

Experimental Climate Monitoring and Prediction

by: Ruchira Lokuhetti, Prabodha Agalawatte, Manusha Lakmali, Zeenas Yahiya,
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Highlights

Wet weather conditions prevailed in many parts of the country during the previous week from 2nd-7th November. The highest rainfall of 90 mm for the period was recorded in adjacent south eastern sea on 3rd. Minimum temperature of 15 °C was recorded from Nuwara Eliya district while most parts of the island recorded a maximum temperature between 30-35 °C. Up to 20 km/h north westerly winds were recorded in the southern region of the country. For the period from 2nd- 8th November the NOAA NCEP model predicts up to 85 mm of rainfall for Colombo and adjacent sea regions.

Monitoring

Rainfall

Weekly Monitoring: On 3rd Kalkuda area received up to 70 mm rainfall while nearby sea including south eastern sea regions of the island received up to 90 mm rainfall. Up to 50 mm rainfall was received in Mannar, Puttalam, Kurunegala and Matale districts and up to 30 mm rainfall was received by Vavuniya, Anuradhapura, Ratnapura, Kalutara, Galle, Kandy Badulla and Monaragala districts. Batticaloa, Matale, Ampara, Kilinochchi, and Mullaitivu and Hambantota districts received up to 20 mm rainfall. On 4th Colombo coastal areas and south western sea regions near the island received up to 80 mm rainfall. Up to 50 mm rainfall was received by Gampaha, Ratnapura, Kalutara and Galle districts. Kegalla district received up to 40 mm rainfall while Matara, Nuwara Eliya, Kandy, Puttalam, Kurunegala, Monaragala and Ampara districts received up to 30 mm rainfall. Matale, Hambantota, Anuradhapura and Badulla districts received up to 20 mm rainfall. On 5th Kalutara, Galle and Matara districts received up to 50 mm while Colombo, Kegalla and Ratnapura districts received up to 40 mm rainfall. Up to 30 mm rainfall was received by Gampaha and Hambantota districts and up to 20 mm rainfall was received by Monaragala and Nuwara Eliya districts. On 6th Galle and Kalutara districts received up to 50 mm rainfall while Trincomalee, Gampaha, Matara and Ratnapura districts received up to 30 mm rainfall. Up to 20 mm rainfall was received by Mannar, Mullaitivu, Vavuniya, Hambantota, Anuradhapura and Polonnaruwa districts. Adjacent southern sea received up to 80 mm rainfall. On 7th surrounding areas of Hambegamuwa in Monaragala district received up to 80 mm rainfall while Silavatturai and Paraiyanalankulam of Mannar district including Ratnapura district received up to 50 mm rainfall. Tambuttegama region near the Anuradhapura and Kurunegala district border received up to 30 mm rainfall while several areas of Vavuniya, Jaffna, Batticaloa, Polonnaruwa and Hambantota districts received up to 20 mm rainfall. For the past week, the RFE 2.0 tool shows rainfall up to 100 mm in Colombo, Kalutara, Ratnapura, Kegalla, Gampaha, Galle, Matara, Monaragala, Hambantota and Mannar districts. Up to 75 mm of rainfall is shown for Puttalam, Kurunegala, Trincomalee, Kandy and Nuwara Eliya districts. Up to 50 mm rainfall is shown for most of the country. It also shows an above average rainfall of 25-50 mm in the Western and Southern provinces. Below average rainfall of 50-100 mm is shown for Kurunegala, Matale, Anuradhapura, and Ampara districts, and 25-50 mm for most parts of the island.

Monthly Monitoring: Below average rainfall conditions were experienced in the entire island in the month of October except for coastal regions of Galle district, where monthly average rainfall amount to 450 mm/month. Rainfall did not exceed 210 mm/month for the rest of the island. The CPC Unified Precipitation Analysis tool shows ~100 mm of total rainfall in Gampaha, Colombo, Ratnapura, Galle, Matara, Anuradhapura, Mannar, Vavuniya,, Matale, Kandy and Nuwara Eliya districts ; and ~25 mm of total rainfall in Ampara, Badulla, Monaragala, Kegalla and Jaffna districts.

Temperature

From 30th October-5th November the lowest temperature of 15-20 °C was recorded in Nuwara Eliya. The maximum temperature recorded in Kandy, Badulla, Kegalla and Ratnapura regions was between 25-30 °C. The maximum temperature range in rest of the country was 30-35 °C. During this period an above average temperature of 0-1 °C was recorded by the western and eastern coastal regions. Northern and central regions experienced an above average temperature of 0-3 °C.

Wind

At 850 mb level up to 20 km/h north westerly wind was experienced by the southern region of the island. The rest of the country experienced wind in the same direction with speed less than 18 km/h. At 700 mb level Southern province experienced north westerly winds with a speed of up to 20 km/h while rest of the country experienced winds with a speed less than 18 km/h in the same direction.

Ocean State

Pacific sea state: October 20, 2016

During mid-October 2016 the tropical Pacific SST anomaly was slightly cooler than -0.5C, the threshold for weak La Niña. However, not all of the atmospheric variables have been supporting weak La Niña conditions for a sufficient duration to constitute good ocean-atmospheric coupling. Although the upper level winds suggest weak La Niña, the lower level trade winds only became stronger than

average in mid-September. The Southern Oscillation index and the pattern of cloudiness and rainfall do indicate weak La Niña conditions. The lack of enhanced trade winds until recently makes us hesitate to say La Niña has really begun, so our diagnosis remains ENSO-neutral. The collection of ENSO prediction models indicates SSTs near or slightly cooler than the threshold of La Niña during fall, then weakening to cool-neutral during winter. (*Text Courtesy IRI*)

Indian Ocean State

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

Predictions

Rainfall

14-day prediction: From 2nd-8th November, the NOAA NCEP models predicts total rainfall, between 75-85 mm in Colombo and adjacent area; 65-75 mm in Galle, Matara and Ratnapura regions; 45-55 mm in Jaffna, Ampara, Gampaha and Kegalla regions; and total rainfall between 25-35 mm is expected in most parts of the country. For the period 9th-16th November total rainfall between 75-85 mm is expected in Colombo. Gampaha, Kegalla, Ratnapura, Puttalam, Kurunegala and Galle regions are expected to receive total rainfall between 45-55 mm. Total rainfall between 35-45 mm is expected in Central and North Central provinces.

Weekly prediction: IMD GFS model predicts rainfall between 1-10 mm is expected for the whole island except for northern and western regions on 11th. On 12th rainfall between 40-70 mm is expected for Nuwara Eliya and Badulla regions and rainfall between 20-40 mm in Kandy, Kegalla and Ratnapura regions. Rest of the island is expected to receive 1-10 mm rainfall except for northern and north eastern regions. On 13th Colombo and adjacent sea are expected to receive rainfall between 70-130 mm with Gampaha and Kalutara regions expected to receive 40-70 mm. Rainfall between 20-40 mm is expected in Galle, Kalutara, Kegalla, Ratnapura and Nuwara Eliya regions while rest of the country except for south eastern region of the island expected to receive rainfall between 1-10 mm. On 14th the whole island is expected to receive rainfall between 1-10 mm. On 15th rainfall between 20-40 mm is expected in Colombo, Kegalla, Kandy, Mannar, Puttalam and Nuwara Eliya while rest of the country expected to receive 1-10 mm rainfall. On 16th surrounding areas of Kegalla and Ratnapura are expected to receive rainfall between 20-40 mm while rest of the country expected to receive 1-10 mm rainfall except for Polonnaruwa and Dehiattakandiya regions.

IMD WRF & IRI Model Forecast: According to the IMD WRF model up to 64 mm of rainfall is expected in Yala region of Southern province on the 11th. Monaragala, Badulla, Nuwara Eliya and Ratnapura regions are expected to receive up to 35 mm rainfall with rest of the south eastern regions expected to receive 35 mm rainfall. On 5th surrounding areas of Tissamaharama and Kilinochchi shall receive rainfall up to 124 mm, and rest of the northern region including Kandy, Ratnapura, Matara and Monaragala regions shall experience rainfall up to 35 mm. Southern sea near the island is expected to receive up to 64 mm rainfall.

Seasonal Prediction: As per IRI Multi Model Probability Forecast for November to January 2017, the total 3-month precipitation shall be climatological for the whole island. 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 35-40 °C maximum temperature in Tanamalwila area of Monaragala district. The maximum temperature for the rest of the island will range between 30-35 °C. For the same period minimum temperature is expected in Nuwara Eliya, Kandy, Ratnapura and Badulla to be between 15-20 °C.

Wind

The 850 mb level predicts up to 20 km/h north easterly wind for northern and north western regions of the country. Up to 18 km/h wind in the same direction is expected for the rest of the country. The 700 mb level predicts up to 20 km/h north easterly wind in the northern and eastern regions of the island. The rest of the country expected to experience wind in the same direction with speed less than 18 km/h.

