

**11 September
2020**

EXPERIMENTAL CLIMATE MONITORING AND PREDICTION

By: Nipuni Alahakoon, Chethana Chandrasiri, Chayana Gunathilake, Tuan Hedgie Lareef Zubair and Michael Bell¹ (FECT and IRI¹)

HIGHLIGHTS

Rainfall Forecast



- The NOAA weekly rainfall forecast predicts up to 135 mm Jaffna district during 17th -23rd September.

Monitored Rainfalls



- Between 2nd- 8th September: up to 120 mm of rainfall was recorded in Badulla and Monaragala districts on 6th September.

Monitored Wind



- From 2nd- 8th September: up to 15 km/h, northwesterly winds were experienced by the entire island.

Monitored Sea Surface



- 1^oC above average sea surface temperature was observed in the seas around Sri Lanka.

Monitoring Rainfall

Weekly Monitoring

Date	Rainfall
2 nd September	Up to 40 mm in Mannar, Anuradhapura and Vavuniya districts; up to 30 mm in Puttalam district; up to 20 mm in Jaffna, Mullaitivu and Kilinochchi districts, up to 15 mm in Trincomalee, Ampara, Hambantota, Monaragala, Badulla, Kandy, Nuwara Eliya, Ratnapura, Kegalle, Colombo and Kalutara districts; and up to 10 mm in Galle, Matara, Gampaha, Kurunegala, Matale, Polonnaruwa and Batticaloa districts.
3 rd September	Up to 30 mm in Batticaloa district; up to 15 mm in Ampara and Polonnaruwa districts; up to 10 mm in Badulla, Matale, Anuradhapura, Trincomalee, Vavuniya and Mullaitivu districts; and up to 5 mm in Kilinochchi, Mannar, puttalam, Kurunegala, Gampaha, Kegalle, Kandy, Nuwara Eliya and Monaragala districts.
4 th September	Up to 10 mm in Kilinochchi, Mullaitivu, Anuradhapura, Trincomalee, Vavuniya and Monaragala districts; up to 5 mm in Jaffna, Mannar, Puttalam, Polonnaruwa, Ampara and Badulla districts; and up to 2.5 mm in Nuwara Eliya, Kandy and Matale districts.
5 th September	Up to 60 mm in Polonnaruwa, Ampara and Badulla districts; up to 50 mm in Matale and Batticaloa districts; up to 30 mm in Monaragala district; up to 20 mm in Nuwara Eliya, Kandy, Kurunegala, Anuradhapura, Puttalam and Trincomalee districts; up to 15 mm in Mannar, Vavuniya and Mullaitivu districts; up to 10 mm in Gampaha, Kegalle, Ratnapura, Kilinochchi and Jaffna districts; up to 5 mm in Colombo and Kalutara districts; and up to 2.5 mm in Galle district.



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Date	Rainfall
6th September	Up to 120 mm in Badulla and Monaragala districts; up to 80 mm in Nuwara Eliya district; up to 70 mm in Kandy district; up to 60 mm in Matale, Ampara and Trincomalee districts; up to 50 mm in Polonnaruwa, Puttalam and Kurunegala districts; up to 40 mm in Anuradhapura district; up to 30 mm in Galle, Kalutara, Colombo, Gampaha, Kegalle and Ratnapura districts; up to 20 mm in Batticaloa and Puttalam districts; up to 15 mm in Matara and Hambantota districts; up to 10 mm in Vavuniya and Mullaitivu districts; and up to 5 mm in Kilinochchi and Jaffna districts.
7th September	Up to 15 mm in Ampara district; up to 10 mm in Hambantota, Monaragala, Nuwara Eliya, Kandy, Badulla, Batticaloa, Kurunegala, and Matale districts; up to 5 mm in Mullaitivu, Puttalam, Polonnaruwa, Gampaha, Kegalle, ratnapura, Anuradhapura, Matara and Galle districts; and up to 2.5 mm in Kalutara and Jaffa districts.
8th September	Up to 60 mm in Gampaha district, up to 50 mm in Colombo, Puttalam and Kurunegala districts; up to 30 mm in Kegalle, Kalutara and Ratnapura districts; up to 20 mm in Galle and Matara districts; up to 15 mm in Hambantota, Monaragala and Ampara districts; up to 10 mm in Badulla, Batticaloa, Jaffna, Kilinichchi and Mullaitivu districts; up to 5 mm in Kandy, Nuwara Eliya, Matale, Polonnaruwa, Anuradhapura, Vavuniya, Trincomalee and Mannar districts.

Total Rainfall for the Past Week

The RFE 2.0 tool shows total up to 75 – 100 mm in Galle and Ratnapura districts; up to 50 - 75 mm in Matara and Colombo districts; up to 25 -75 mm in Nuwara Eliya, Kegalle and Gampaha districts; Up to 10 – 25 mm in Hambantota, Monaragala, Badulla, Ampara, Batticaloa, Polonnaruwa, Matale, Kurunegala, Anuradhapura and Puttalam districts; up to 5 -10 mm in Trincomalee and Jaffna districts.

Above rainfall average up to 50 – 100 mm in Ampara, Trincomalee, Puttalam, Polonnaruwa, Gampaha and Badulla districts; up to 25 – 50 mm in Colombo, Kurunegala, Kegalle, Monaragala, Matale, Kandy, Batticaloa, Anuradhapura, Mullaitivu and Mannar districts; up to 10 – 25 mm in Vavuniya, Kilinochchi and Jaffna districts; Below rainfall average up to 25 – 50 mm in Ratnapura district; up to 10 – 25 mm in Kalutara, Galle, Matara, Hambantota districts.

Monthly Monitoring

During August – Above average rainfall conditions up to 4 mm in Monaragala, Badulla and Ampara districts; and up to 3 mm in Hambantota, Ratnapura, Nuwara Eliya, Kandy, Matale, Polonnaruwa, Batticaloa, Anuradhapura, Gampaha, Kurunegala, Puttalam, Trincomalee, Vavuniya, Mullaitivu, Mannar, Kilinochchi and Jaffna districts. Below average rainfall conditions up to 3 mm in Kegalle, Colombo, Kalutara, Galle and Matara.

Ocean State (Text Courtesy IRI)

Pacific sea state: September 2, 2020

SSTs in the east-central and south eastern Pacific decreased to near the La Niña threshold in Early-September, and the atmospheric variables were either ENSO-neutral or indicative of weak La Niña conditions. The average of the forecasts of many models just short of the borderline of weak La Niña SST conditions through fall, becoming slightly weaker beginning in early winter. The official CPC/IRI



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outlook is somewhat similar to these model forecasts, calling for a likely continuation of ENSO-neutral in summer, with approximately equal chances of ENSO-neutral or La Niña for fall and winter.

Indian Ocean State

1 °C above average sea surface temperature was observed in the seas around Sri Lanka.

