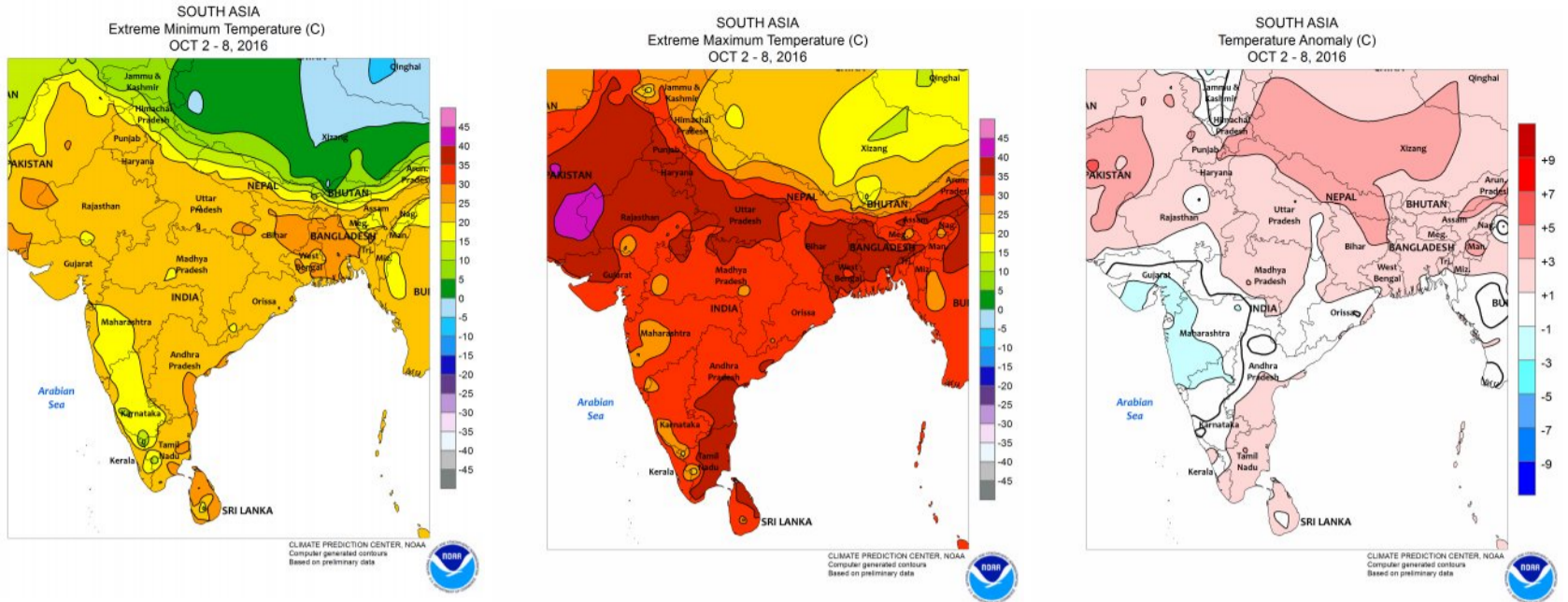
The following figure shows the observed accumulated rainfall (top) and daily observed rainfall (bottom) in Sri Lanka in the last 30 days.