MJO based OLR predictions

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

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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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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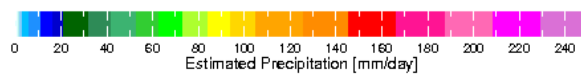
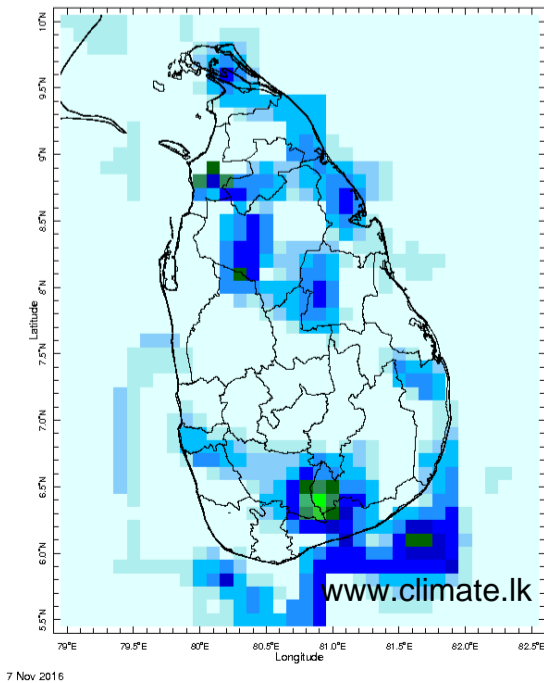
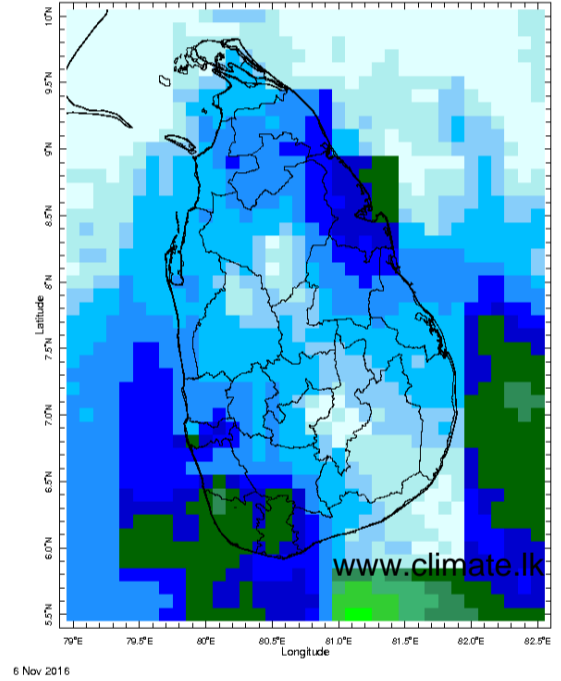
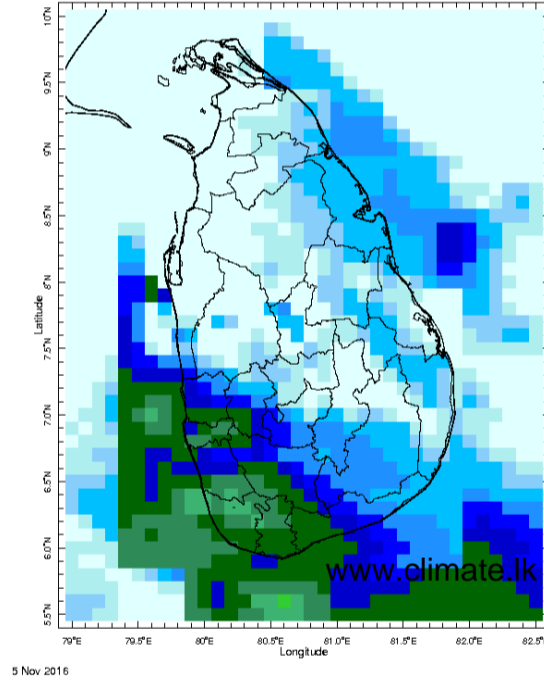
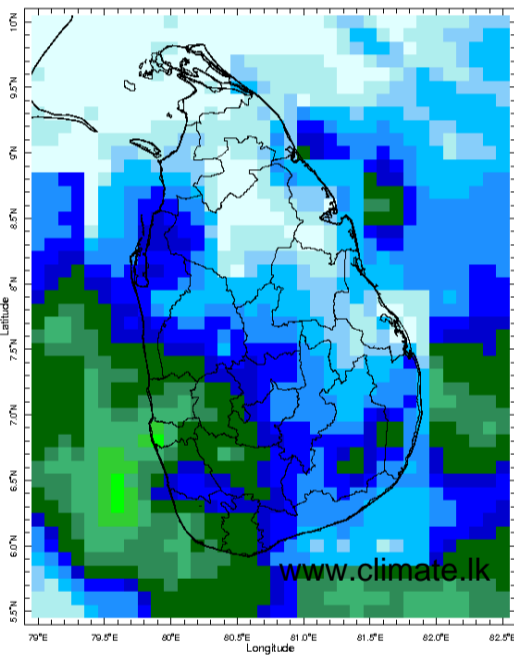
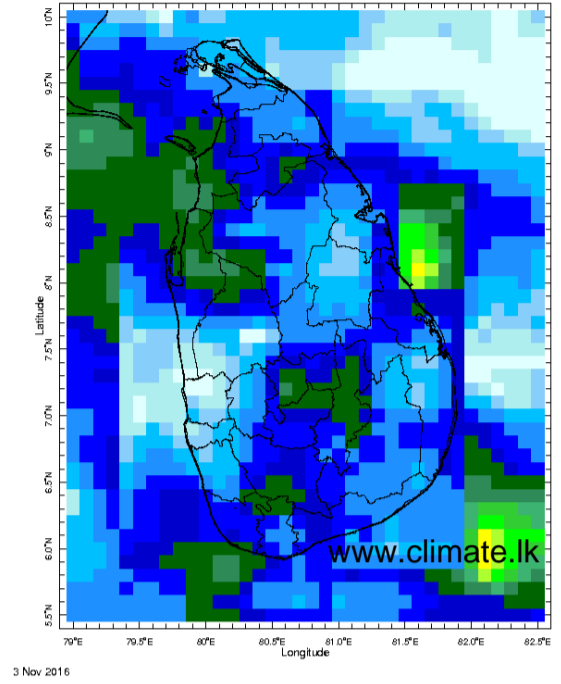
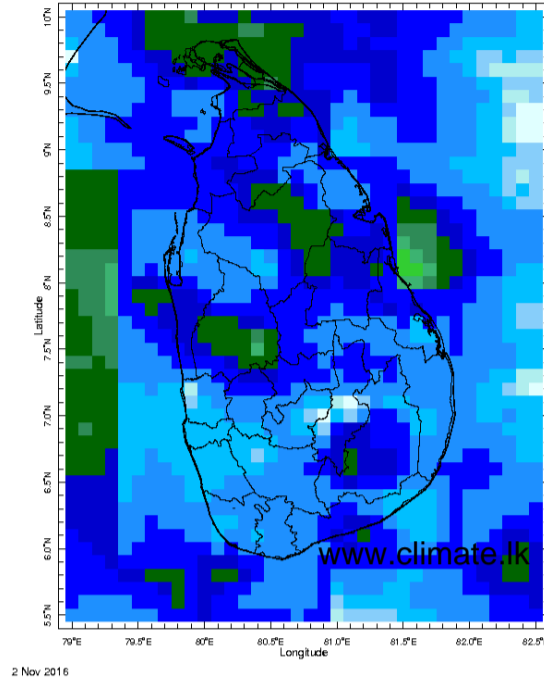
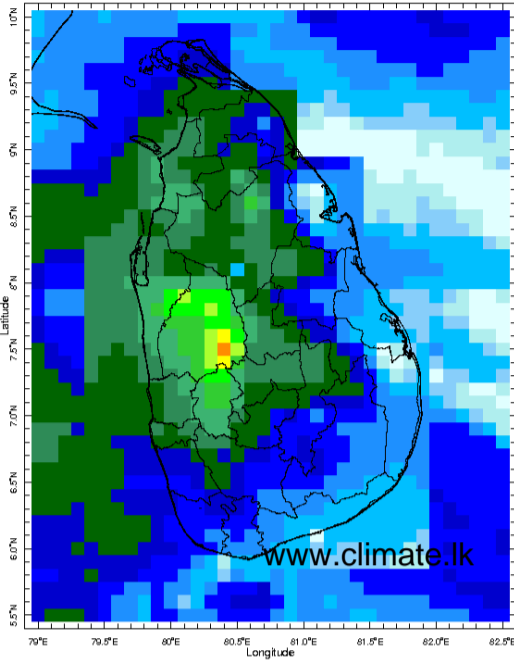
- a. Daily Rainfall Monitoring
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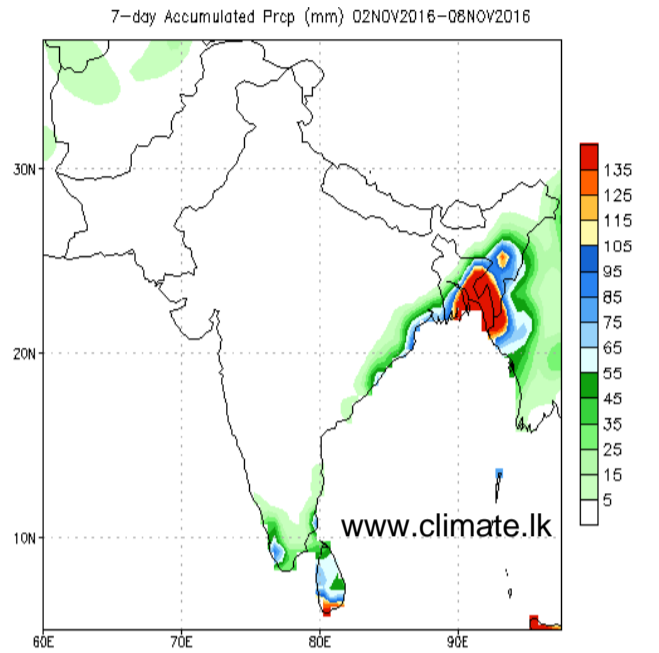
Daily Rainfall Monitoring

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

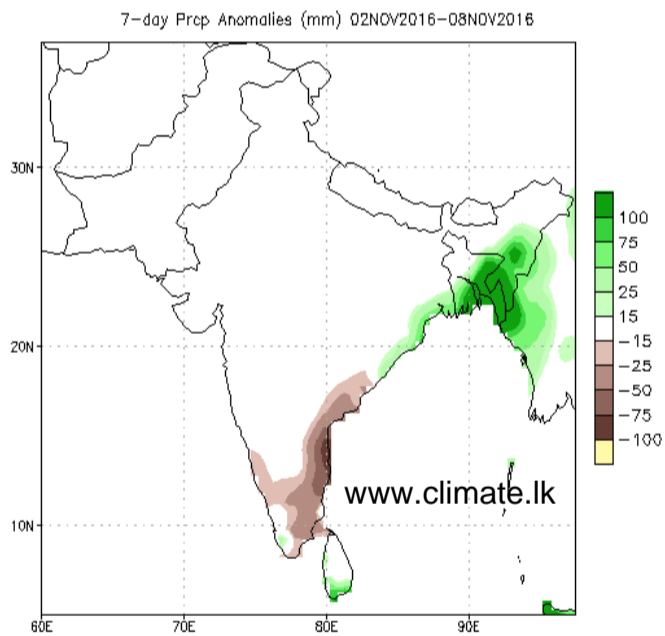
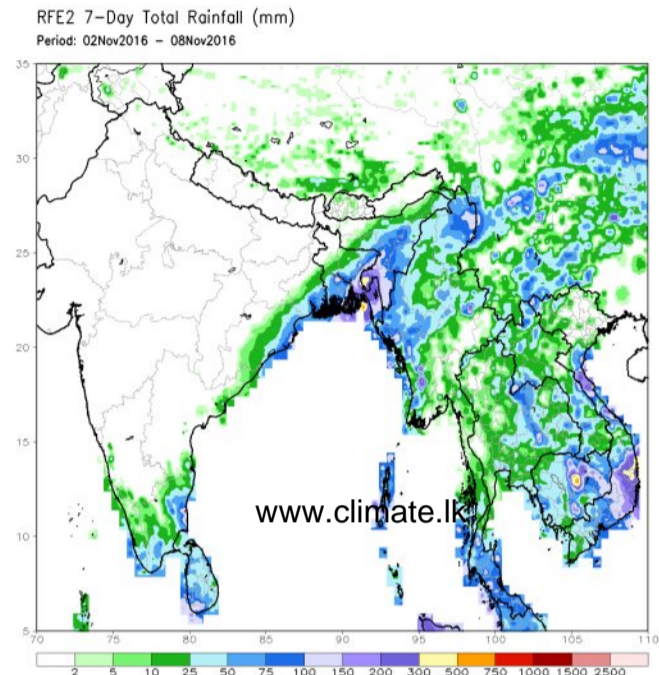


