කාලගුණ විද්‍යා දෙපාර්තමේන්තුව
வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook

October, November and December(OND)

Seasonal Rainfall and Temperature for Sri Lanka

This forecast was prepared using

- The prevailing global climate conditions.
- Forecasts from different climate models from around the world.
- Statistical downscaling of GCM output using CPT

Issued by Centre for Climate Change Studies (CCCS)

And

Research Division

Prevailing global climate conditions

Equatorial sea surface temperatures (SSTs) are near-to-above average across most of the Pacific Ocean. During the last four weeks, equatorial SSTs were above average in parts of the central and western Pacific. Above-average SSTs were generally observed north of the equator, while below-average SSTs were present south of the equator (Figs 1 and 2).

Atmospheric conditions over the Pacific also indicate ENSO neutral conditions. The latest forecast from global models indicates increased probability of further warming of SSTs over equatorial central and east Pacific leading to development of weak El Nino conditions during the 2018 OND season. The weak El Nino conditions are most likely to continue till the early part of next year. Overall, the oceanic and atmospheric conditions reflected ENSO-neutral. The majority of models in the IRI/CPC plume predict ENSO-neutral to continue during the remainder of the Northern Hemisphere summer 2018, with El Niño most likely to develop by October-December 2018 (Fig. 3 UPPER) There is ~60% chance of El Niño in the Northern Hemisphere fall 2018 (October-December), increasing to ~70% during winter 2018-19(Climate Prediction Center, USA). Positive IOD condition is likely during October, November and December 2018 (Fig 3 lower) (BoM, Australia).