Predictions

Rainfall

14-day prediction: NOAA NCEP models

From 10th September – 10th September: Total rainfall up to 55 mm in Jaffna, Kilinochchi and Mullaitivu districts; up to 45 mm in Trincomalee, Vavuniya, Anuradhapura, Batticaloa and Polonnaruwa districts; up to 35 mm in Mannar, Ampara, Monaragala, Badulla, Nuwara Eliya, Kandy, Matale, Galle and Ratnapura districts; and up to 25 mm in Puttalm, Kurunegala, Kegalle, Colombo, Gampaha, Matara and Hambantota districts.

From 17th September– 23rd September: Total rainfall up to 135 mm in Jaffna district; up to 95 mm in Kilinochchi and Mullaitivu districts; up to 85 mm in Mannar and Vavuniya districts; up to 65 mm in Anuradhapura and Trincomalee districts; up to 55 mm in Puttalam, Polonnaruwa, Batticaloa and Ampara districts; up to 45 mm in Kurunegala, Matale, Kandy, Nuwara Eliya, Badulla, Monaragala, Galle, Ratnapura and Matara districts; up to 35 mm in Gampaha and Hambantota districts; and up to 25 mm in Kegalle district.

NOAA Model Forecast:

From 10th – 15th September: Total rainfall up to 50 mm in Kalutara and Galle districts; and up to 25 mm in Colombo, Matale, Kandy, Kegalle, Nuwara Eliya, Badulla, Mullaitivu, Trincomalee, Kilinochchi, Vavuniya, Anuradhapura, Polonnaruwa, Kurunegala, Gampaha, Puttalam, Ratnapura, Matara, Hambantota, Ampara, Monaragala, Mannar, Jaffna and Batticaloa districts.

MJO based OLR predictions

For the next 15 days:

MJO shall remain neutral rainfall during 9th -18th September, slightly suppressed during 19th -23rd September.

¹ 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.



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<http://www.tropicalclimate.org/>



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Weekly Hydro- Meteorological Report for Sri Lanka

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- Weekly Temperature Monitoring
- Weekly Wind Monitoring
- Weekly Average SST Anomalies

2. Predictions

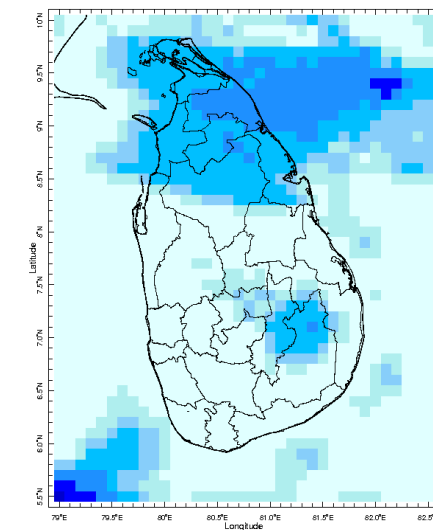
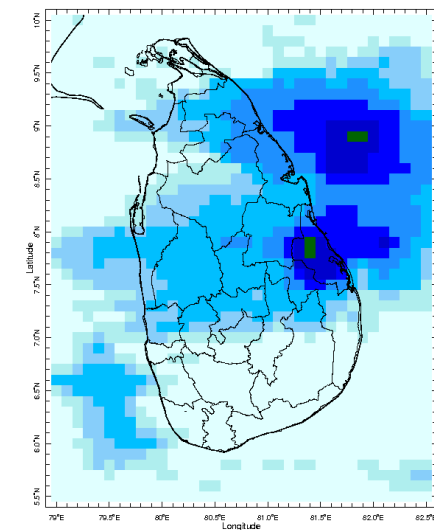
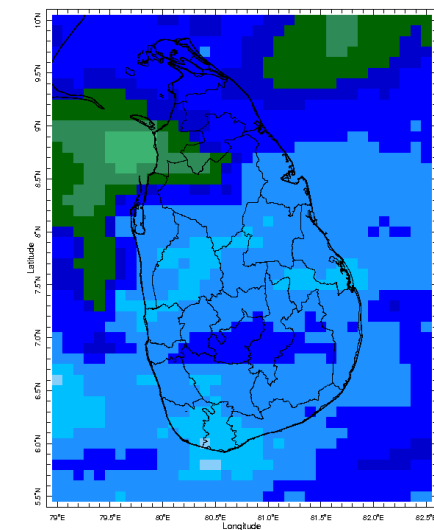
- NCEP GFS Ensemble 1-14 day Rainfall Predictions
- GFS (T574) Model Rainfall Forecast from RMSC New Delhi
- WRF Model Rainfall Forecast from IMD Chennai
- MJO Related OLR Forecast
- Weekly Precipitation Forecast from IRI
- Weekly Temperature Forecast
- Weekly Wind Forecast
- Seasonal Predictions from IRI

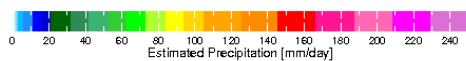
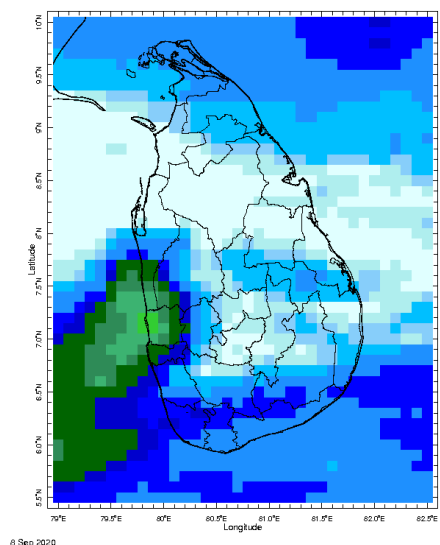
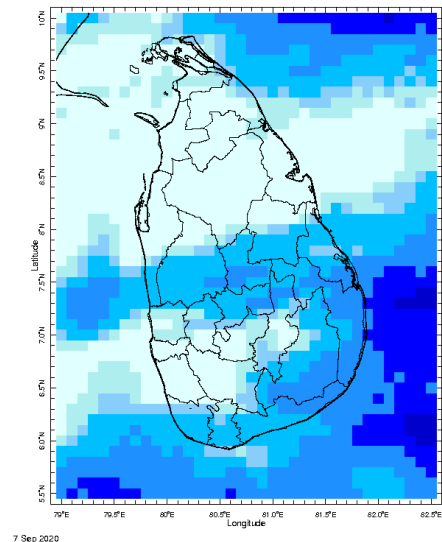
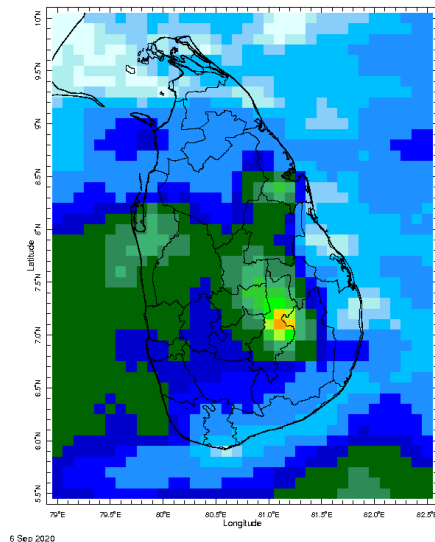
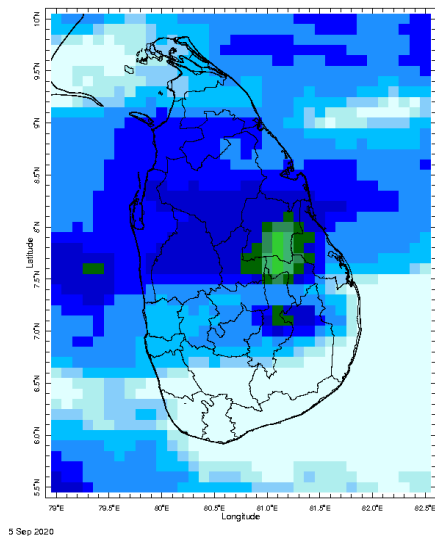