Weekly Rainfall Monitoring

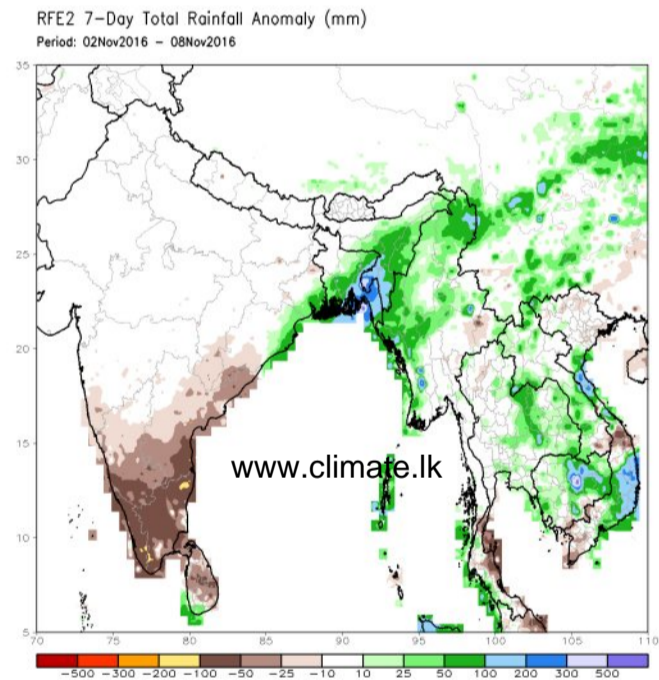
The following figures show the total satellite observed rainfall in the last week in Sri Lanka. The figure in the left is the total 7-day rainfall from NOAA Climate Prediction Center (CPC) Unified Precipitation Analysis and the figure in the right is the total 7-day rainfall from CPC RFE 2.0 Satellite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



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

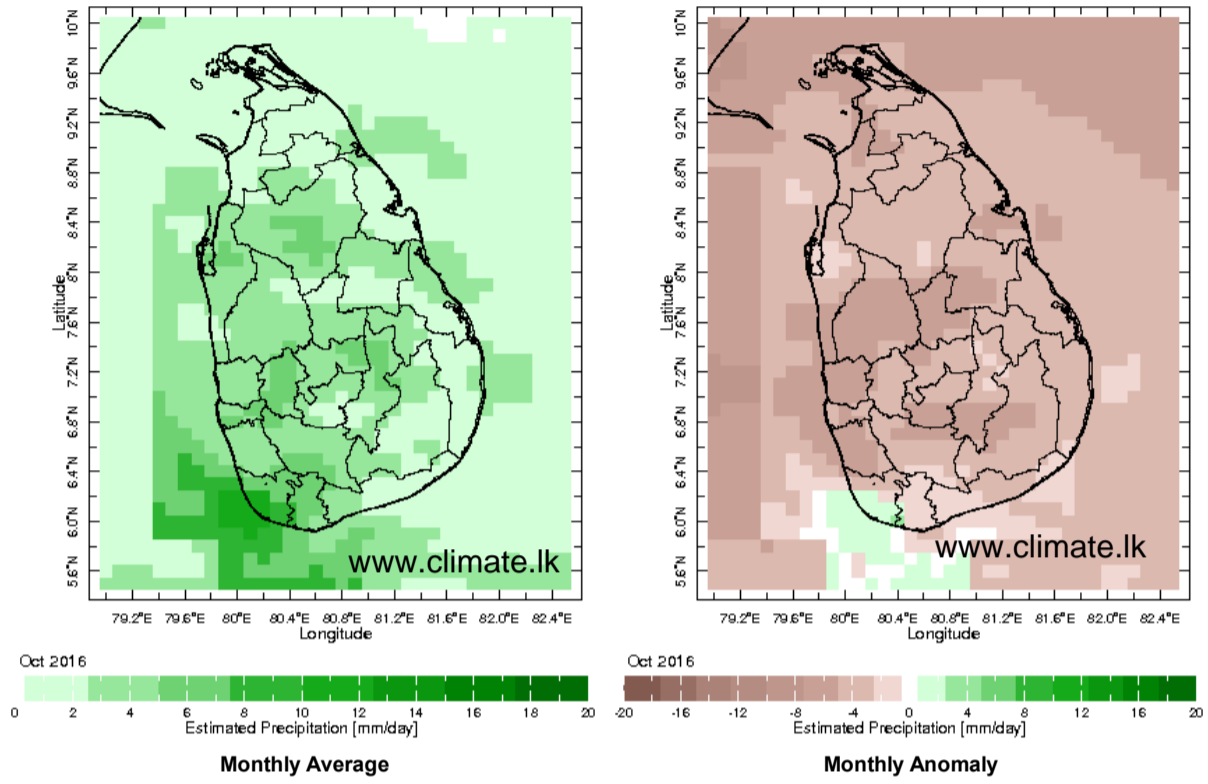


Data Source: CPC Unified (gauge-based & 0.5x0.5 deg resolution) Precipitation Climatology (1981-2010)

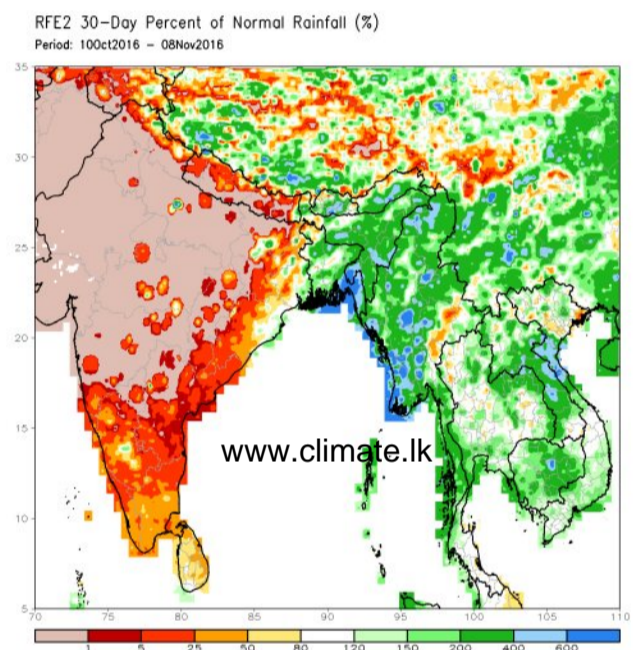
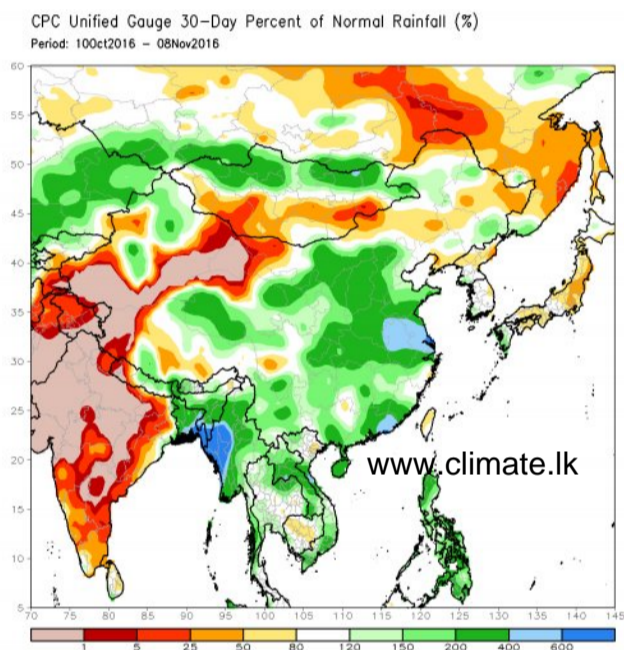
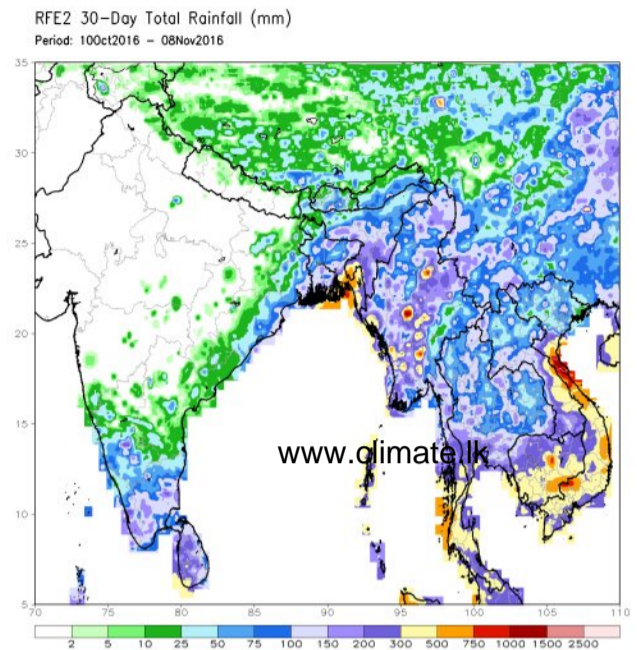
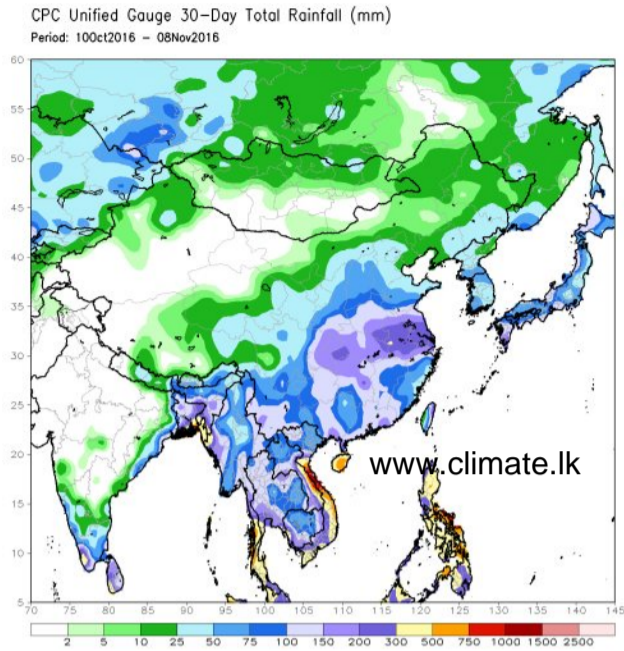