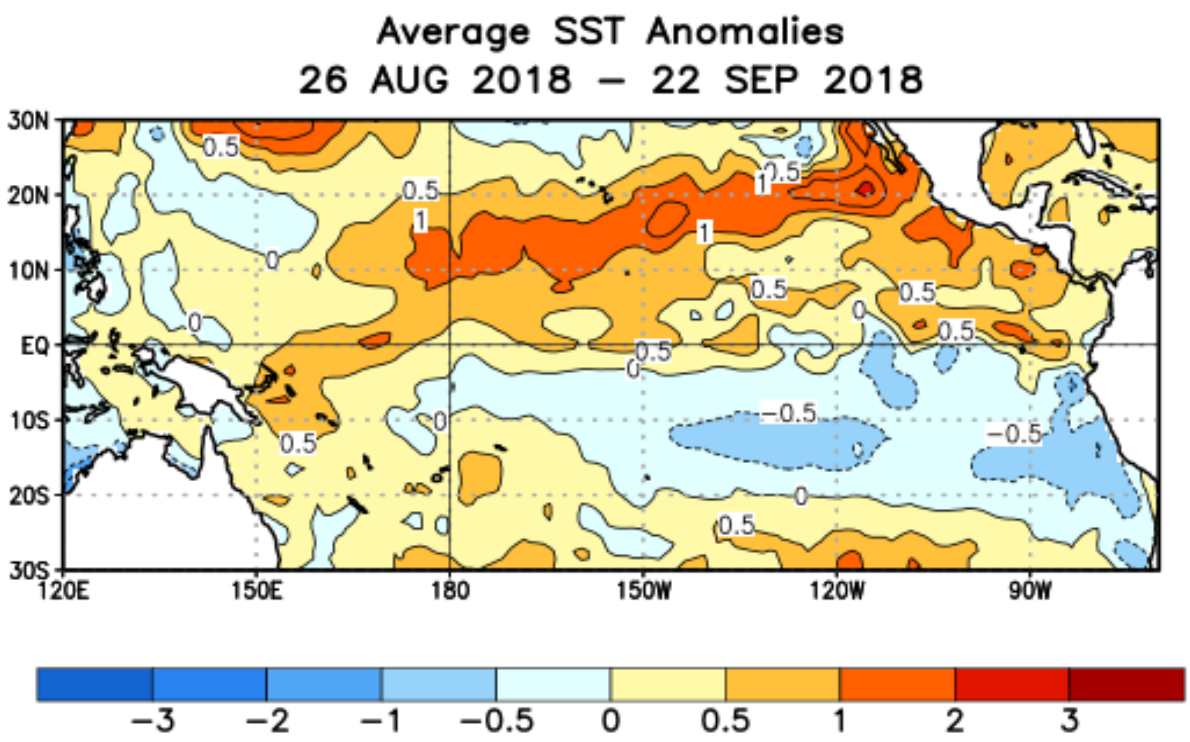


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

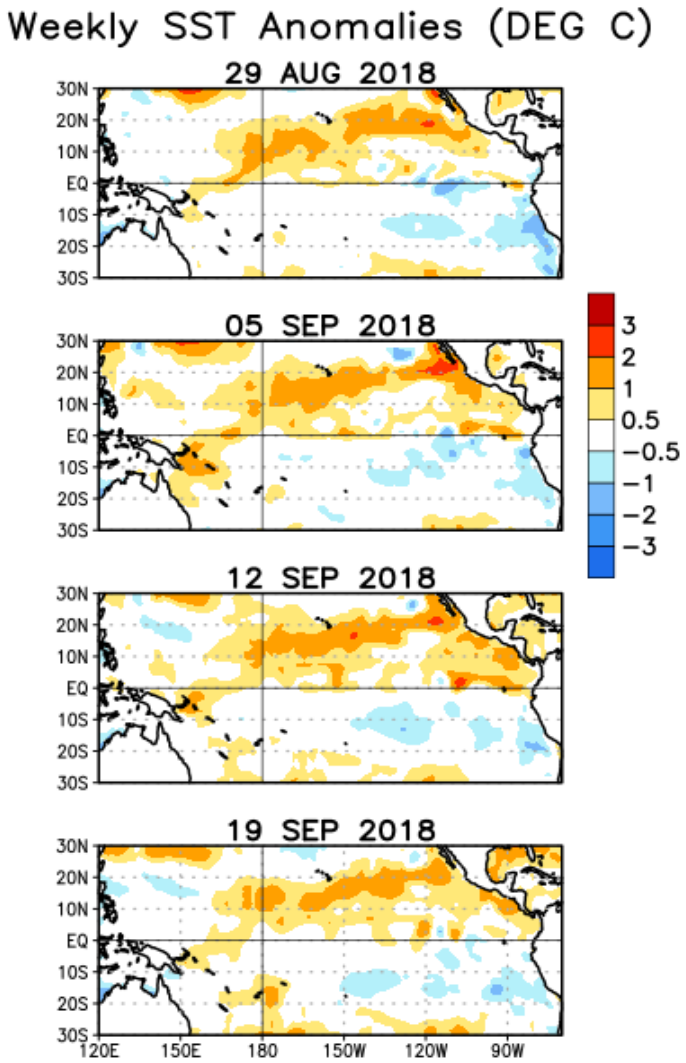
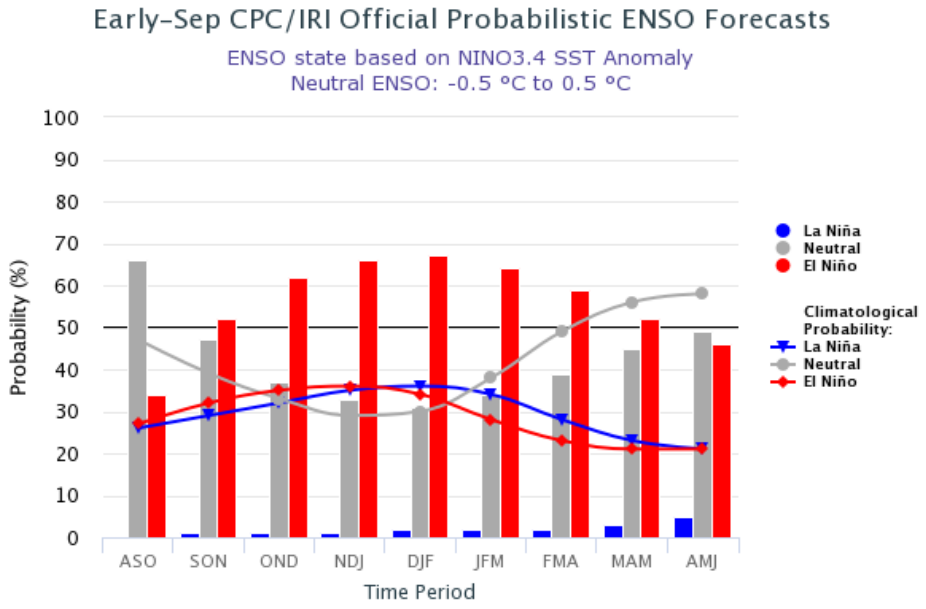