MONITORING

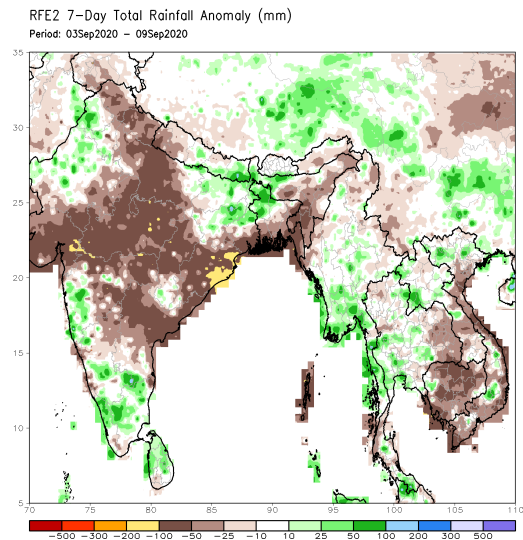
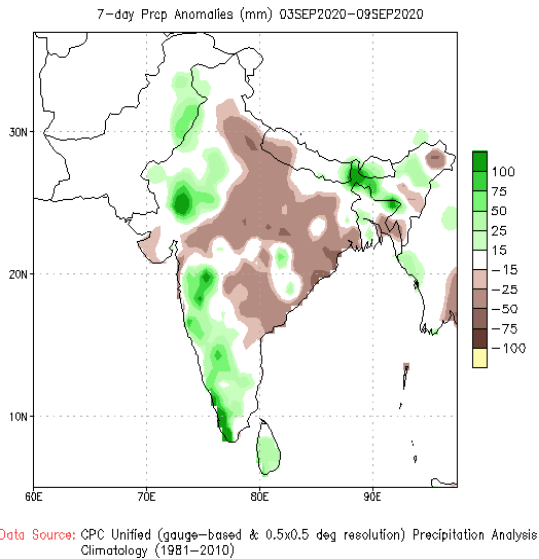
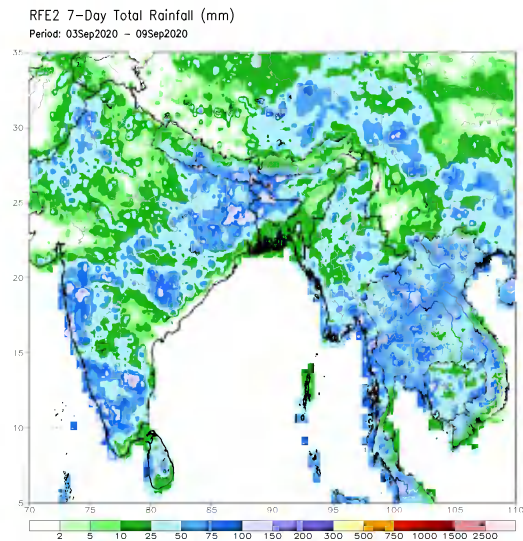
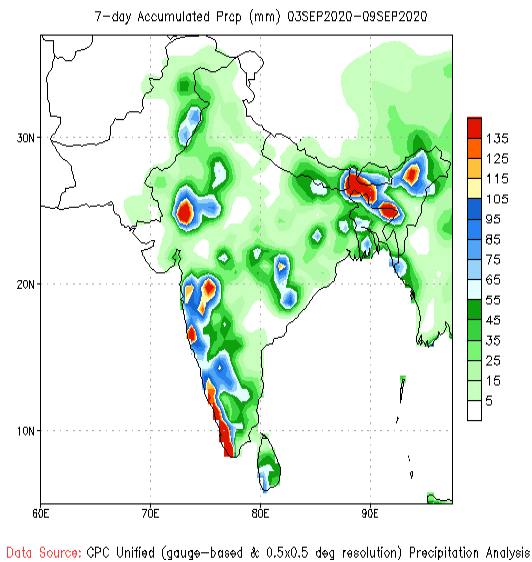
Daily Rainfall Monitoring

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



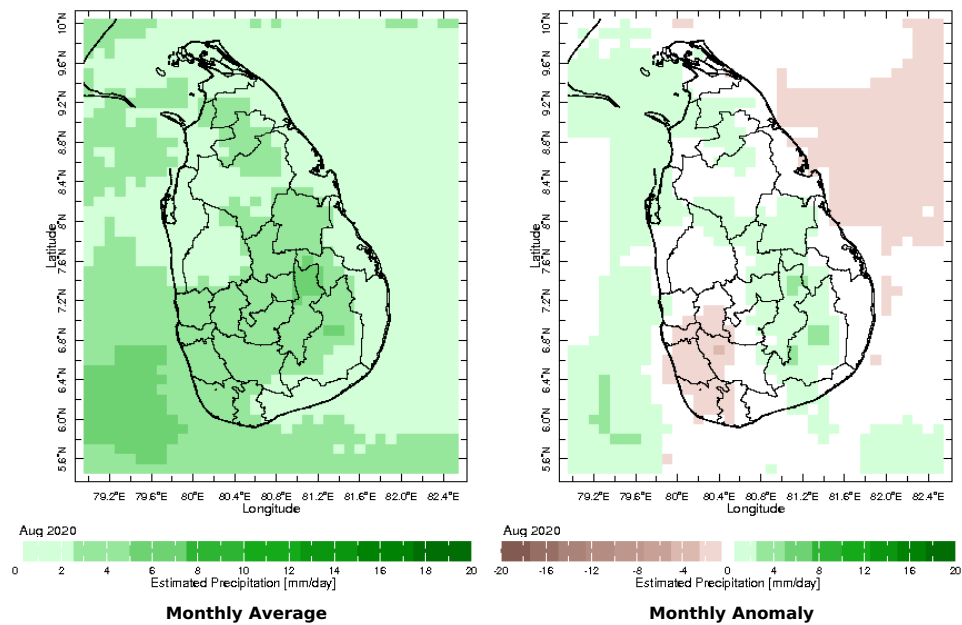


The following figures show the total satellite observed rainfall in the last week in Sri Lanka. The figure in the left is the total 7-day rainfall from NOAA Climate Prediction Center (CPC) Unified Precipitation Analysis and the figure in the right is the total 7-day rainfall from CPC RFE 2.0 Satellite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