Monthly Rainfall Monitoring

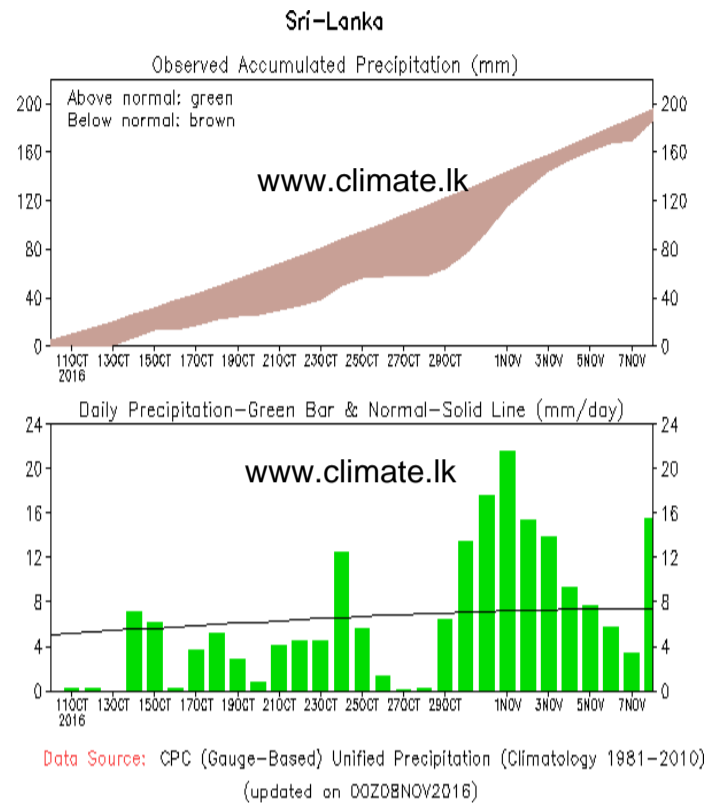
The figure in the left shows the average observed rainfall in the previous month. The rainfall anomaly in the previous month is shown in the figure to the right. The brown color in the anomaly figure shows places which received less rainfall than the historical average while the green color shows places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



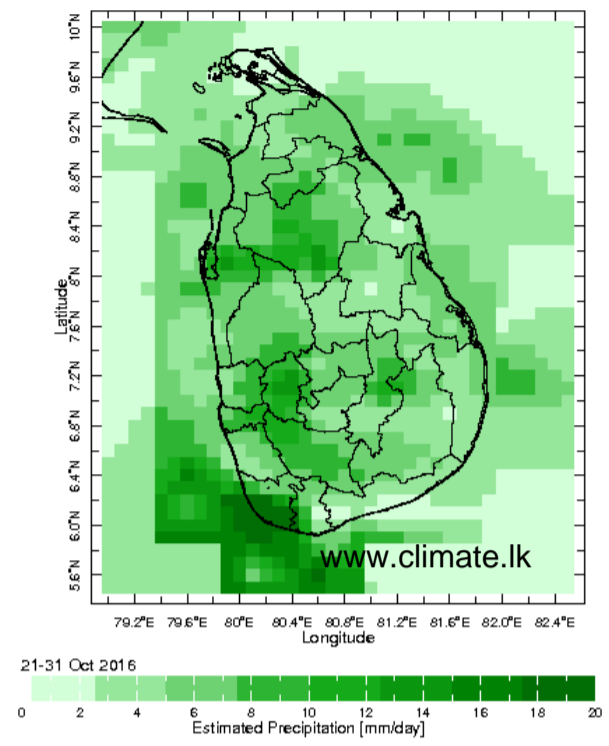
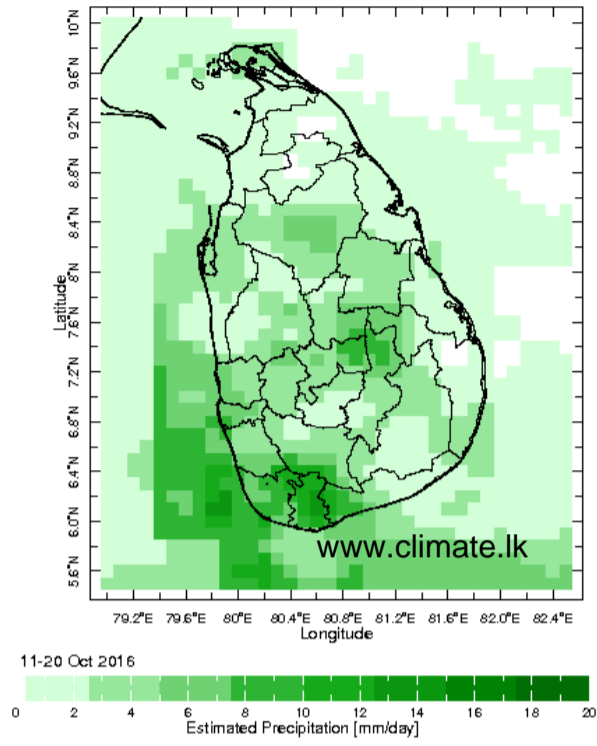
The figure in the top-left shows the total rainfall in the past 30 days from CPC Unified Precipitation Analysis while the figure in the top-right shows the total rainfall for the same period from RFE 2.0 Satellite Rainfall Estimates. The bottom two figures show the percentage of rainfall received in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



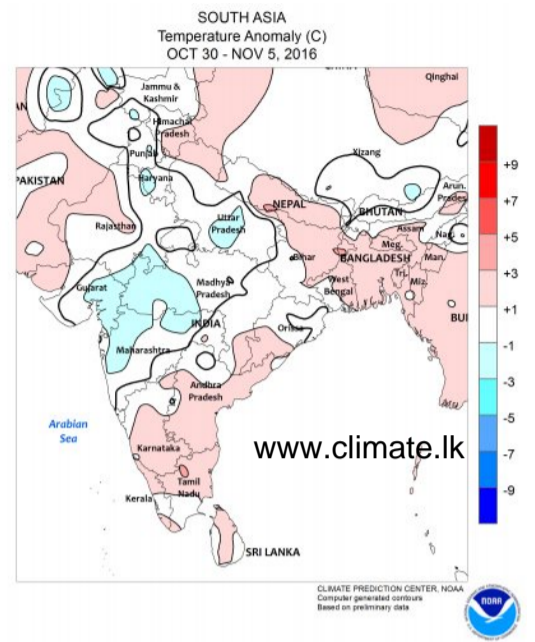
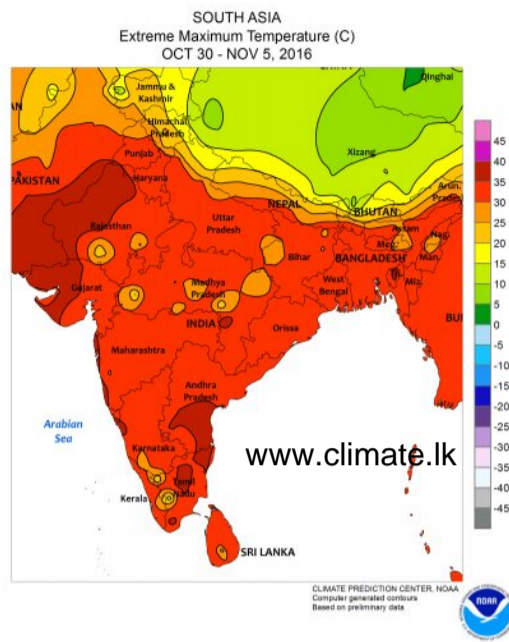
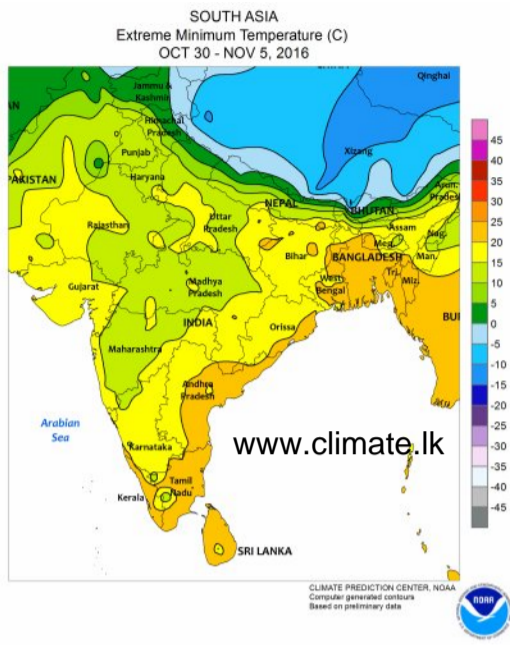
The following figure shows the observed accumulated rainfall (top) and daily observed rainfall (bottom) in Sri Lanka in the last 30 days.