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

(A)



(B)

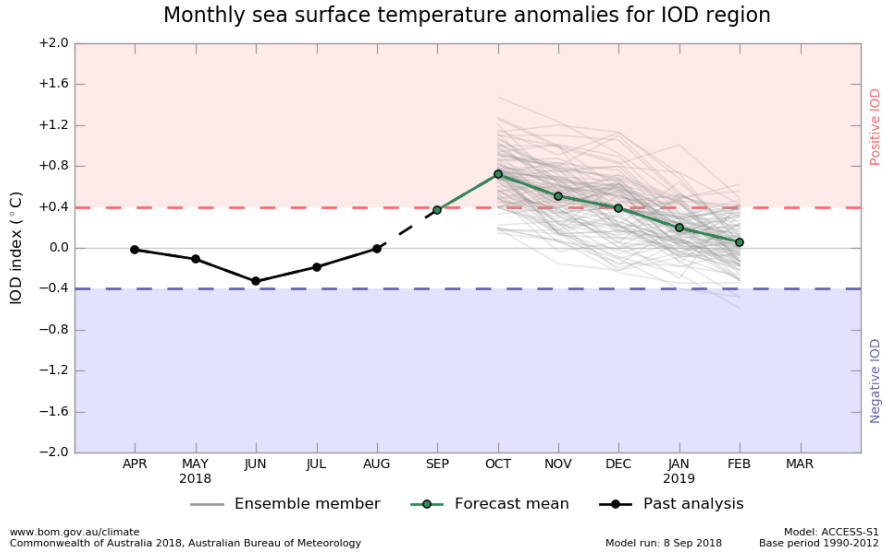


Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast (A) and IOD forecast from Australian Bureau of Meteorology (B).

Impact of El Nino on October, November and December Rainfall in Sri Lanka

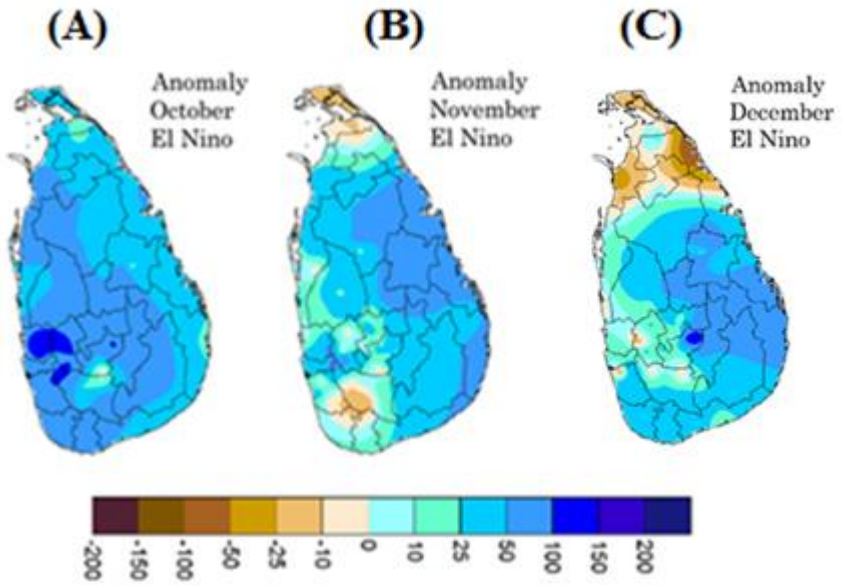


Fig 3b: Anomaly Composite maps of Monthly Rainfall during October (A), November (B) and December (C) during El Nino years (Hapuarachchi et al 2018)