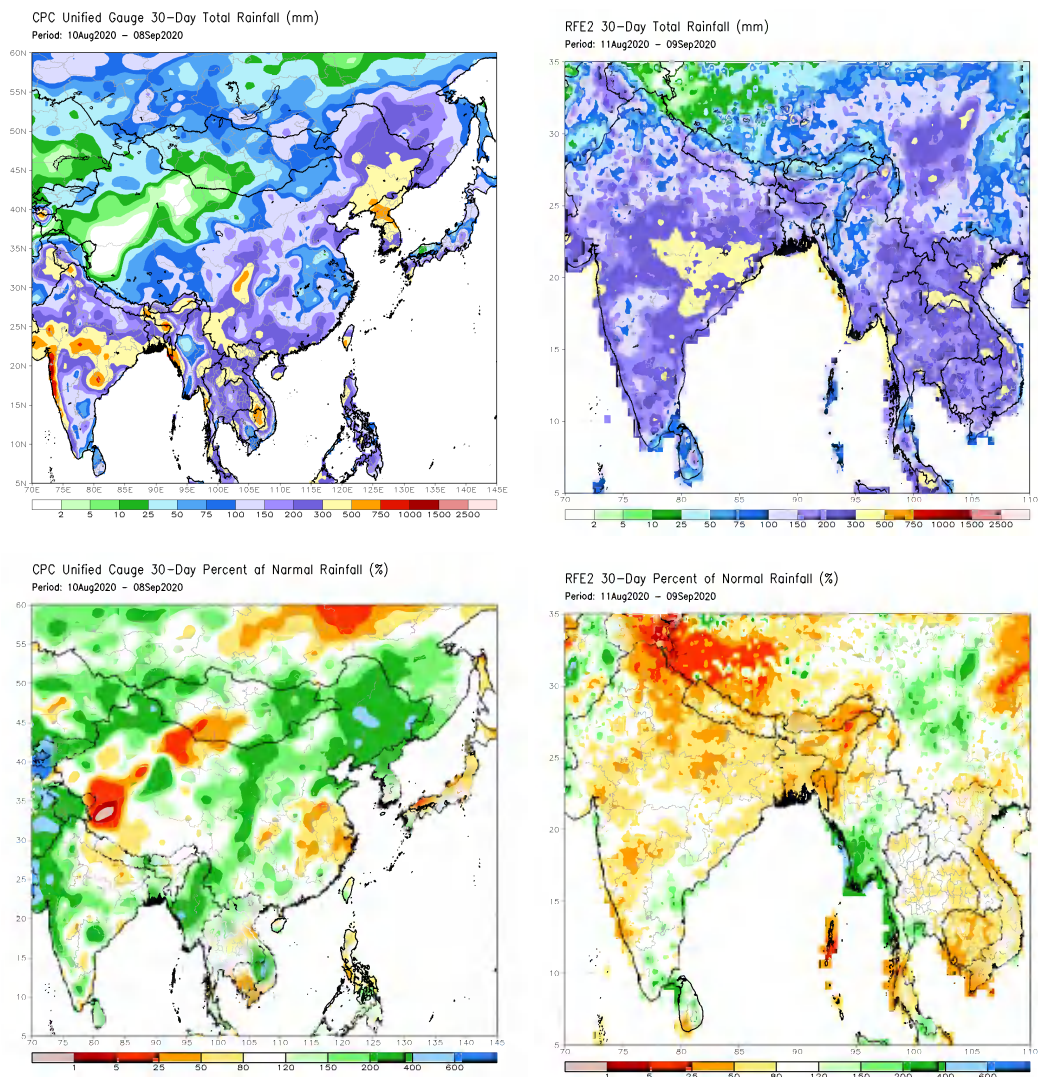


Monthly Rainfall Monitoring

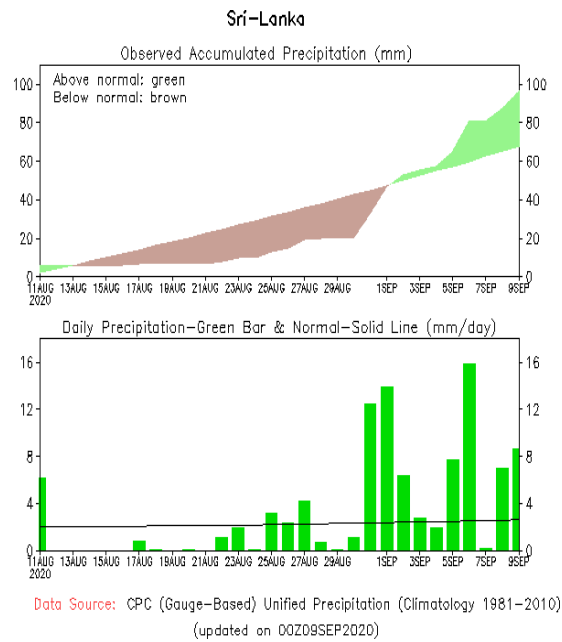
The figure in the left shows the average observed rainfall in the previous month. The rainfall anomaly in the previous month is shown in the figure to the right. The brown color in the anomaly figure shows places which received less rainfall than the historical average while the green color shows places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



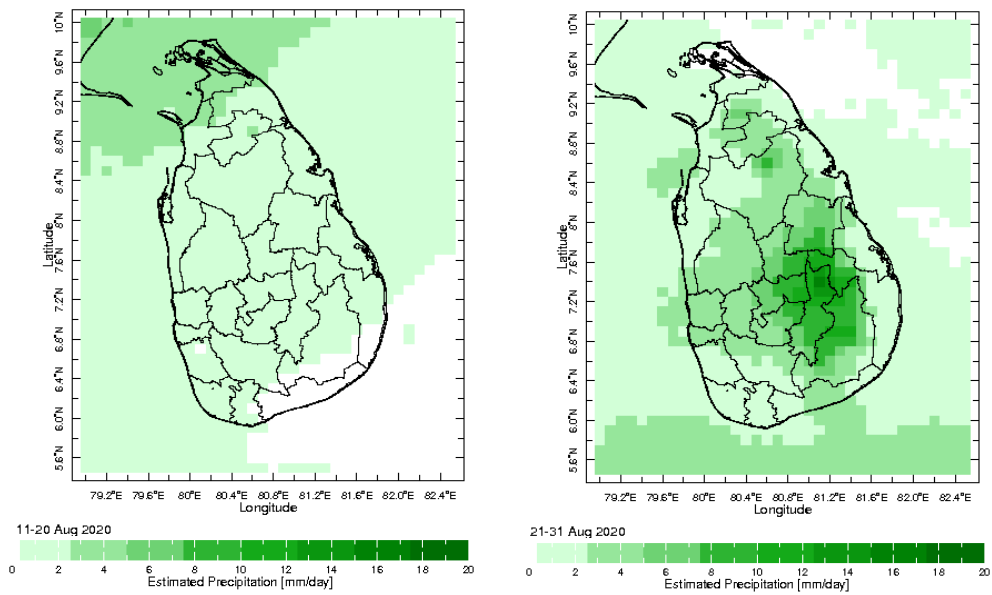
The figure in the top-left shows the total rainfall in the past 30 days from CPC Unified Precipitation Analysis while the figure in the top-right shows the total rainfall for the same period from RFE 2.0 Satellite Rainfall Estimates. The bottom two figures show the percentage of rainfall received in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