**Dekadal (10 Day) Satellite Derived Rainfall Estimates**

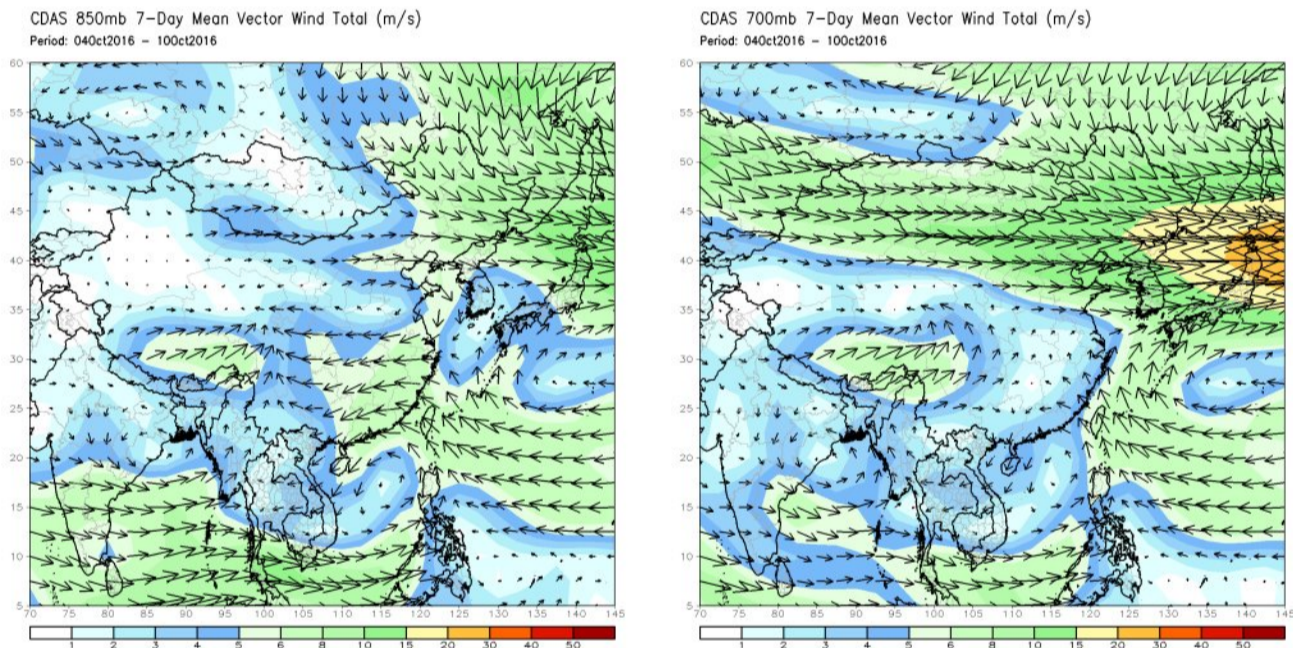


## Weekly Temperature Monitoring



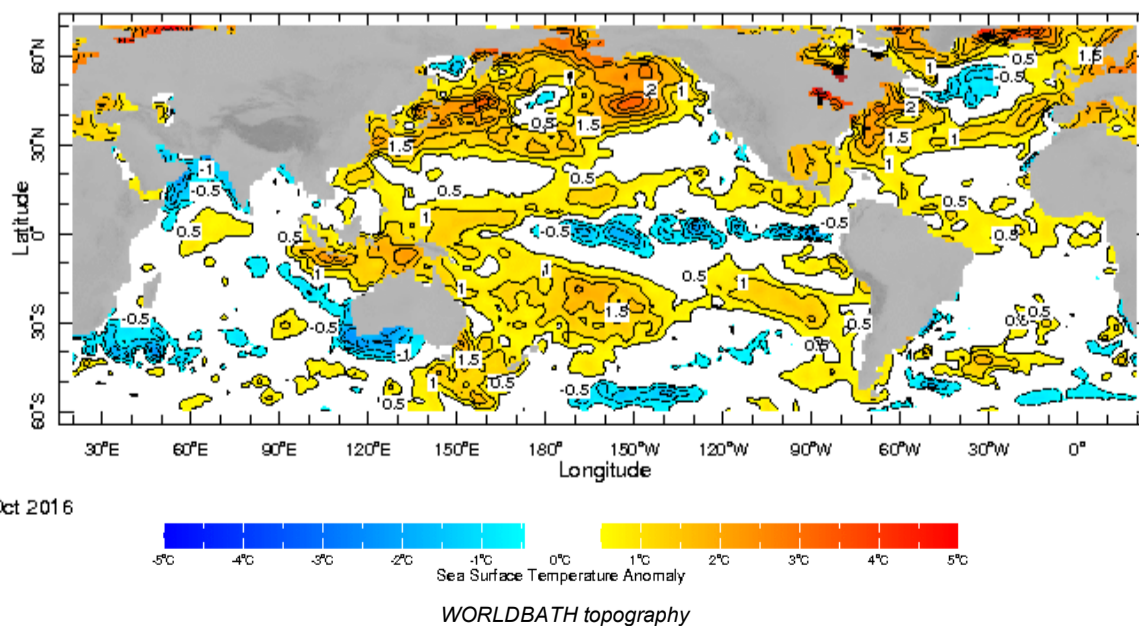
## Weekly Wind Monitoring

The following figures show the mean vector wind total of the past 7 days near Sri Lanka at two levels. The figure on the left shows 850 mb (~1500 m) level and the figure on the right shows 700 mb (~3000 m) level.