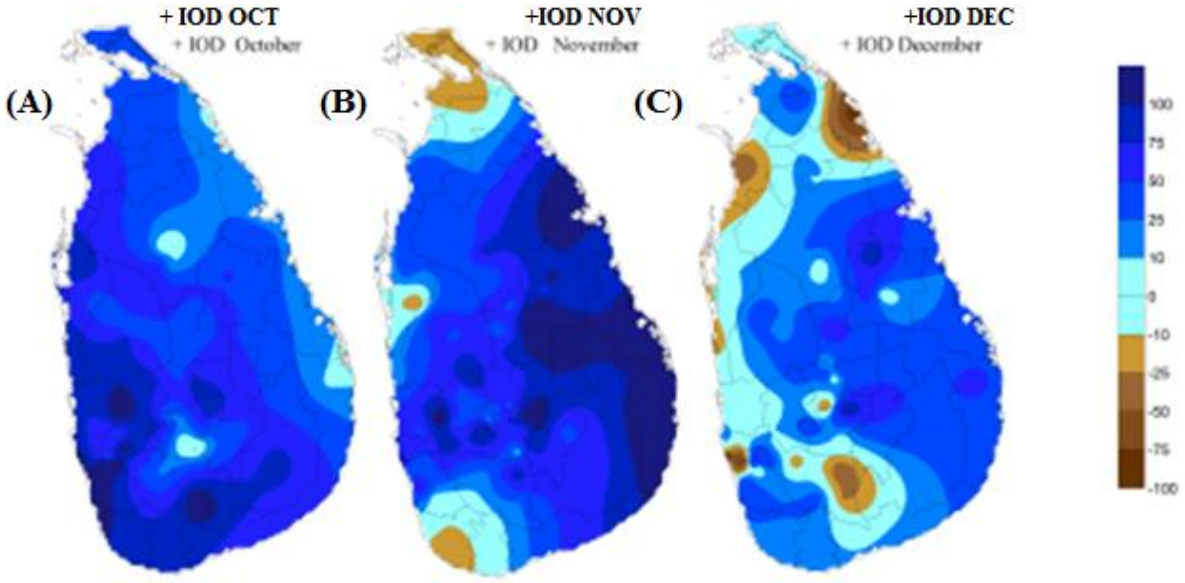


Fig 3c: Anomaly Composite maps of Monthly Rainfall during October (A), November (B) and December (C) during positive IOD years (Hapuarachchi et al unpublished)

Previous studies conducted by the Department of Meteorology, identified that enhancement of rainfall in October (Fig 3b (A)) , November (Fig 3b (B)) and in December (Fig 3b (C)) during El Niño years. Enhancement of rainfall all over the country in October (Fig 3c (A)) and except Northwestern parts in November (Fig 3c (B)) and in December (Fig 3c (C)) is also favored by Positive IOD events. Predicted global climate conditions such as weak El Nino in October, November , and December 2018 and Positive IOD in October, November and December 2018 favors above normal rainfall in October, November and December 2018.

(a) Forecasts from different climate models from around the world.

(a.1) For OND season

Figure 4 shows the probabilistic multi model ensemble forecast using dynamical models from 12 global producing centers (GPC) for OND season. There is no signal for Sri Lanka(Fig.4)indicating equal chances of receiving below normal, near normal and above normal rainfall for those parts during OND season.