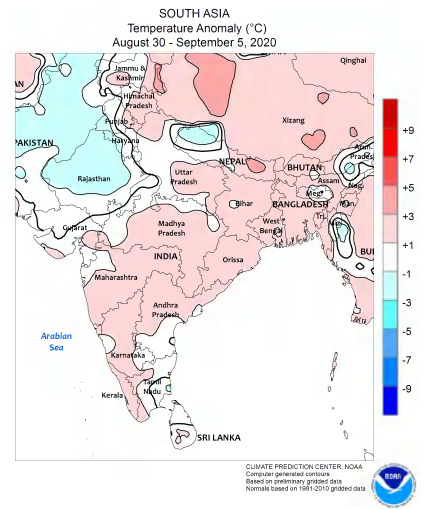
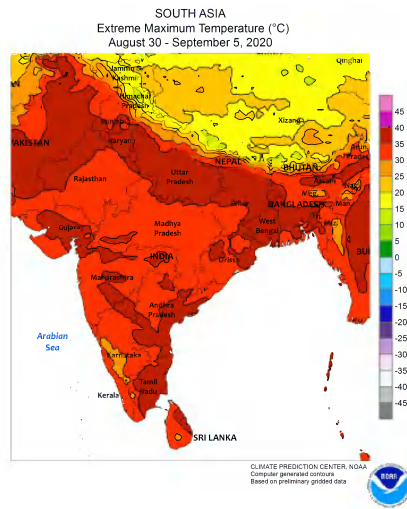
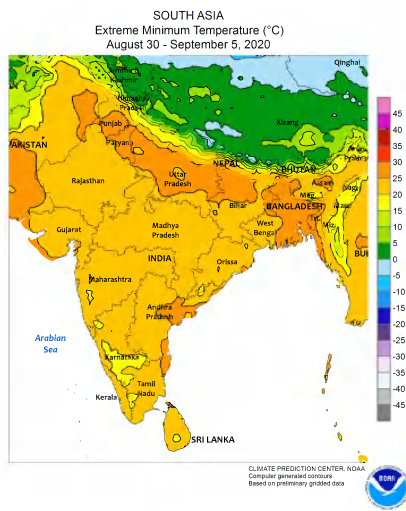
The following figure shows the observed accumulated rainfall (top) and daily observed rainfall (bottom) in Sri Lanka in the last 30 days.



Dekadal (10 Day) Satellite Derived Rainfall Estimates

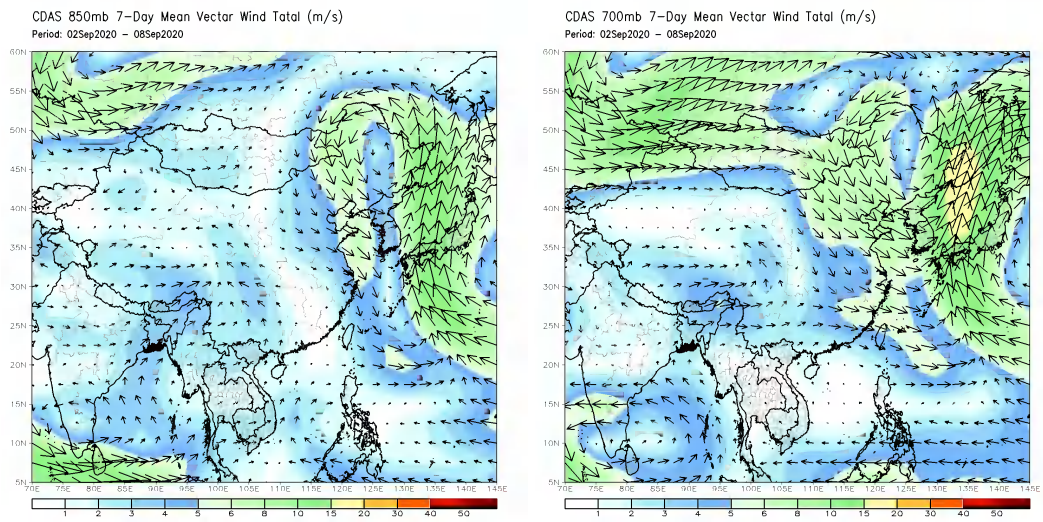


Weekly Temperature Monitoring



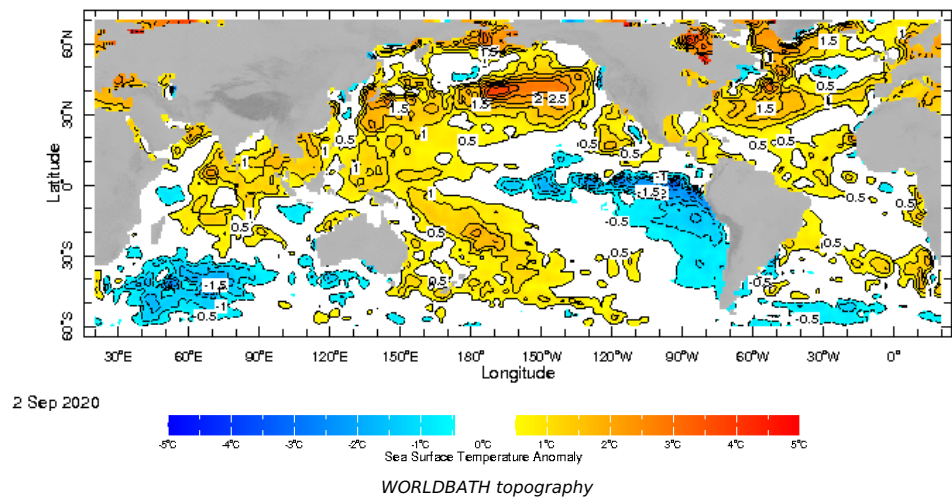
Weekly Wind Monitoring

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.



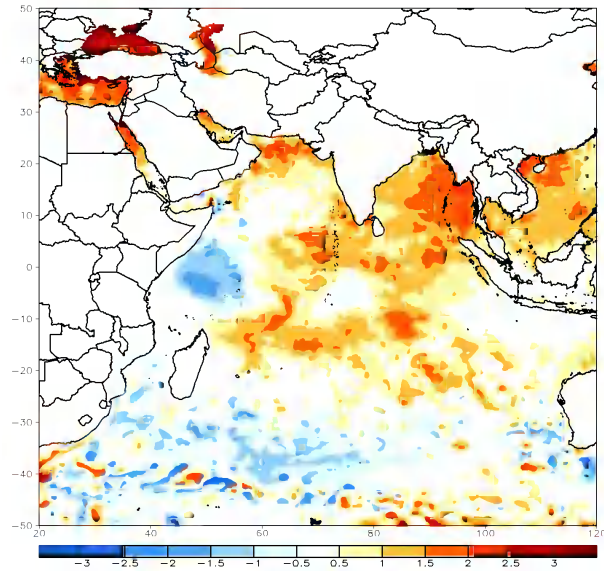
Weekly Average SST Anomalies

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



Optimum Interpolated Sea Surface Temperature Anomaly in the Indian Ocean from NOAA CPC