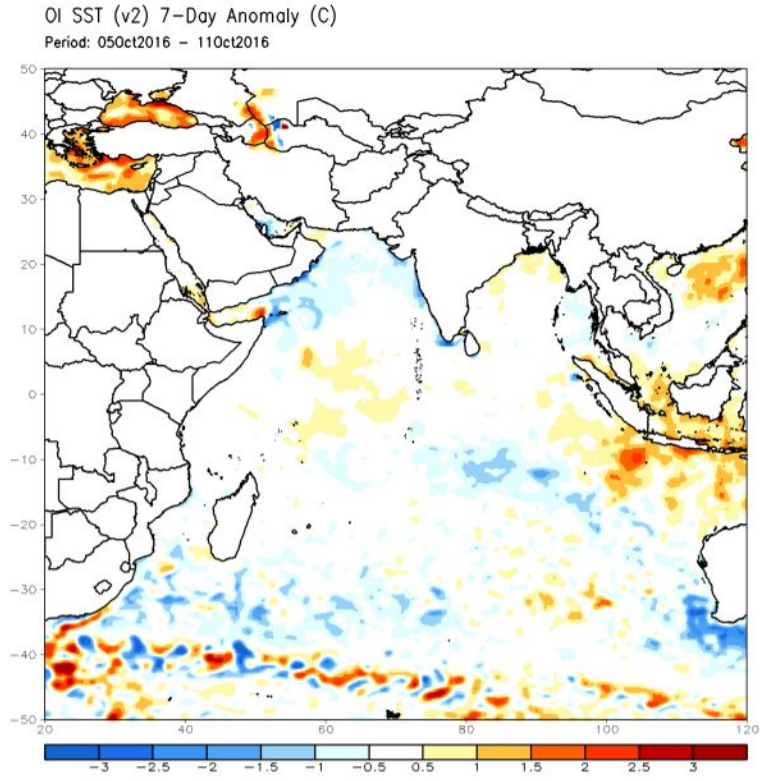


## Weekly Average SST Anomalies

Weekly average Sea Surface Temperature (SST) anomaly in the world from NOAA NCEP

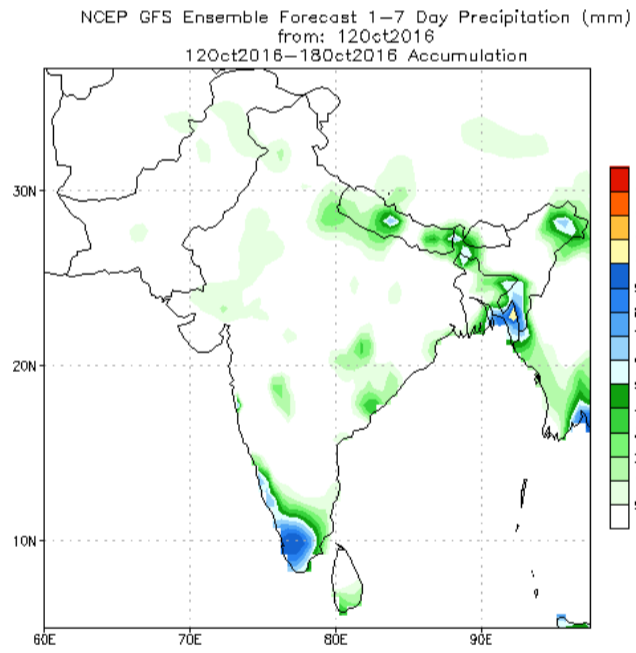




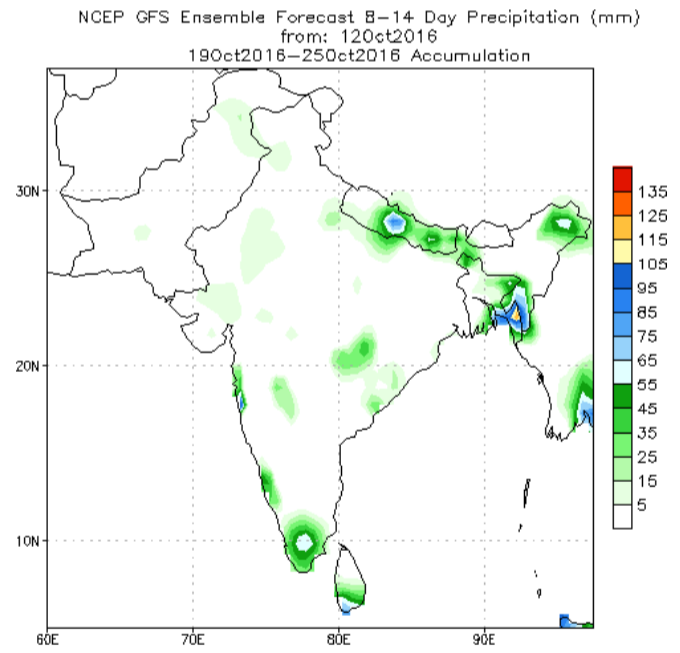


PREDICTIONS