Dekadal (10 Day) Satellite Derived Rainfall Estimates

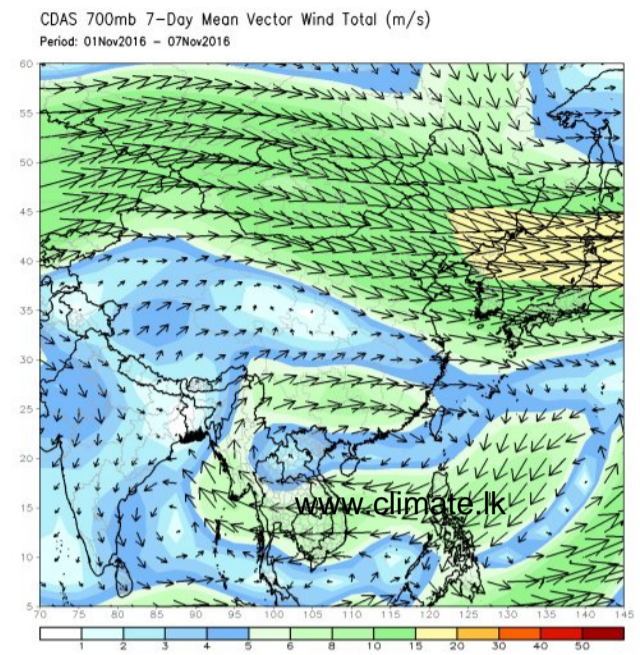
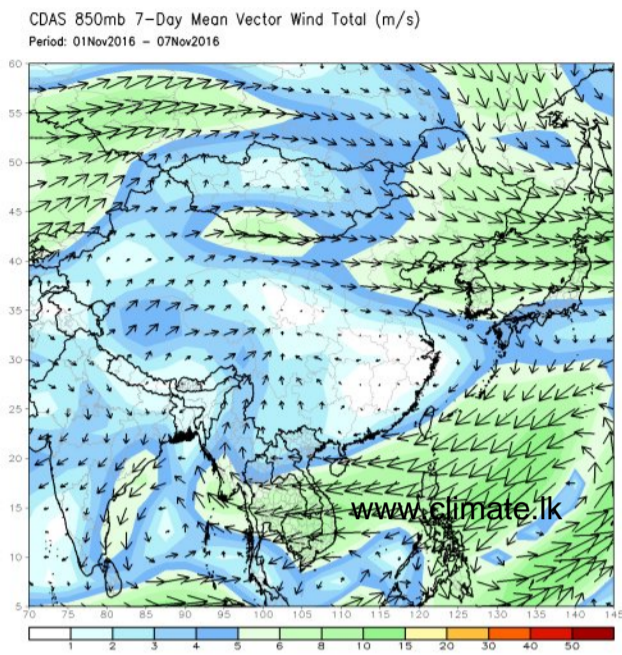


Weekly Temperature Monitoring



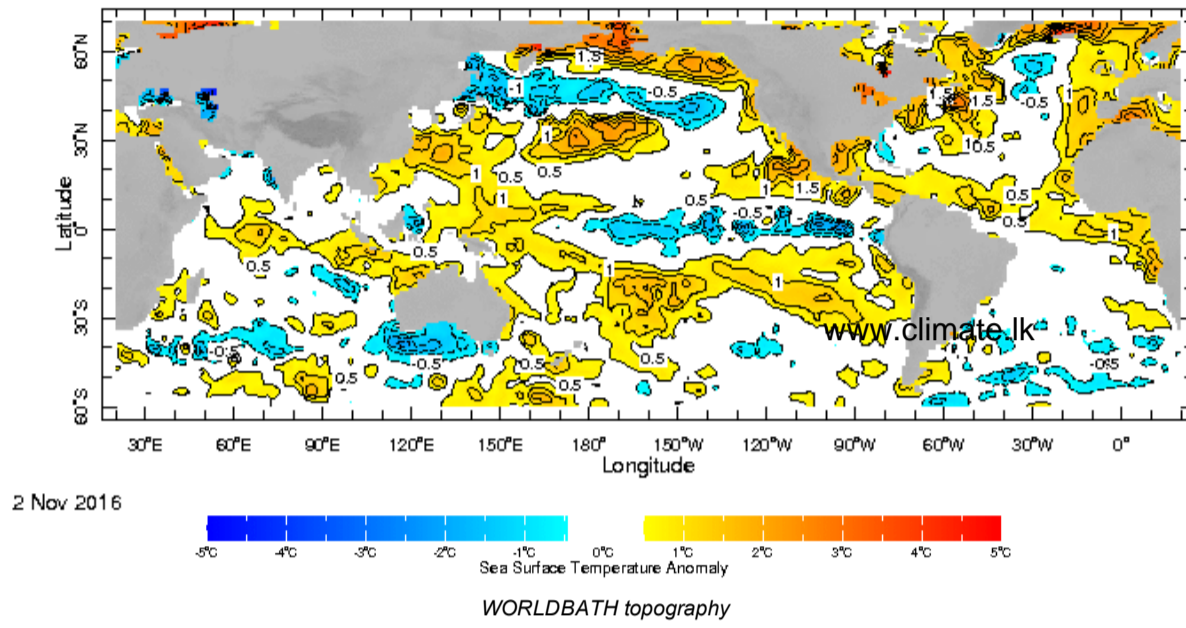
Weekly Wind Monitoring

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.



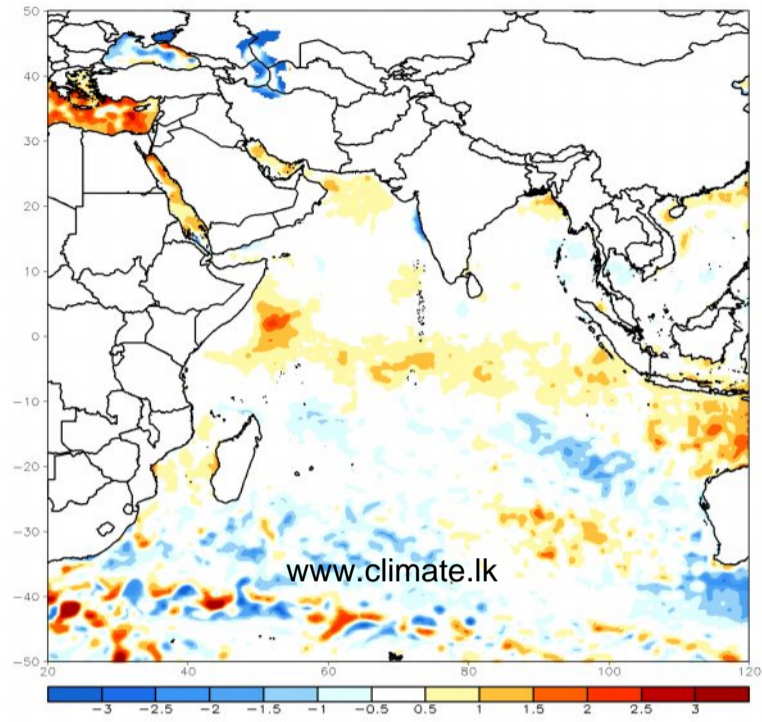
Weekly Average SST Anomalies

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

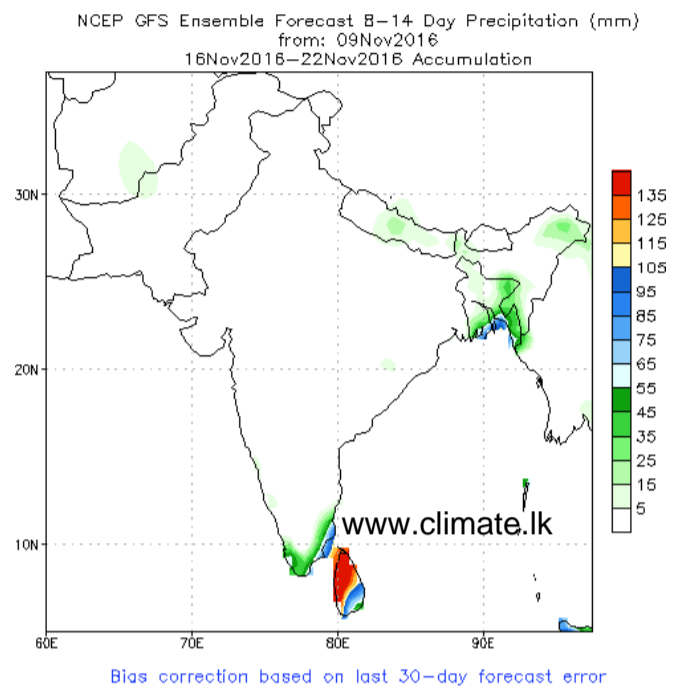
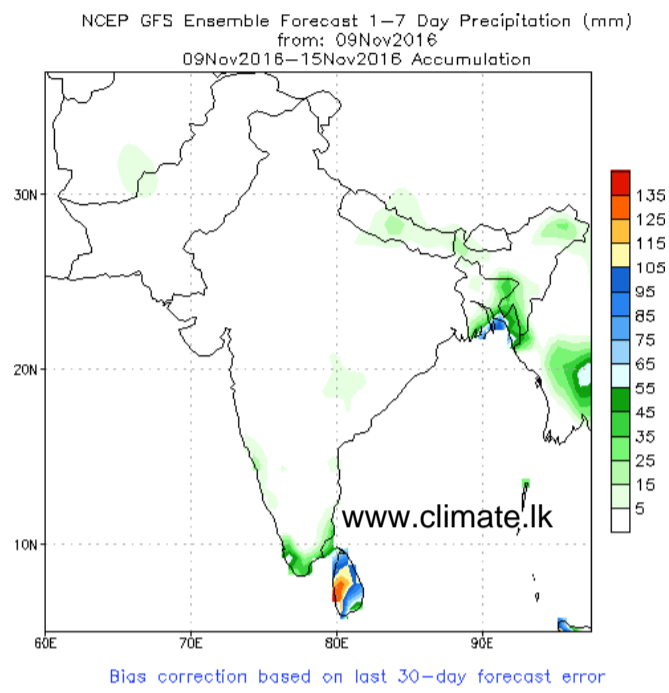


Optimum Interpolated Sea Surface Temperature Anomaly in the Indian Ocean from NOAA CPC