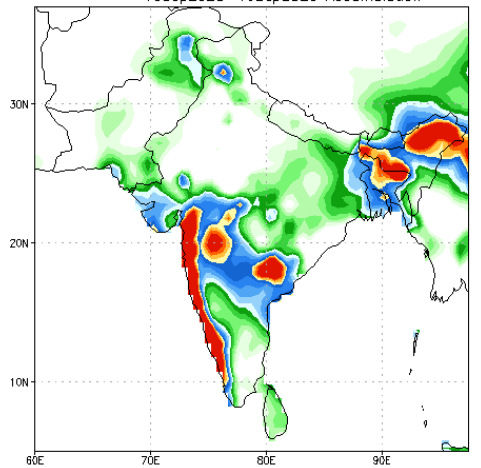
OI SST (v2) 7-Day Anomaly (C)
Period: 02Sep2020 - 08Sep2020



PREDICTIONS

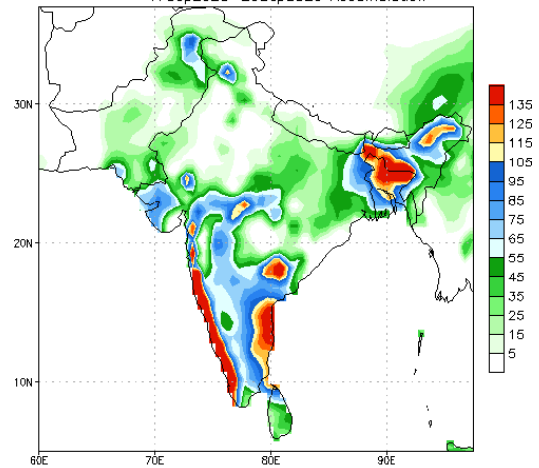
NCEP GFS 1- 14 Day prediction

NCEP GFS Ensemble Forecast 1-7 Day Precipitation (mm)
from: 10Sep2020
10Sep2020-16Sep2020 Accumulation



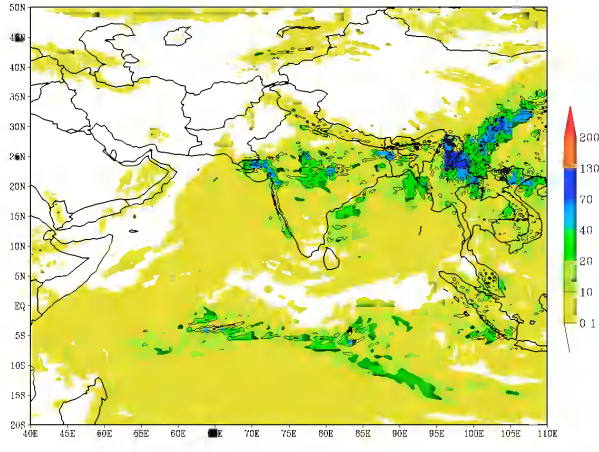
Bias correction based on last 30-day forecast error

NCEP GFS Ensemble Forecast 8-14 Day Precipitation (mm)
from: 10Sep2020
17Sep2020-23Sep2020 Accumulation

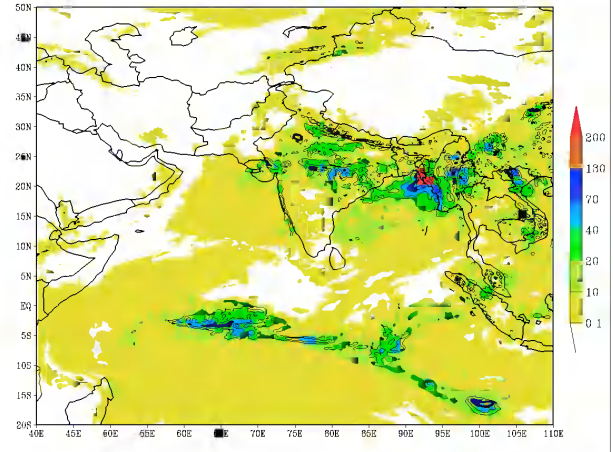


Bias correction based on last 30-day forecast error

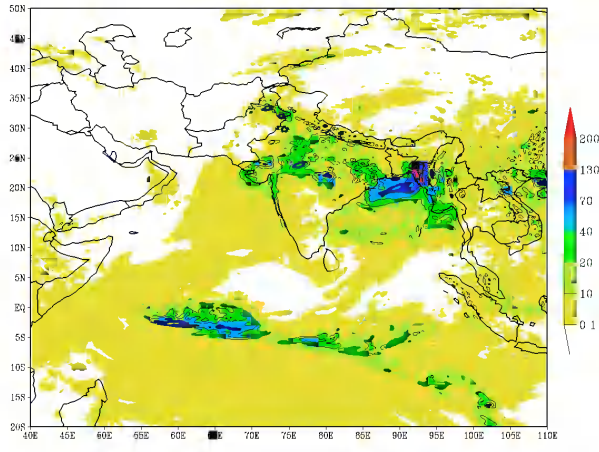
IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (24 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 18-08-2020



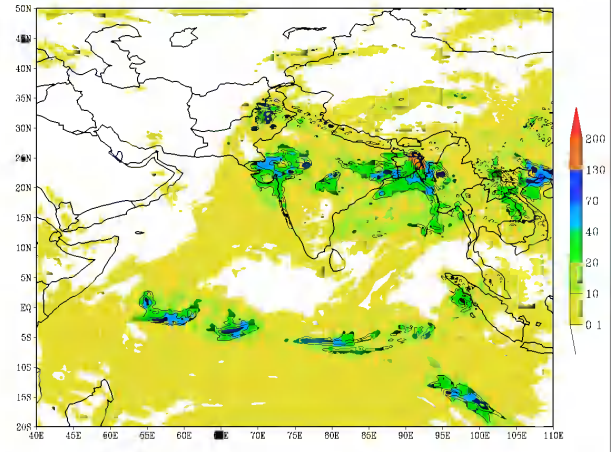
IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (48 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 19-08-2020



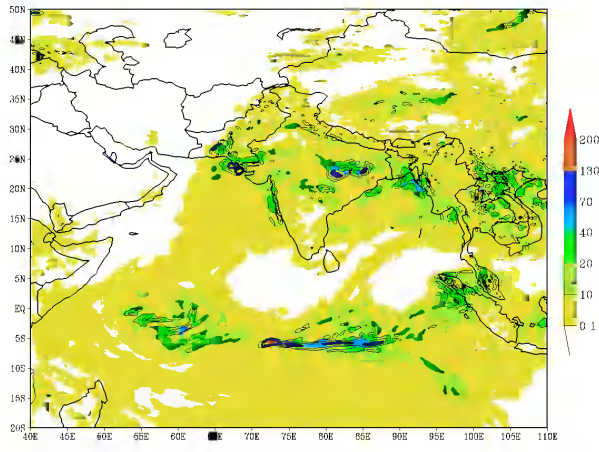
IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (72 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 20-08-2020