NCEP GFS 1- 14 Day prediction

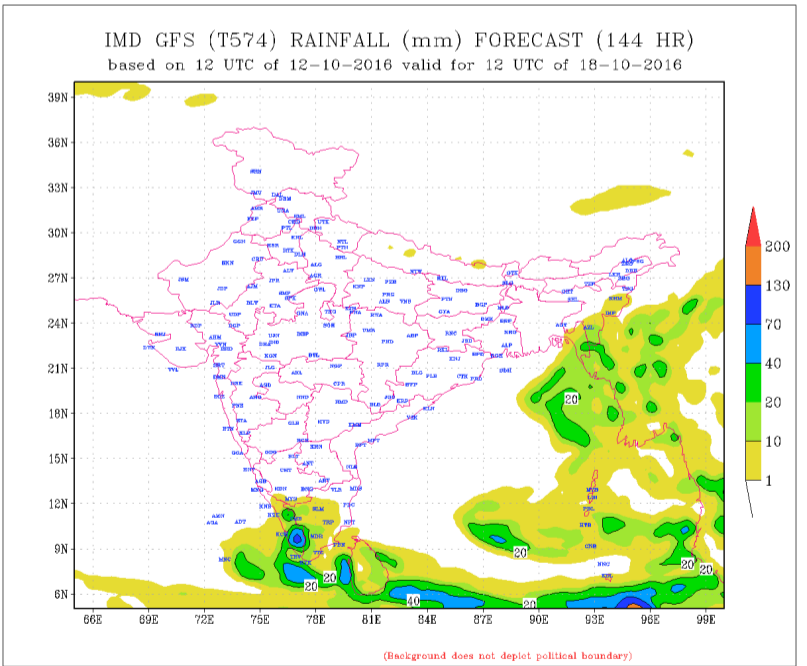
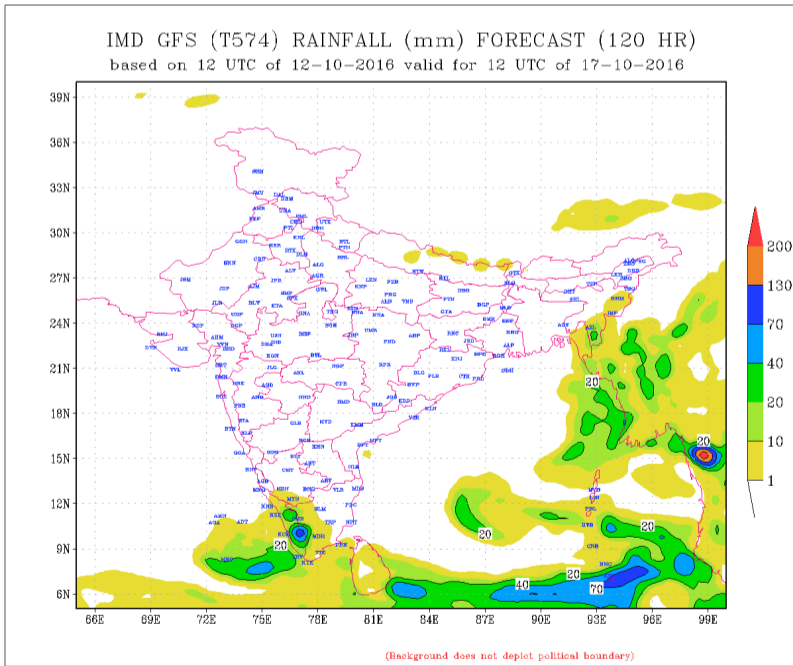
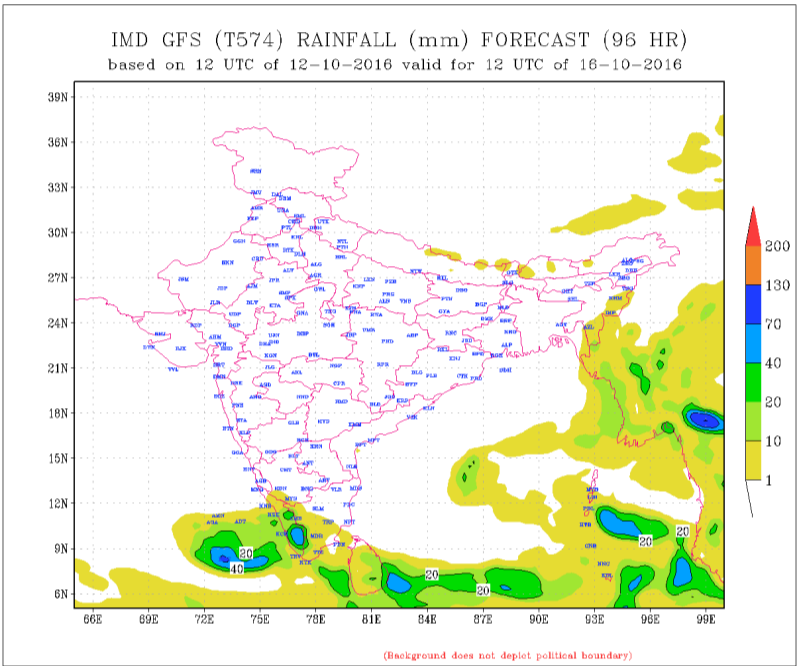
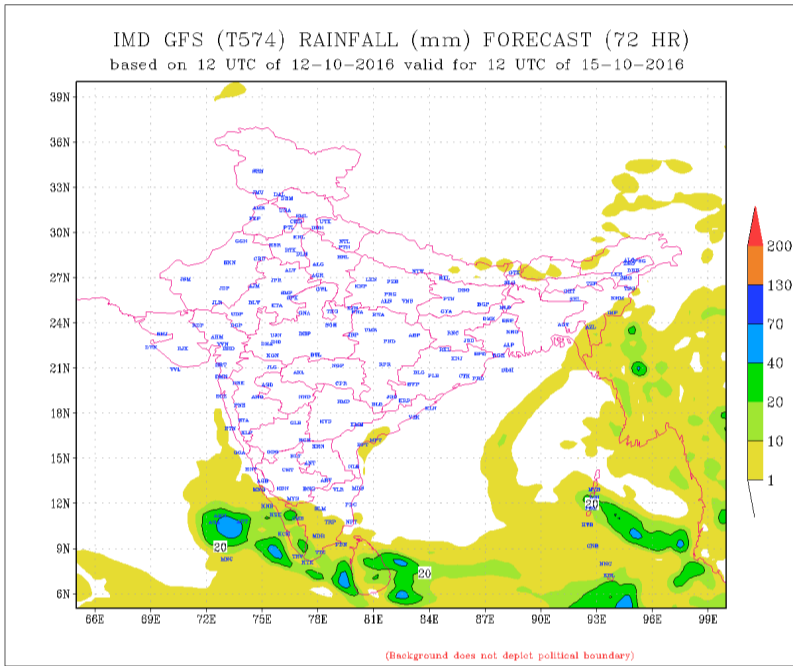
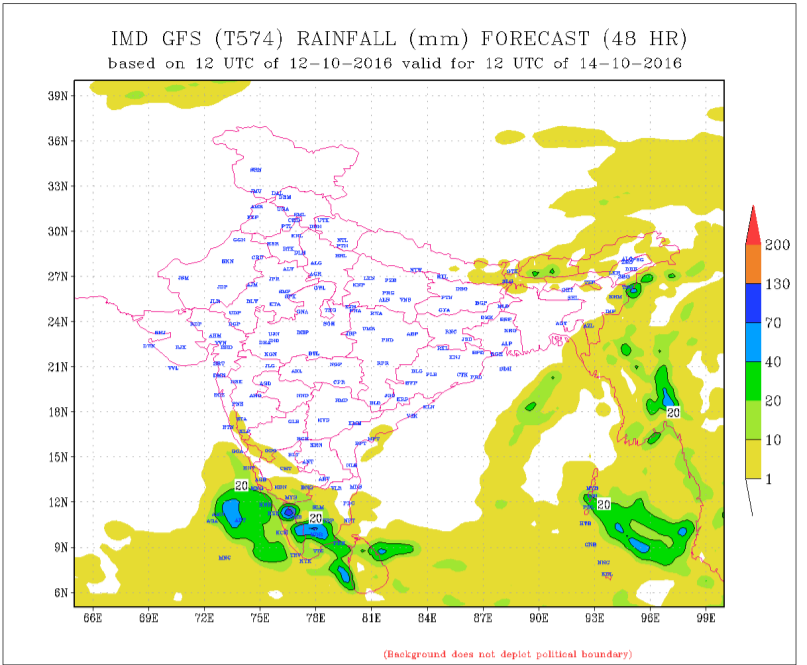
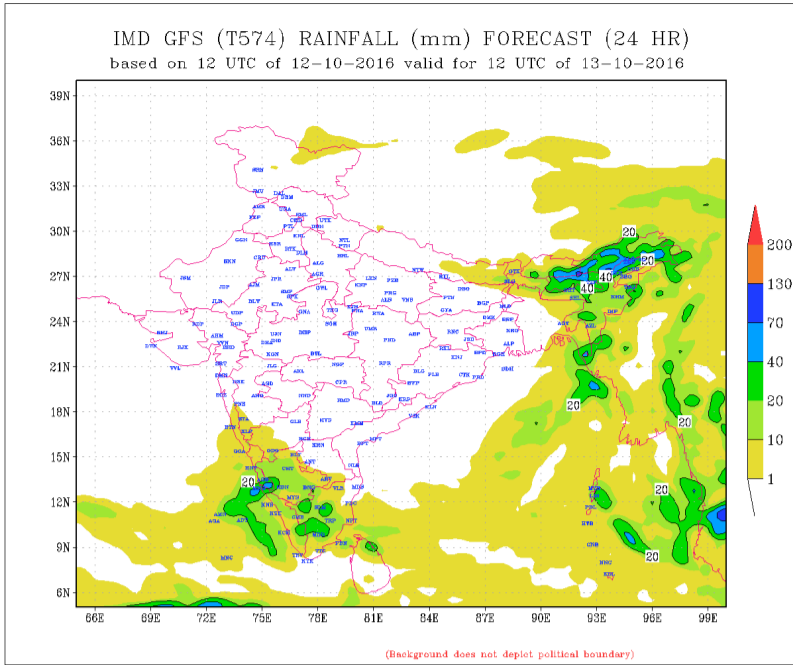