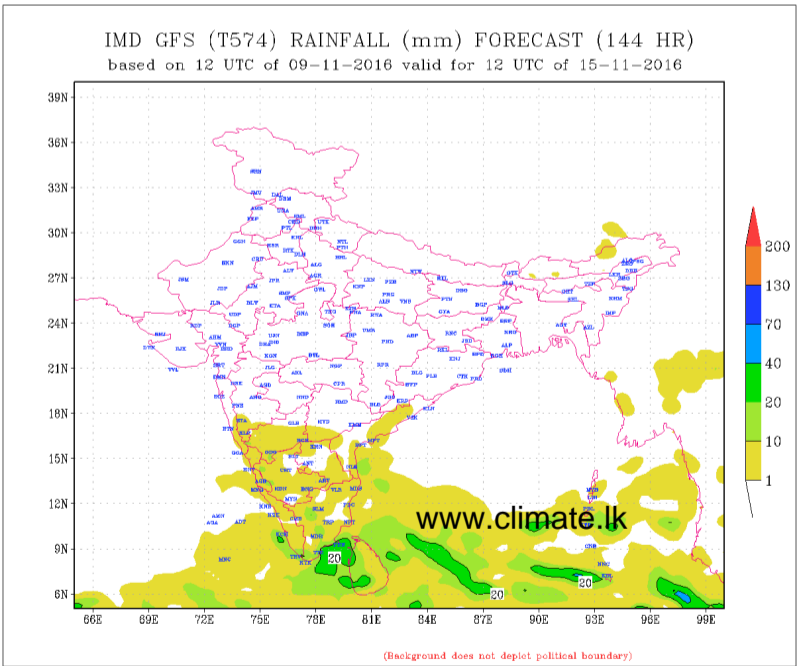
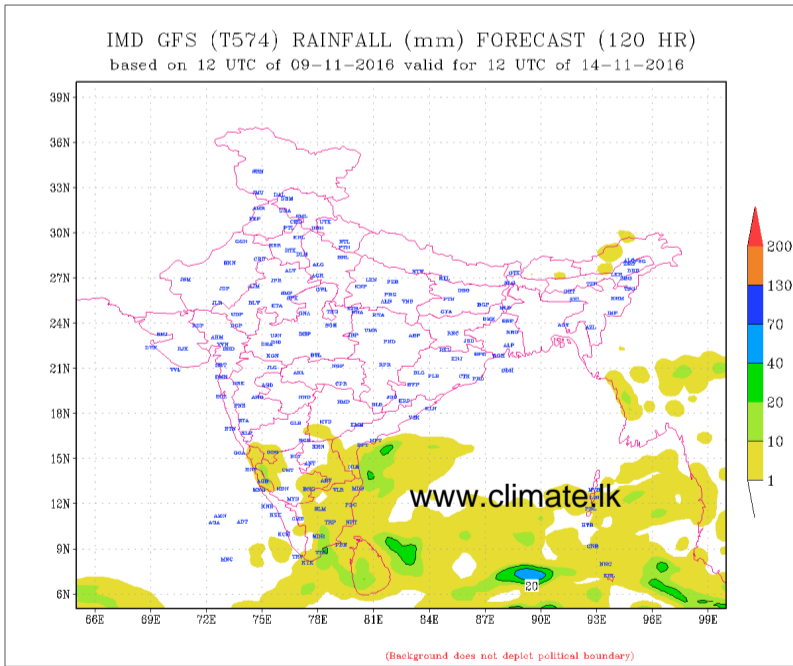
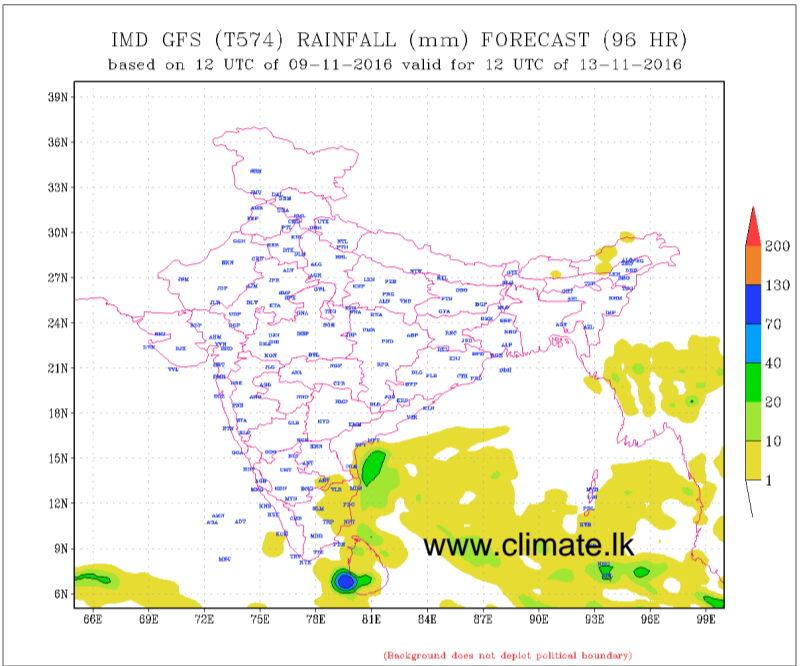
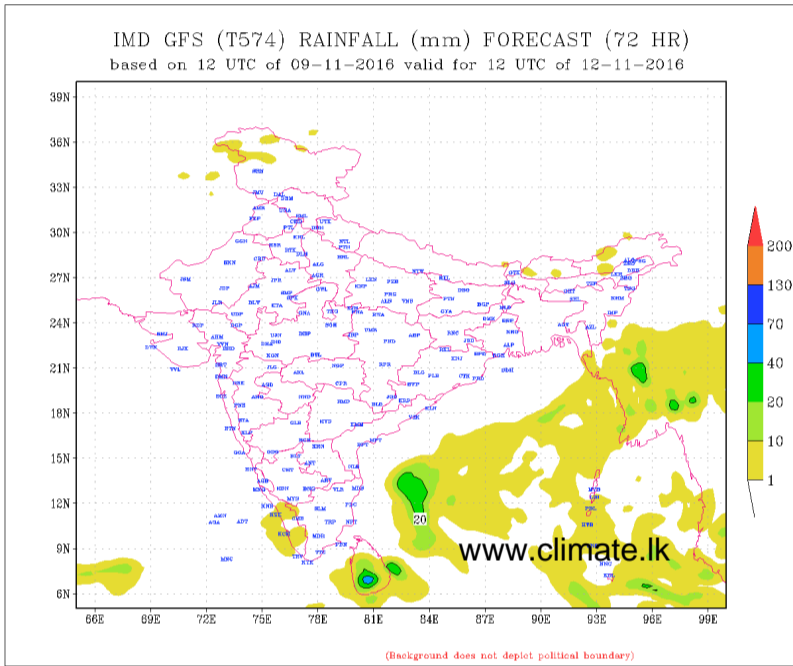
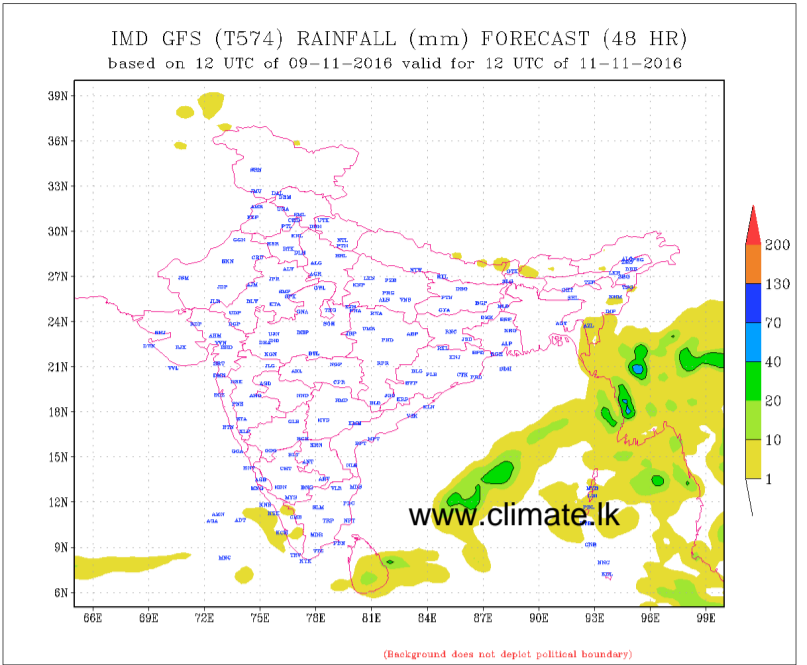
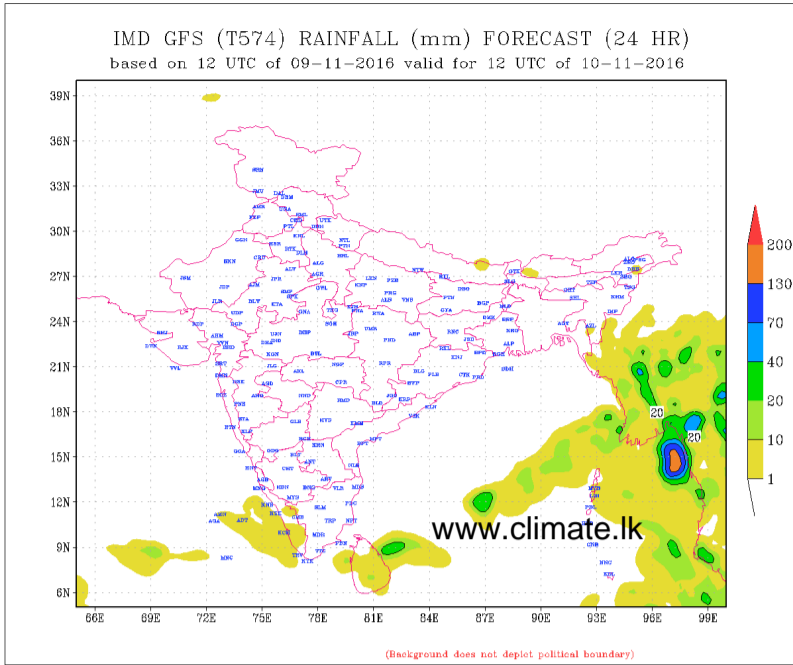
OI SST (v2) 7-Day Anomaly (C)
Period: 02Nov2016 - 08Nov2016



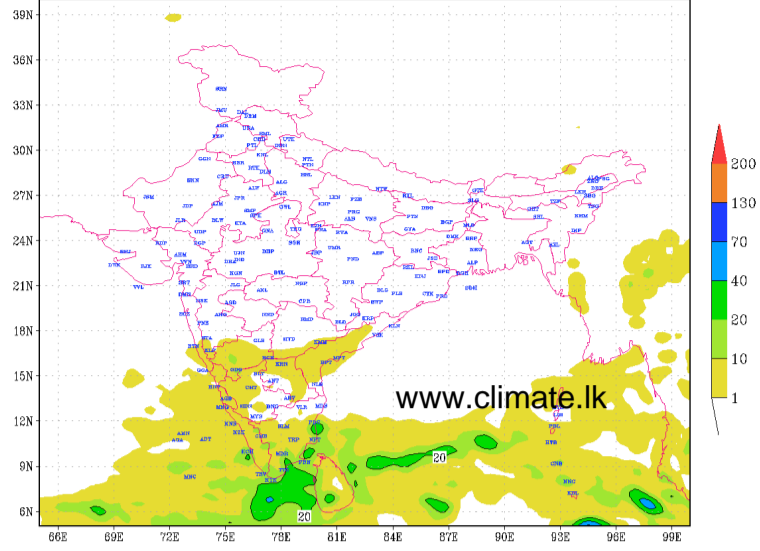
NCEP GFS 1- 14 Day prediction



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



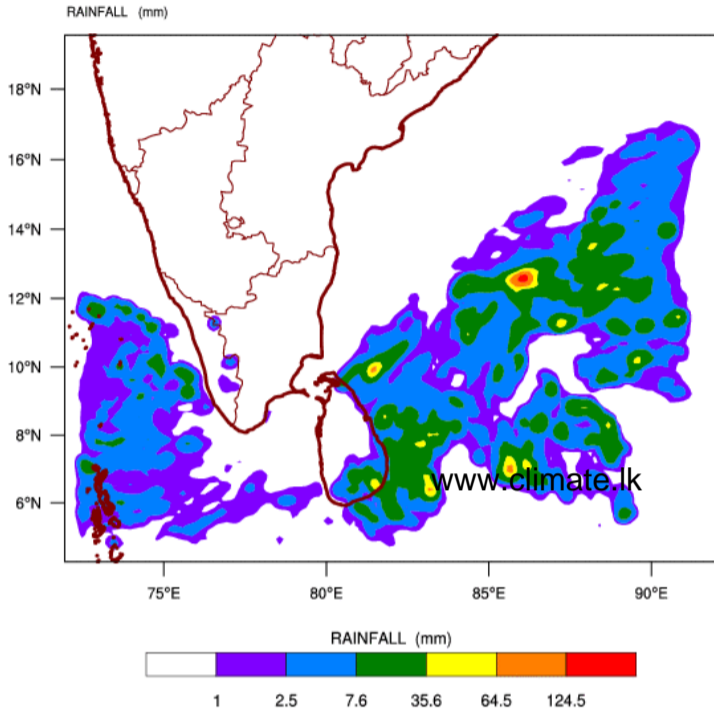
IMD GFS (T574) RAINFALL (mm) FORECAST (168 HR)
based on 12 UTC of 09-11-2016 valid for 12 UTC of 16-11-2016