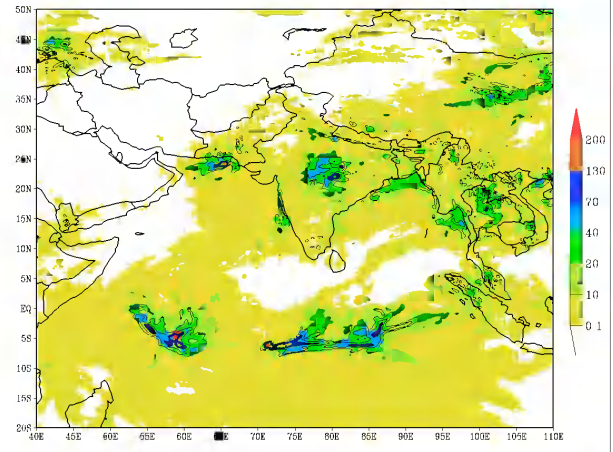
IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (96 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 21-08-2020

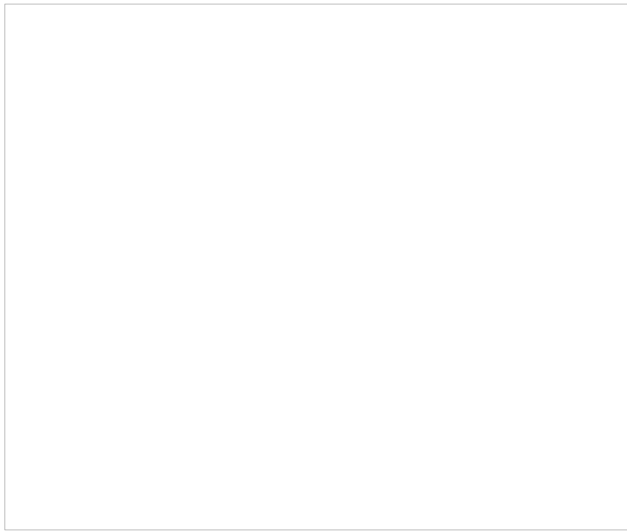


IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (120 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 22-08-2020



IMD :GFS MODEL(12 Km) RAINFALL (mm) FORECAST (144 HR)
based on 00 UTC of 17-08-2020 valid for 03 UTC of 23-08-2020



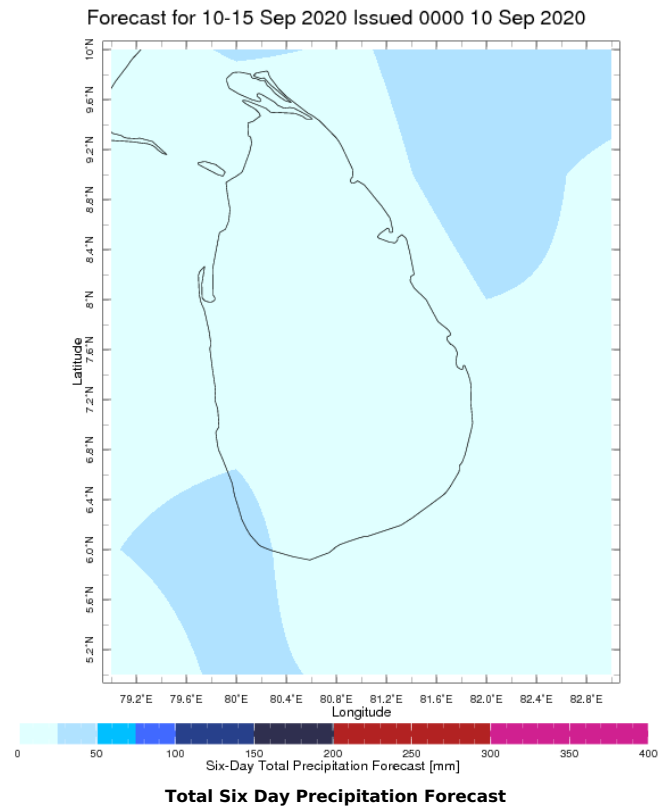
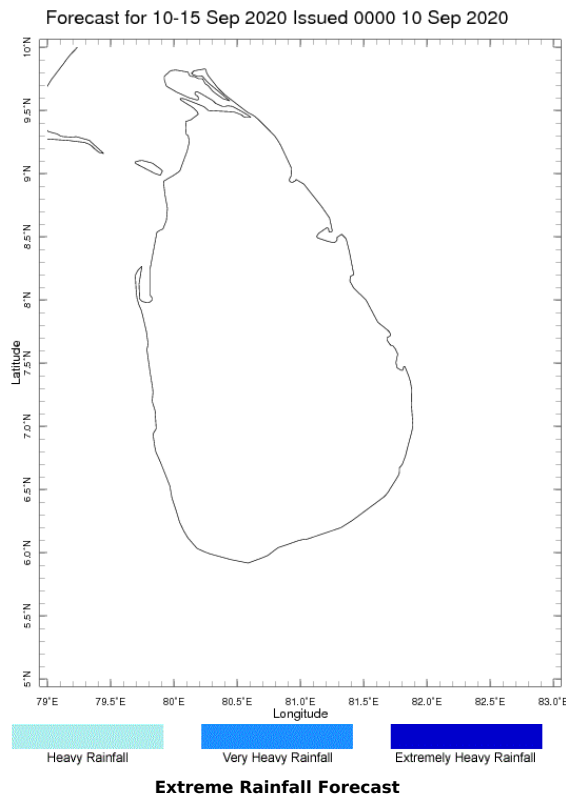


WRF Model Forecast (from IMD Chennai)



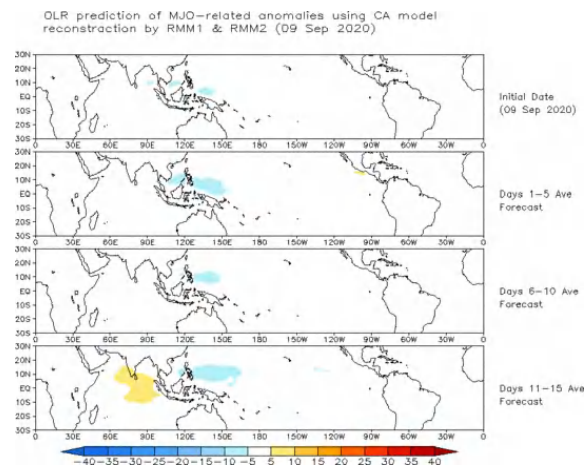
Weekly Rainfall Forecast from IRI

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.