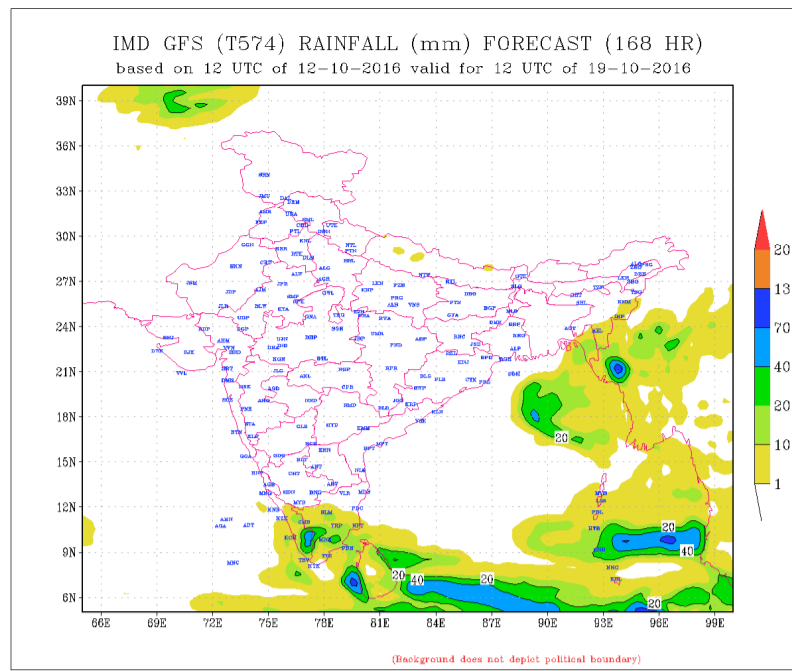
Bias correction based on last 30-day forecast error



Bias correction based on last 30-day forecast error

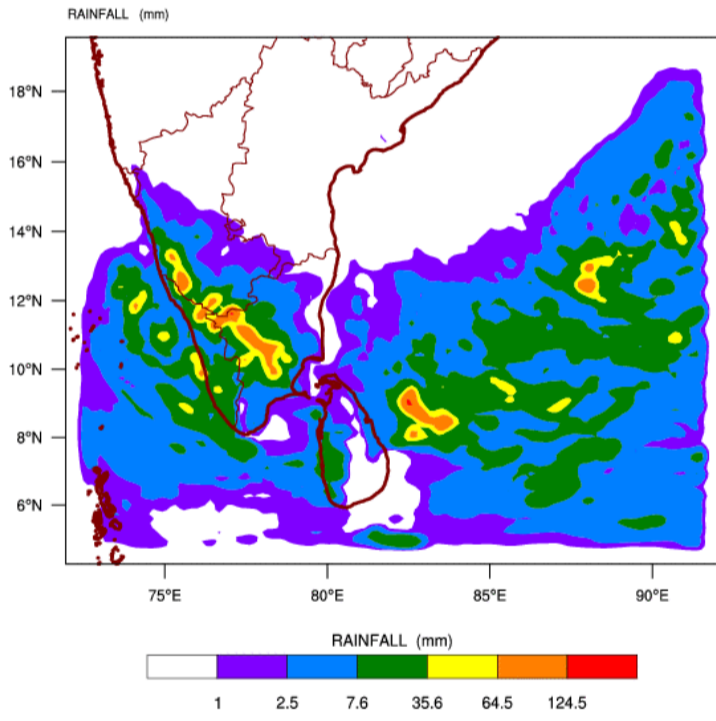
IMD GFS (T574) Model Rainfall Forecast from RMSC New Delhi, India



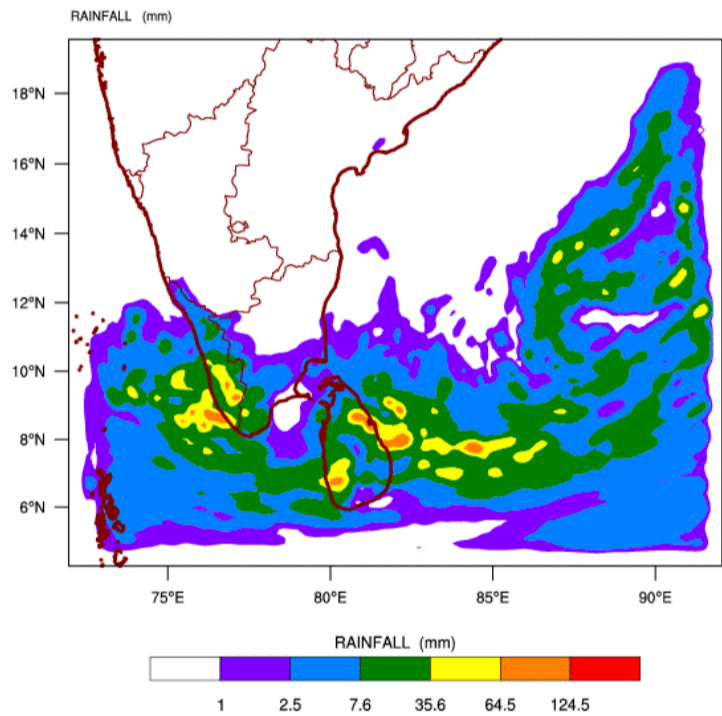


**WRF Model Forecast (from IMD Chennai)**

WRF MODEL FORECAST (48 HR.) RAINFALL(mm)\  
 based on 00 UTC of 12-10-2016 valid for 03 UTC of 14-10-2016