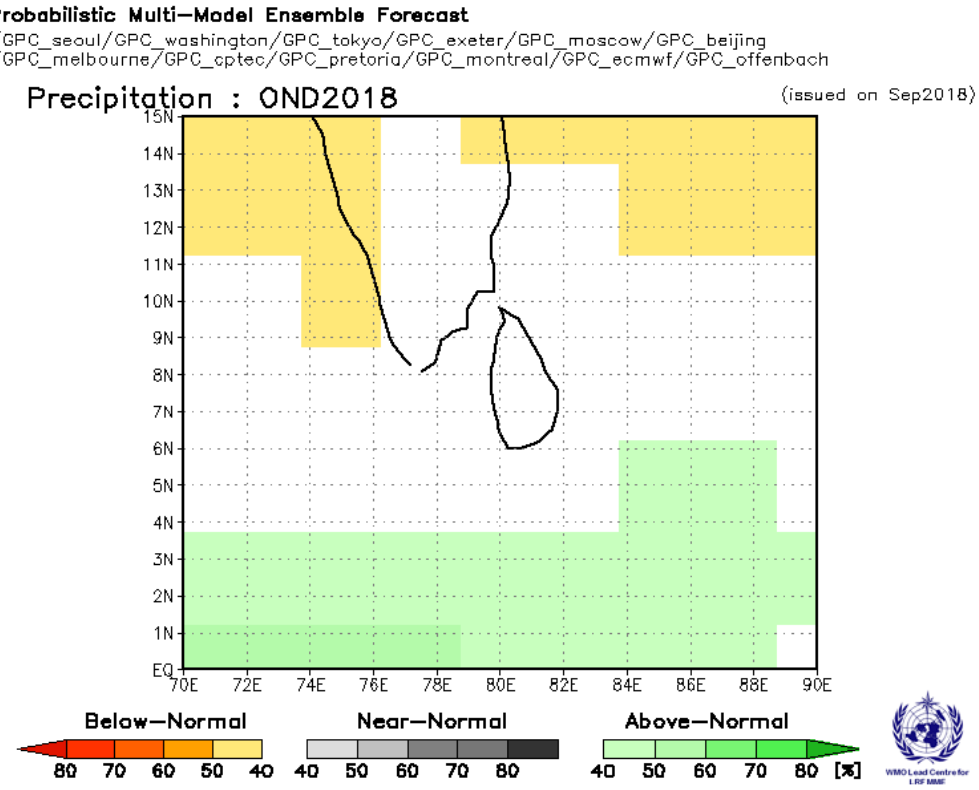


Fig 4: Probabilistic multi model ensemble forecast for OND using dynamical models from 12 WMO global producing centers (GPC).

Out of 13 GPC individual forecasts 6 models provide above normal rainfall during OND season(Fig 5). 5 GPC models are predicted below normal rainfall (Fig 5). There is no signal for OND season over Sri Lanka from 2 GPC forecast outputs. Accordingly there is no signal for OND season 2018. It indicates that there are equal chances of receiving below normal, near normal and above normal rainfall for OND season 2018.