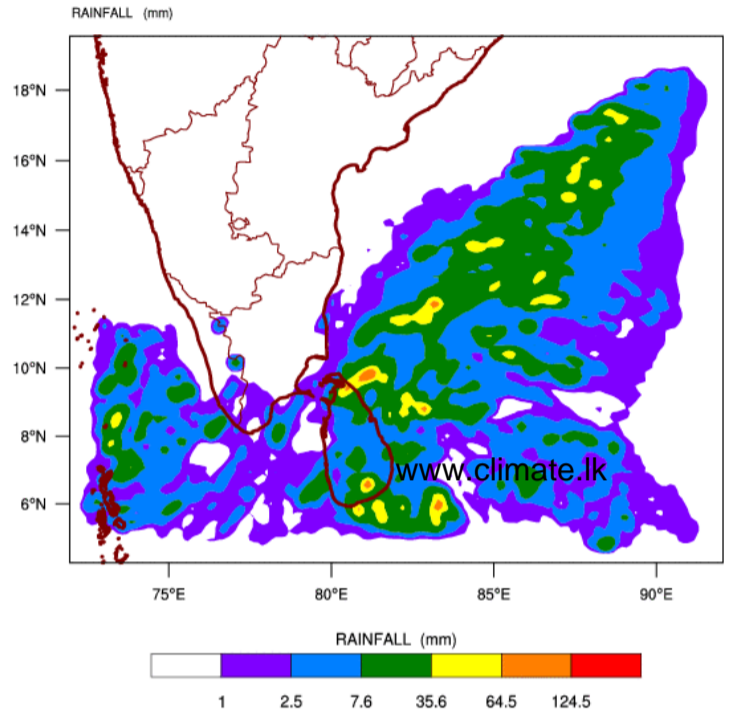
(Background does not depict political boundary)

WRF Model Forecast (from IMD Chennai)

WRF MODEL FORECAST (48 HR.) RAINFALL(mm)\
based on 00 UTC of 09-11-2016 valid for 03 UTC of 11-11-2016



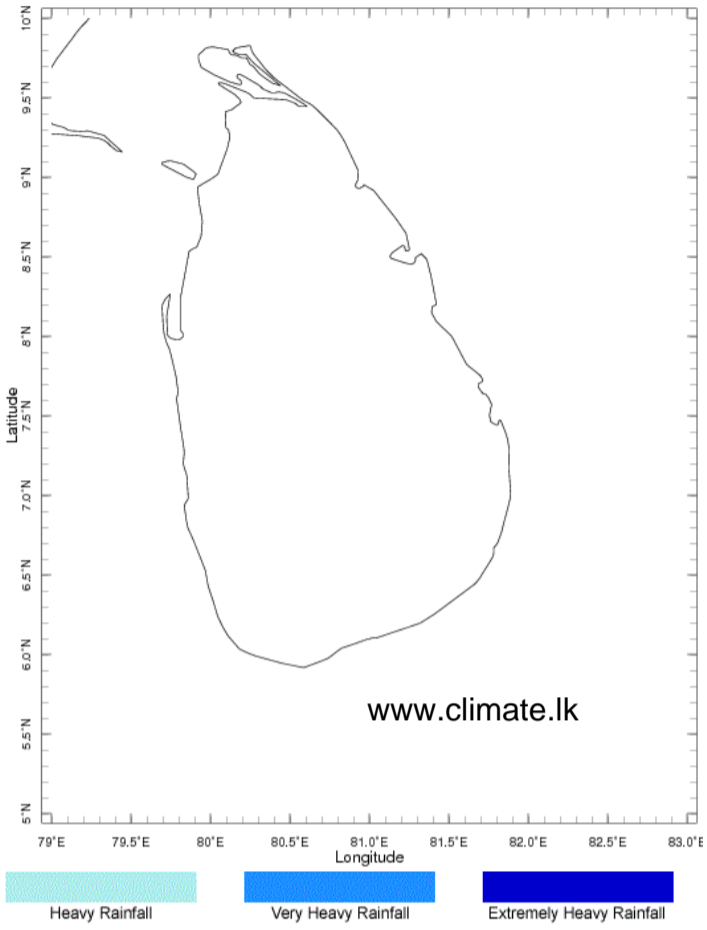
WRF MODEL FORECAST (72 HR.) RAINFALL(mm)\
based on 00 UTC of 09-11-2016 valid for 03 UTC of 12-11-2016



Weekly Rainfall Forecast from IRI

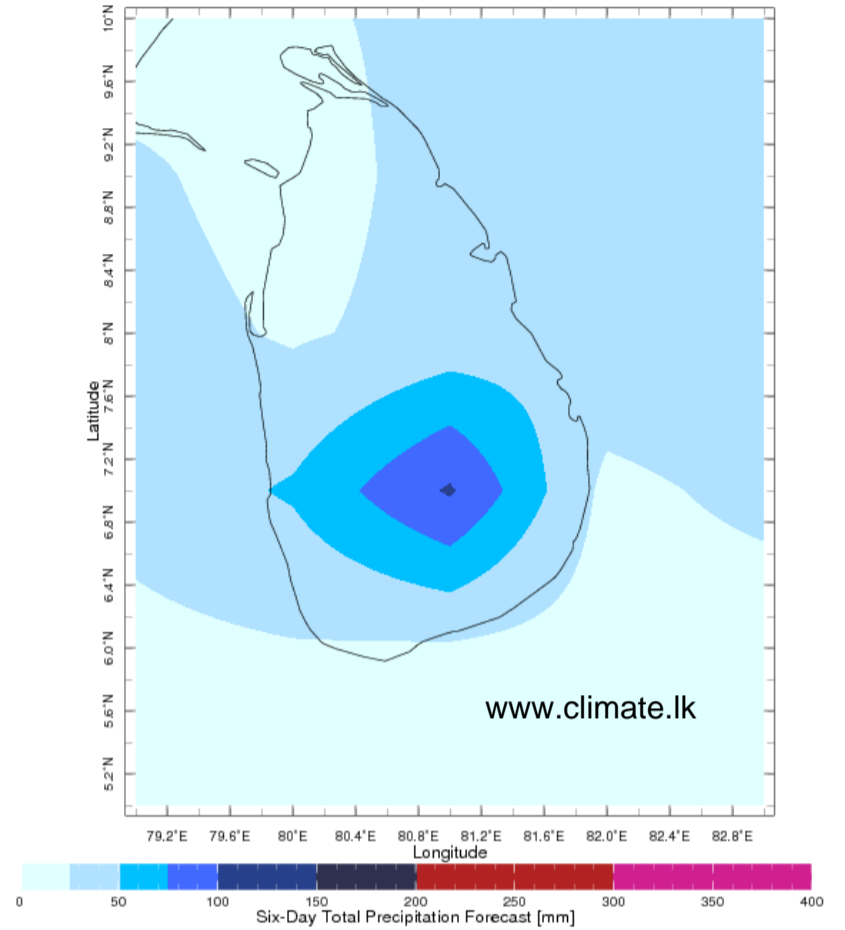
Total rainfall forecast from the IRI for next six days is provided in figures below. The figure to the left shows the expectancy of heavy rainfall events during these six days while the figure to the right is the prediction of total rainfall amount during this period.

Forecast for 9-14 Nov 2016 Issued 0000 9 Nov 2016



Extreme Rainfall Forecast

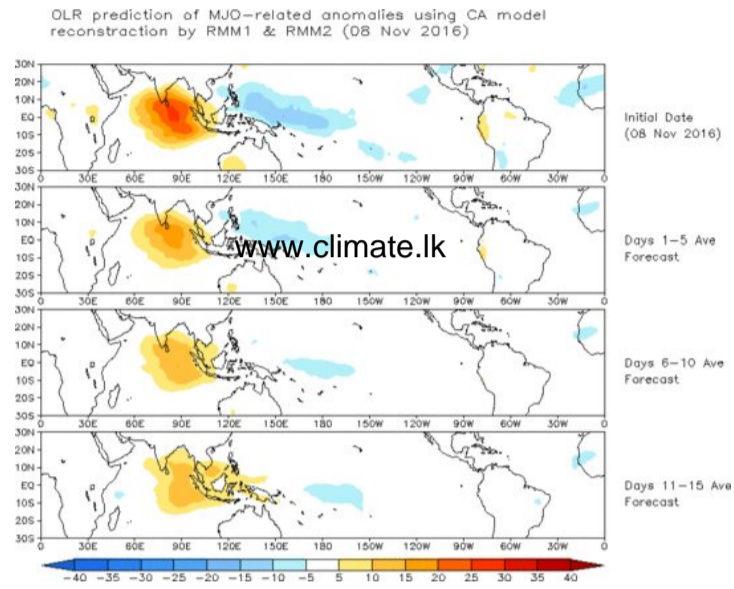
Forecast for 9-14 Nov 2016 Issued 0000 9 Nov 2016