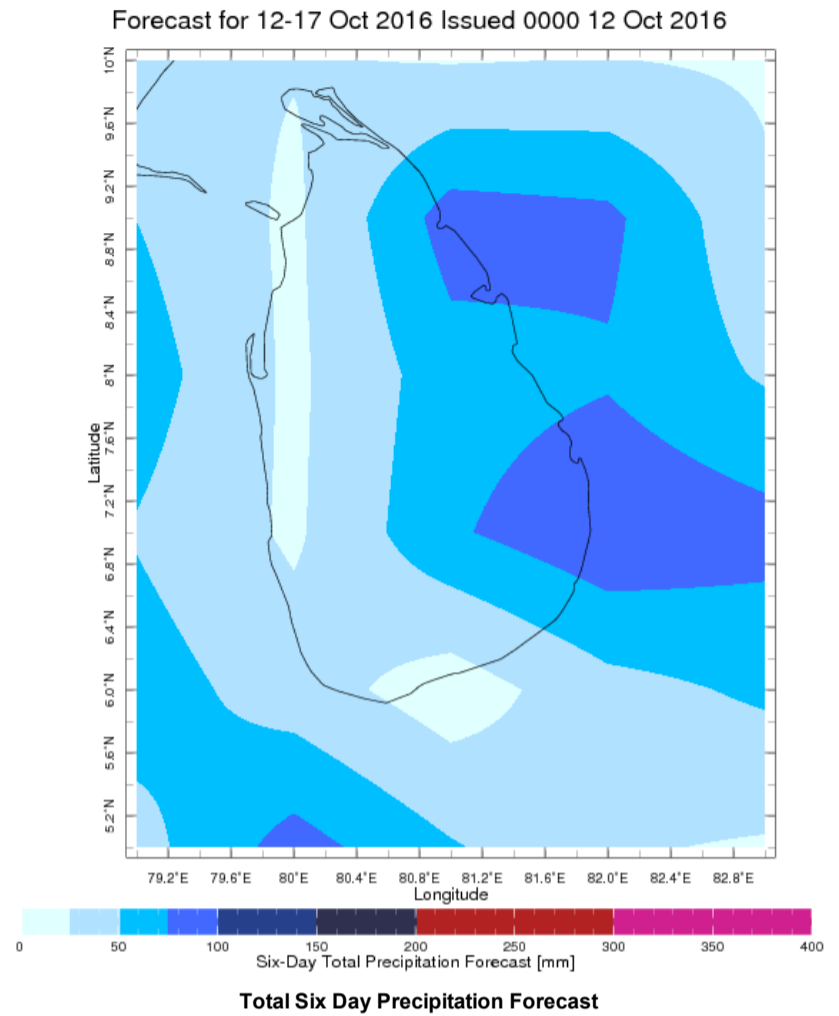
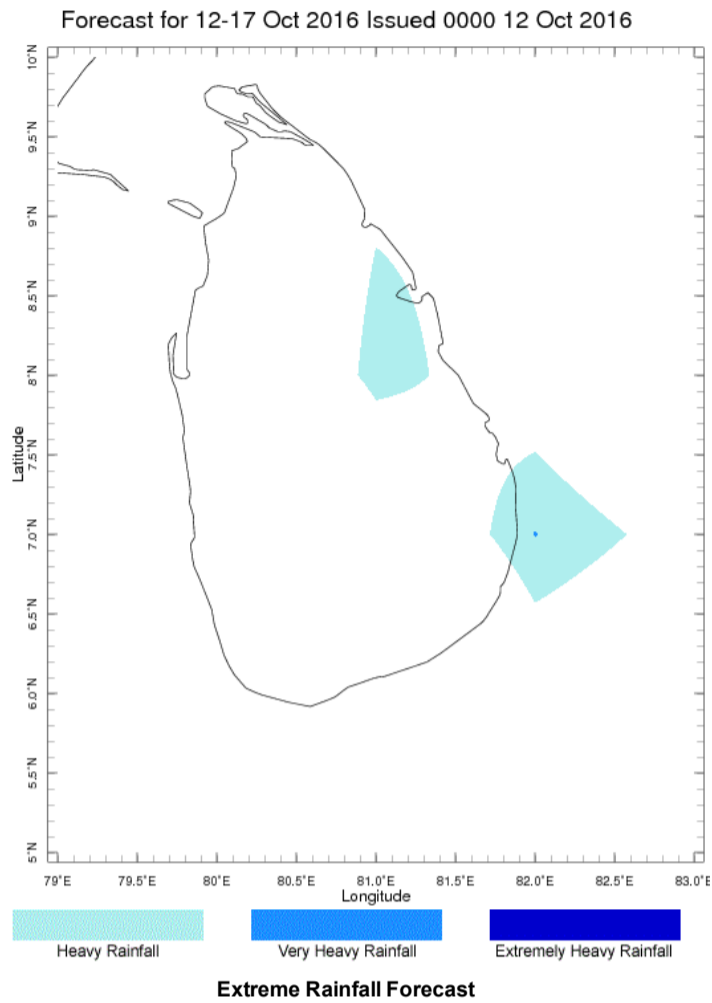


WRF MODEL FORECAST (72 HR.) RAINFALL(mm)\  
 based on 00 UTC of 12-10-2016 valid for 03 UTC of 15-10-2016



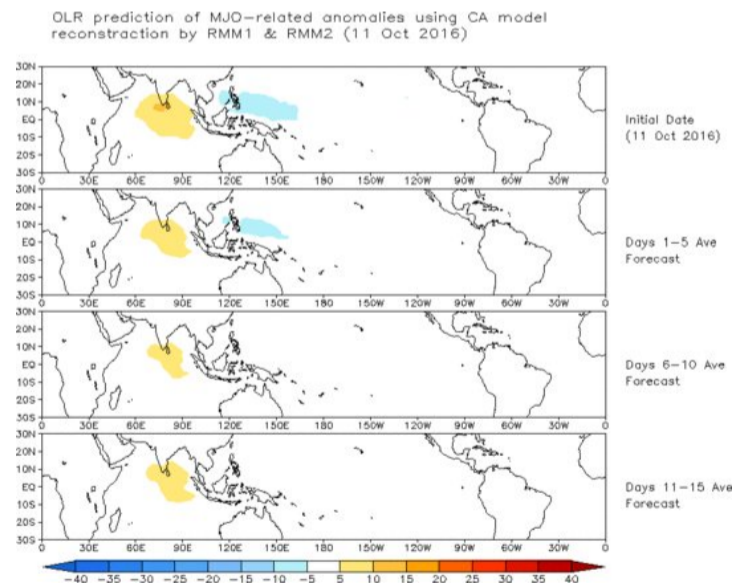
## Weekly Rainfall Forecast from IRI

Total rainfall forecast from the IRI for next six days is provided in figures below. The figure to the left shows the expectancy of heavy rainfall events during these six days while the figure to the right is the prediction of total rainfall amount during this period.