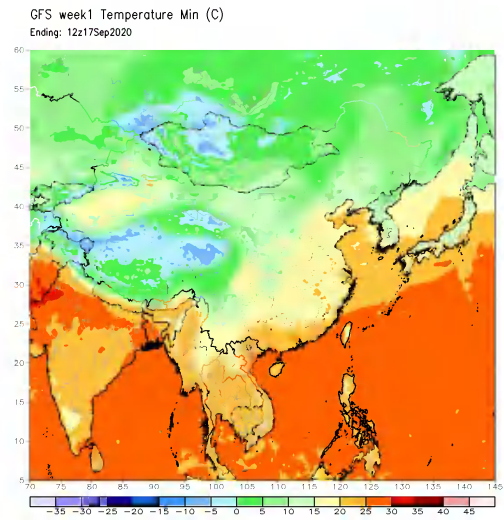
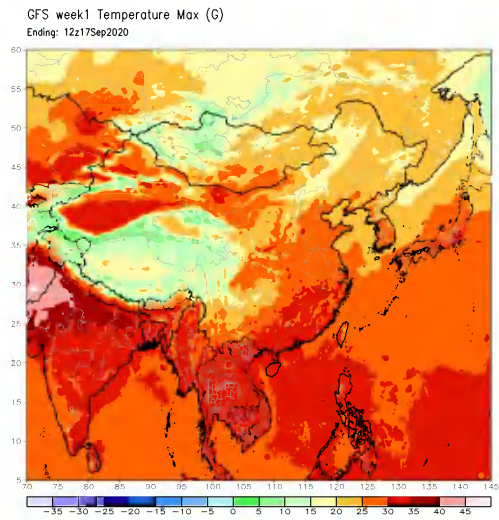
Madden Julian Oscillation (MJO) related Outgoing Longwave Radiation (OLR) Forecast

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.



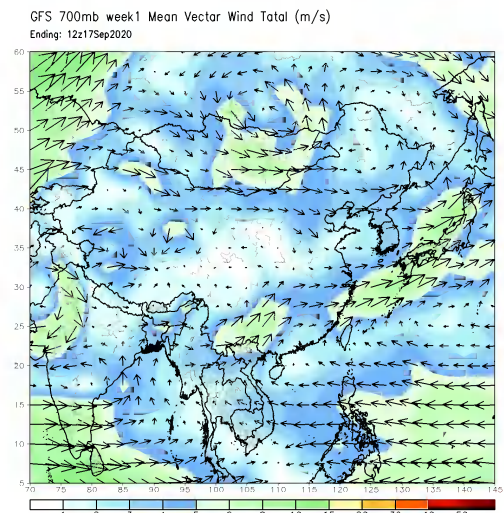
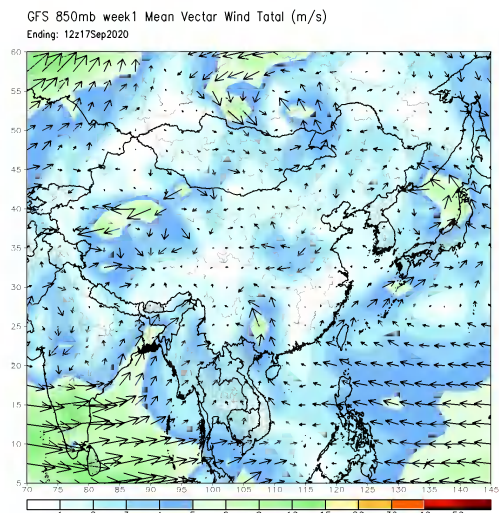
Weekly Temperature Forecast

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



Weekly Wind Forecast

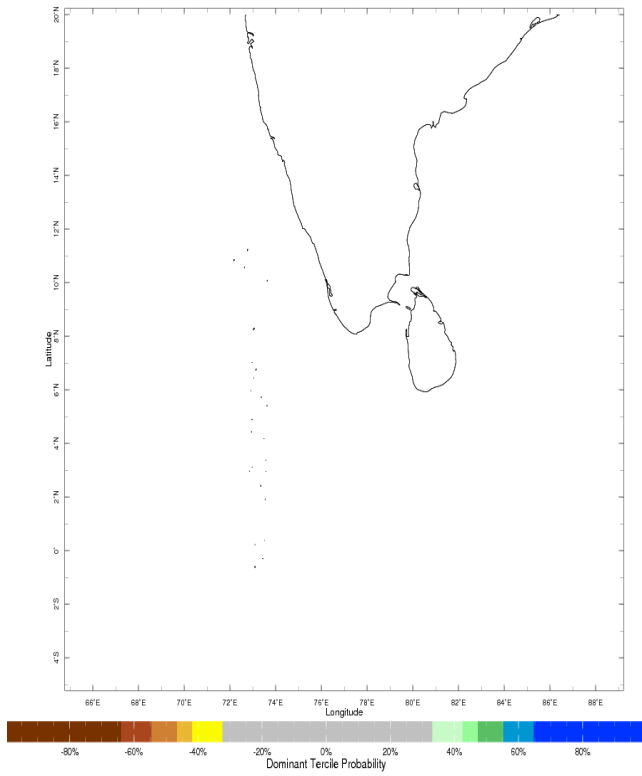
Weekly mean vector wind total prediction from the GFS model at 850 mb (left) and 700 mb (right) levels. (from NOAA CPC)



Seasonal Rainfall and Temperature Forecast

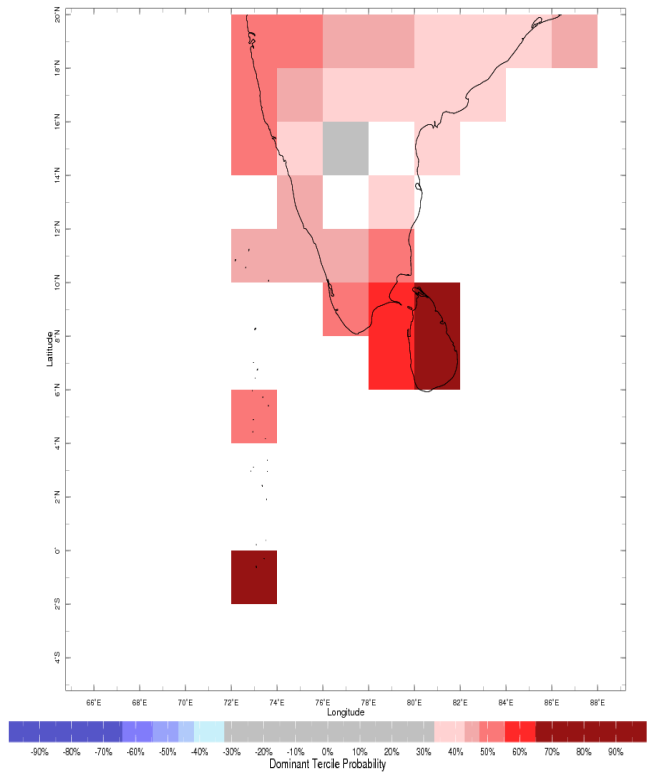
Following is the latest seasonal precipitation and temperature prediction for the next 3 months by the IRI. The color shading indicates the probability of the most dominant tercile -- that is, the tercile having the highest forecast probability. The color bar alongside the map defines these dominant 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%).

Apr-Jun 2017 IRI Seasonal Precipitation Forecast issued Mar 2017



Precipitation Forecast

Apr-Jun 2017 IRI Seasonal Temperature Forecast issued Mar 2017



Temperature Forecast

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