Total Six Day Precipitation Forecast

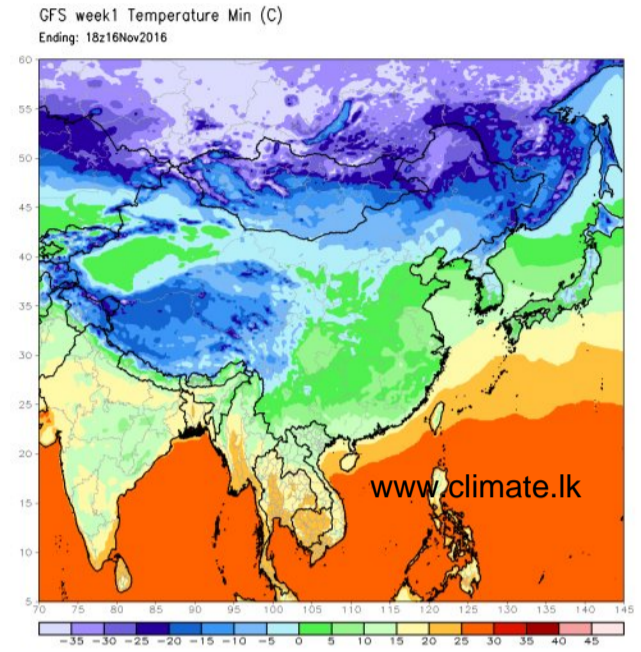
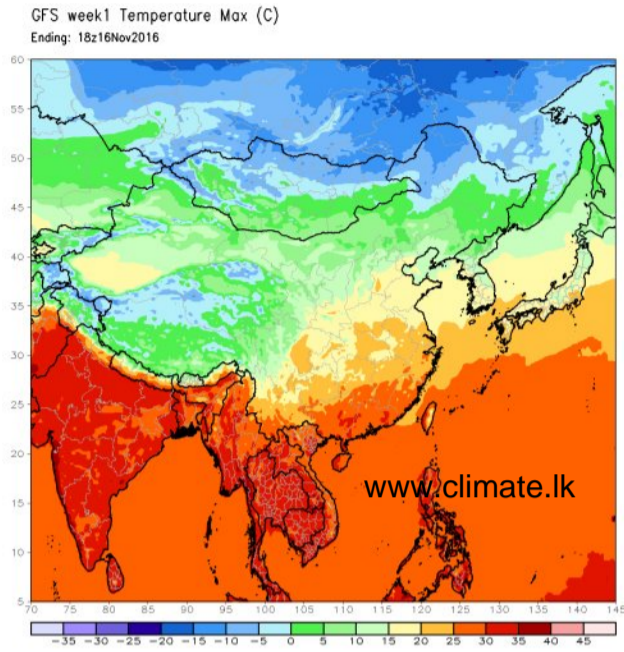
Madden Julian Oscillation (MJO) related Outgoing Longwave Radiation (OLR) Forecast

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.



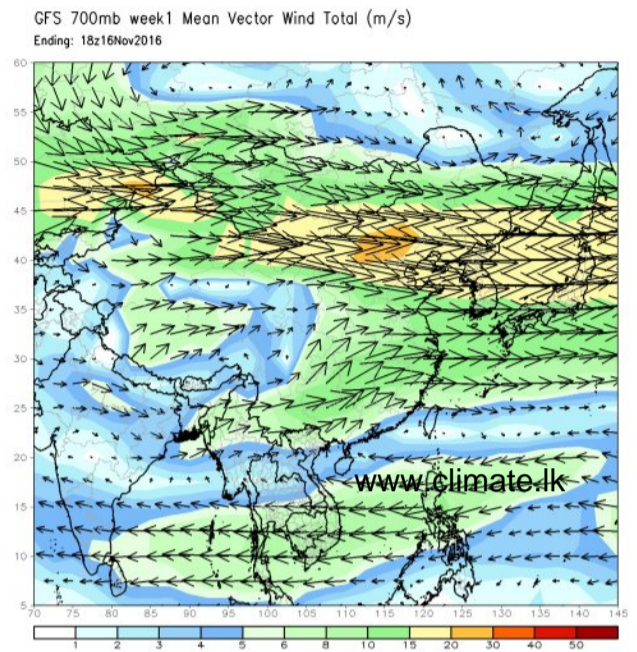
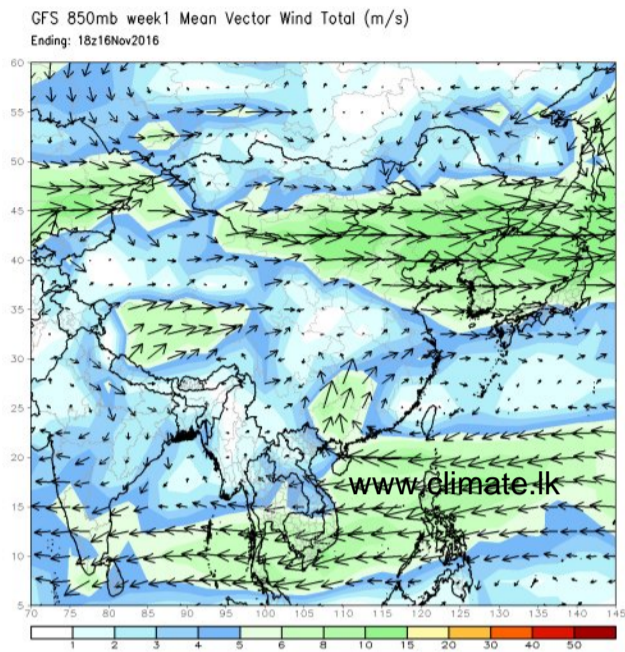
Weekly Temperature Forecast

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



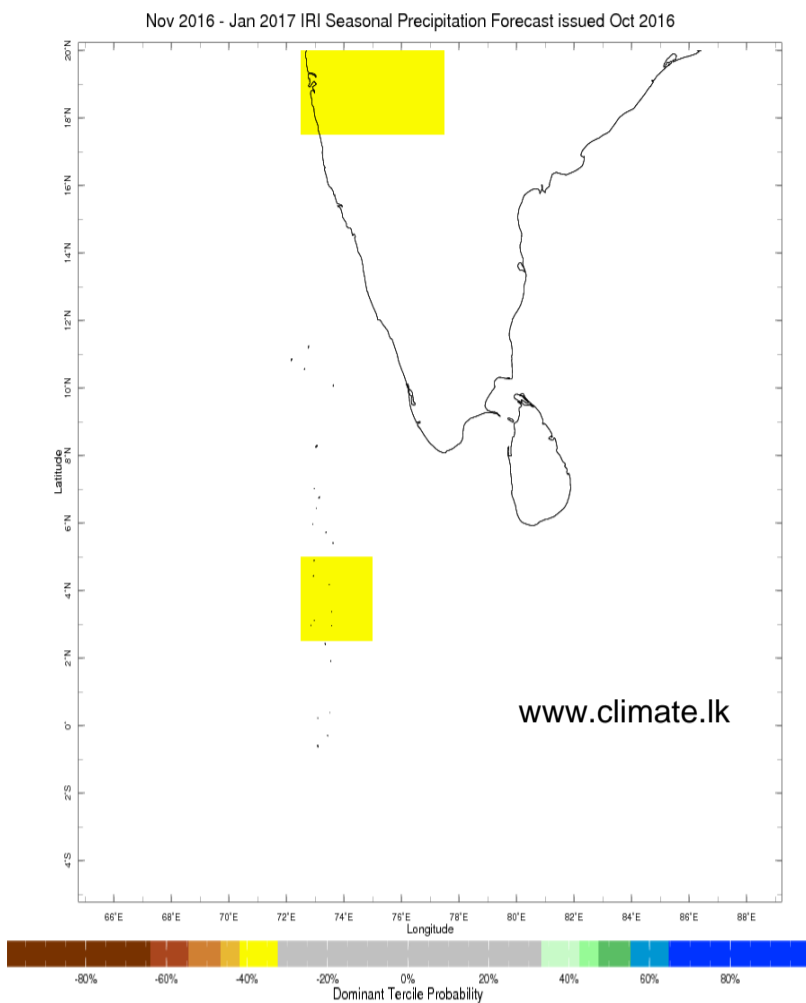
Weekly Wind Forecast

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

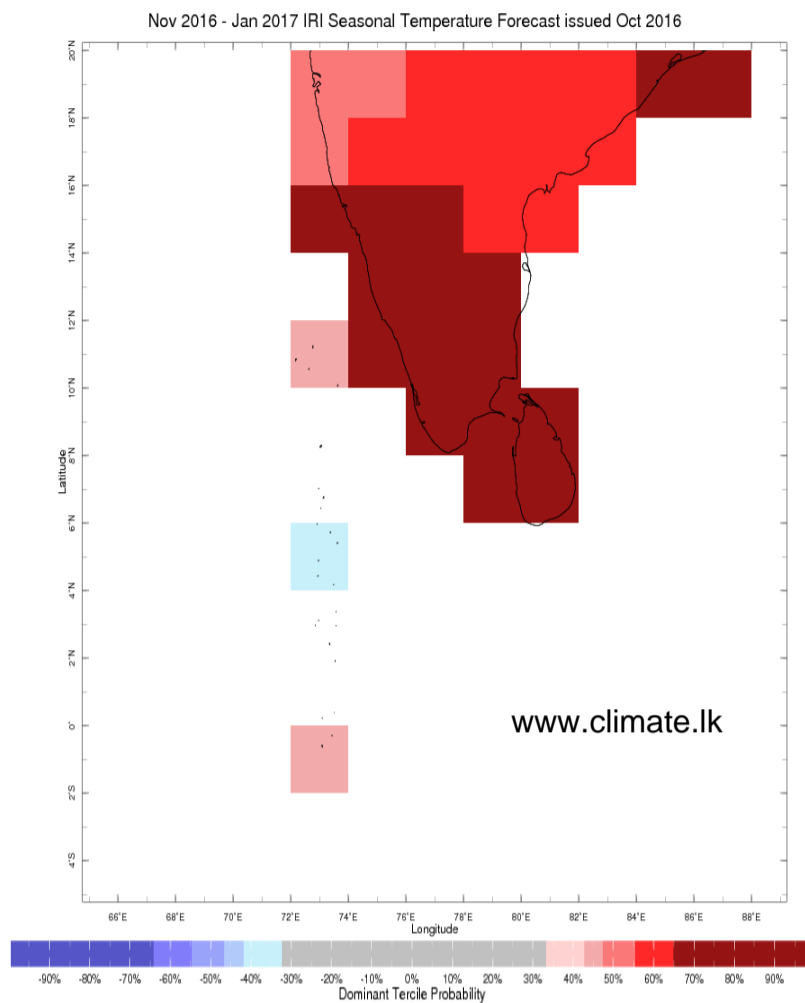


Seasonal Rainfall and Temperature Forecast

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%).



Precipitation Forecast



Temperature Forecast

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