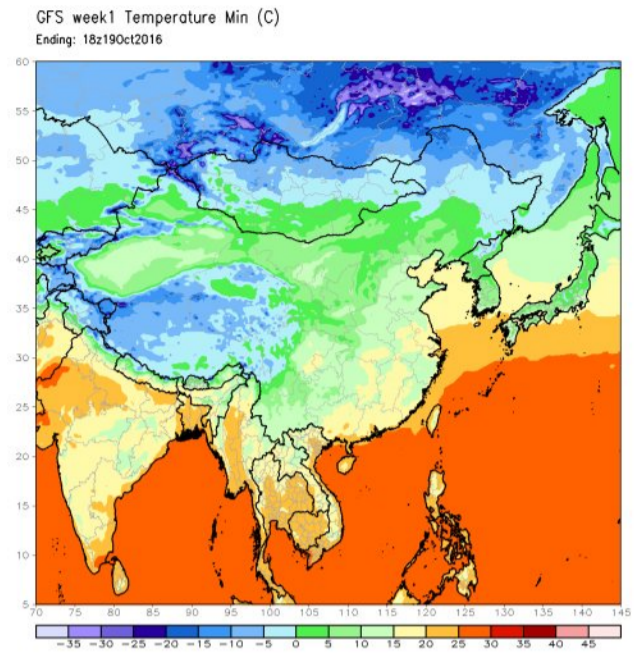
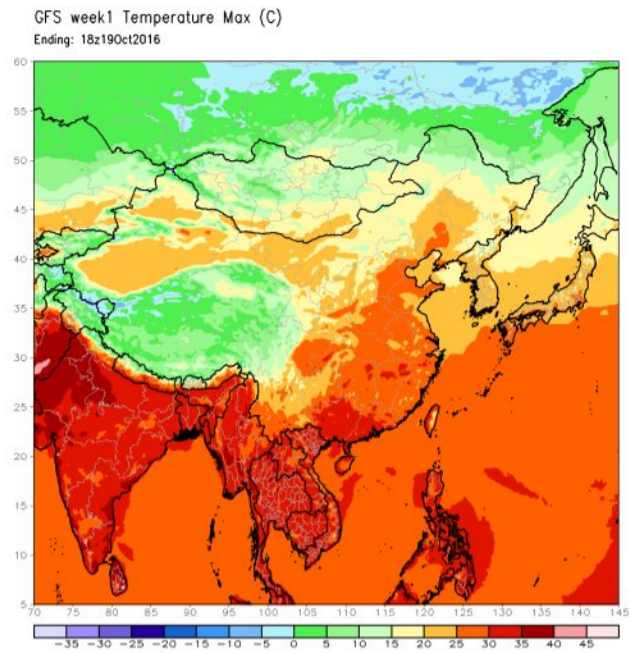
## Madden Julian Oscillation (MJO) related Outgoing Longwave Radiation (OLR) Forecast

The Outgoing Longwave Radiation (OLR) is a proxy for rainfall. This can be used to identify convective rain clouds based on the MJO phase. Violet and Blue shading indicates enhanced tropical weather and Orange shading indicates suppressed conditions. The following figure shows the forecasts of MJO associated anomalous OLR for the next 15 days from the Constructed Analogue (CA) model forecasts.



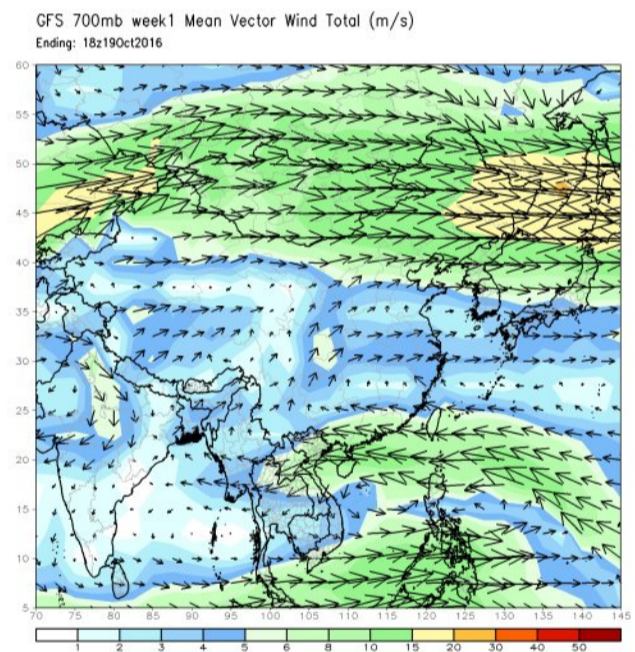
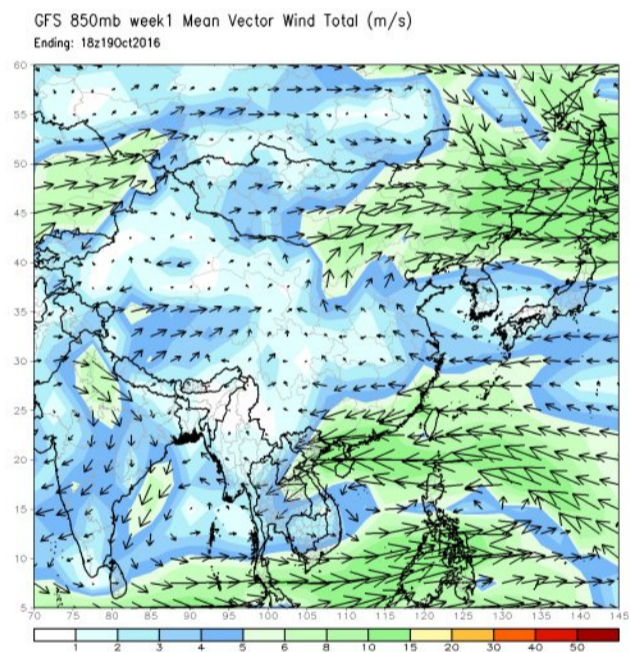
## Weekly Temperature Forecast

Weekly Minimum and Maximum Temperature prediction from the GFS model (from NOAA CPC)



## Weekly Wind Forecast

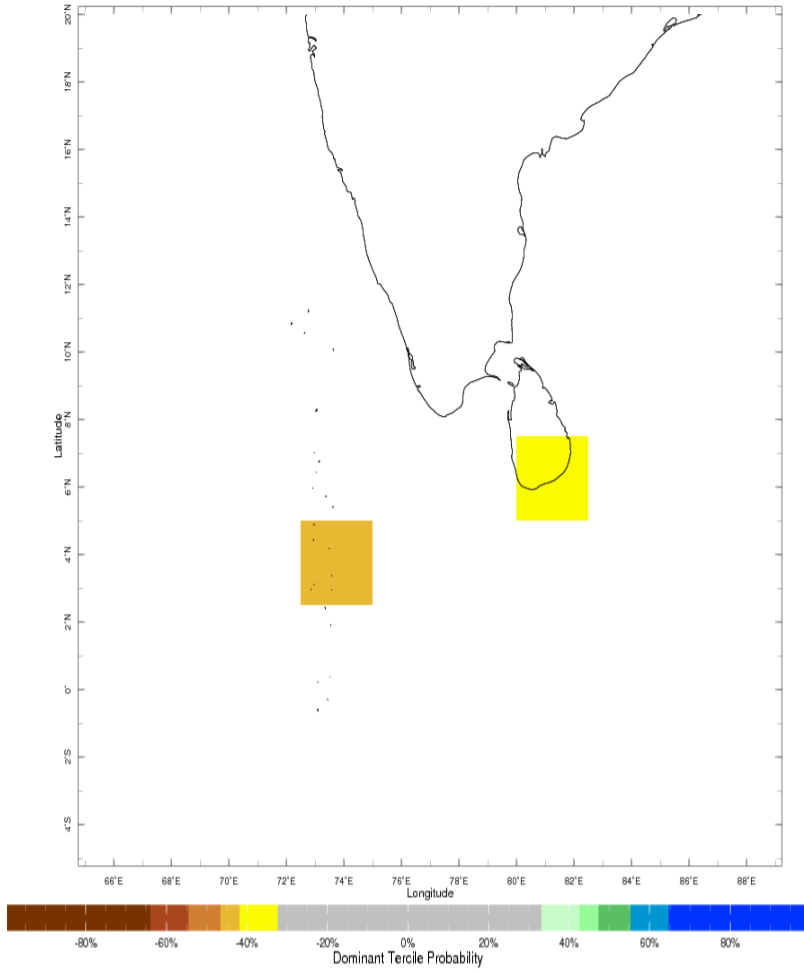
Weekly mean vector wind total prediction from the GFS model at 850 mb (left) and 700 mb (right) levels. (from NOAA CPC)



# Seasonal Rainfall and Temperature Forecast

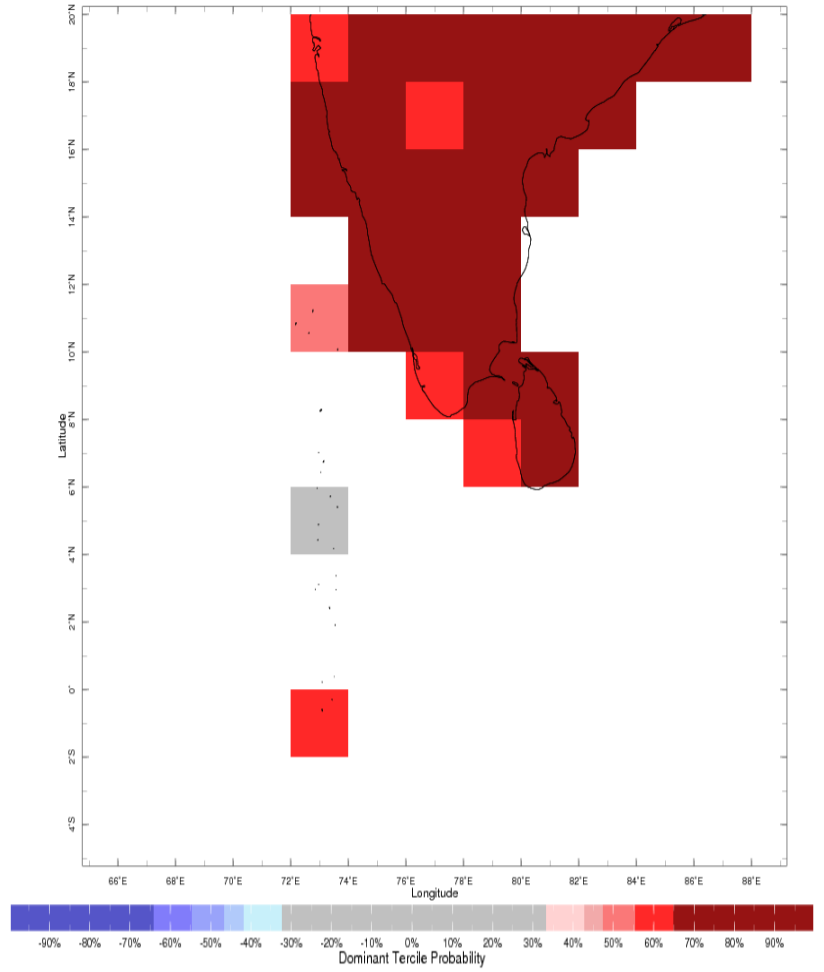
Following is the latest seasonal precipitation and temperature prediction for the next 3 months by the IRI. The color shading indicates the probability of the most dominant tercile -- that is, the tercile having the highest forecast probability. The color bar alongside the map defines these dominant tercile probability levels. The upper side of the color bar shows the colors used for increasingly strong probabilities when the dominant tercile is the above-normal tercile, while the lower side shows likewise for the below-normal tercile. The gray color indicates an enhanced probability for the near-normal tercile (nearly always limited to 40%).

Oct-Dec 2016 IRI Seasonal Precipitation Forecast issued Sep 2016



Precipitation Forecast

Oct-Dec 2016 IRI Seasonal Temperature Forecast issued Sep 2016



Temperature Forecast

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