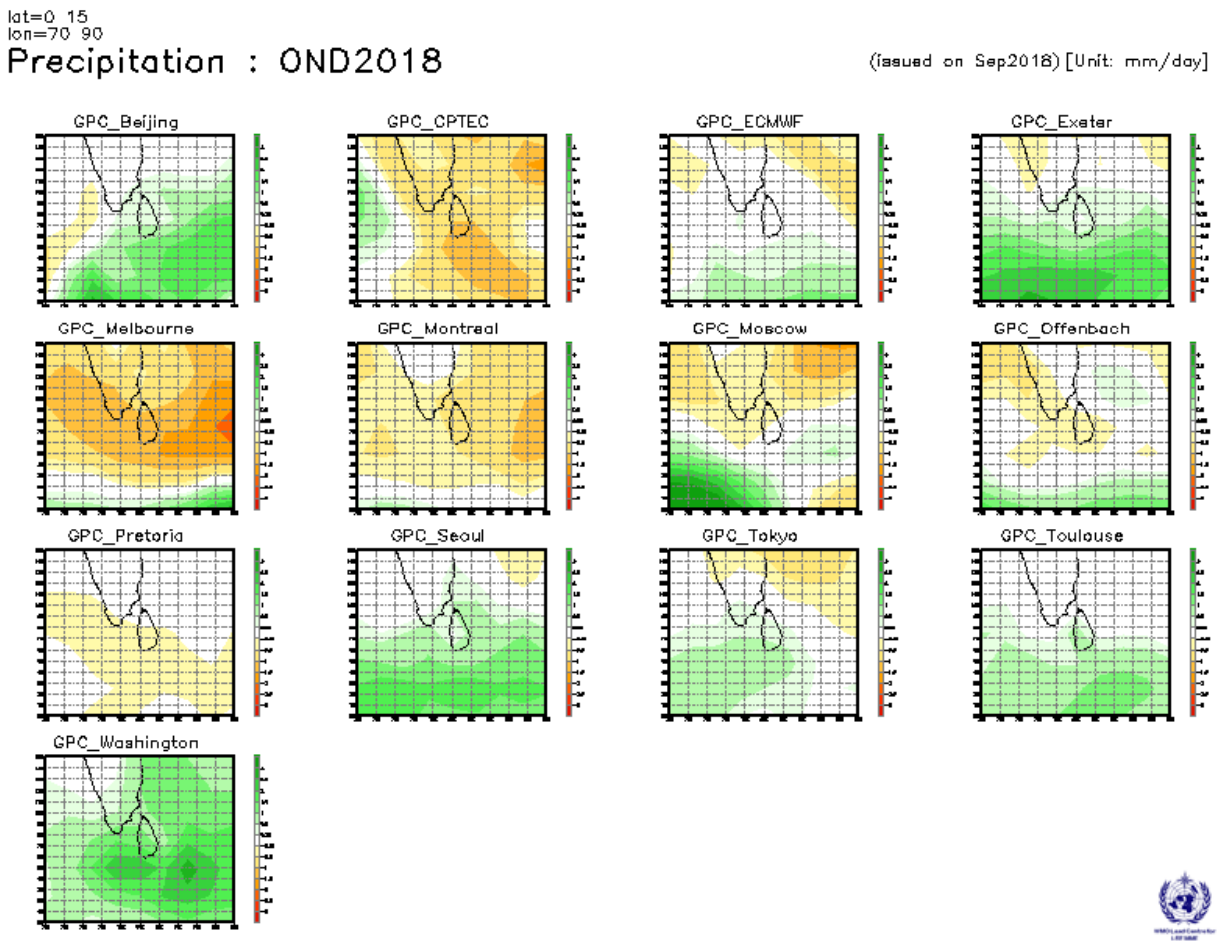


Fig 5: Individual forecast for OND season by dynamical models from 13 WMO global producing centers (GPC).

(a.2) Forecast for October, November and December 2018

Figure 6 shows the probabilistic multi model ensemble forecast using dynamical models from 12 global producing centers (GPC) for October, November and December 2018. According to Fig. 6 there is no signal for the months of October, November and December 2018 (Fig 6). It indicates that there are equal chances of receiving below normal, near normal and above normal rainfall for October, November and December 2018.

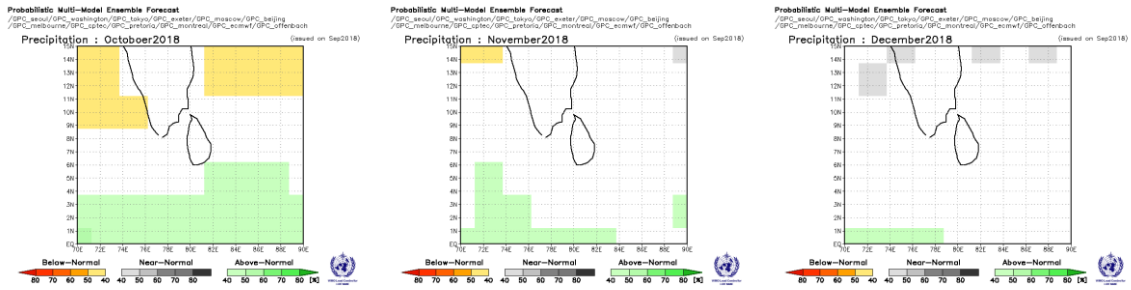


Fig 6:Probabilistic multi model ensemble forecast for October 2018 (left), November 2018 (middle) and December2018 (right) using dynamical models from 12 WMO global producing centers (GPC).

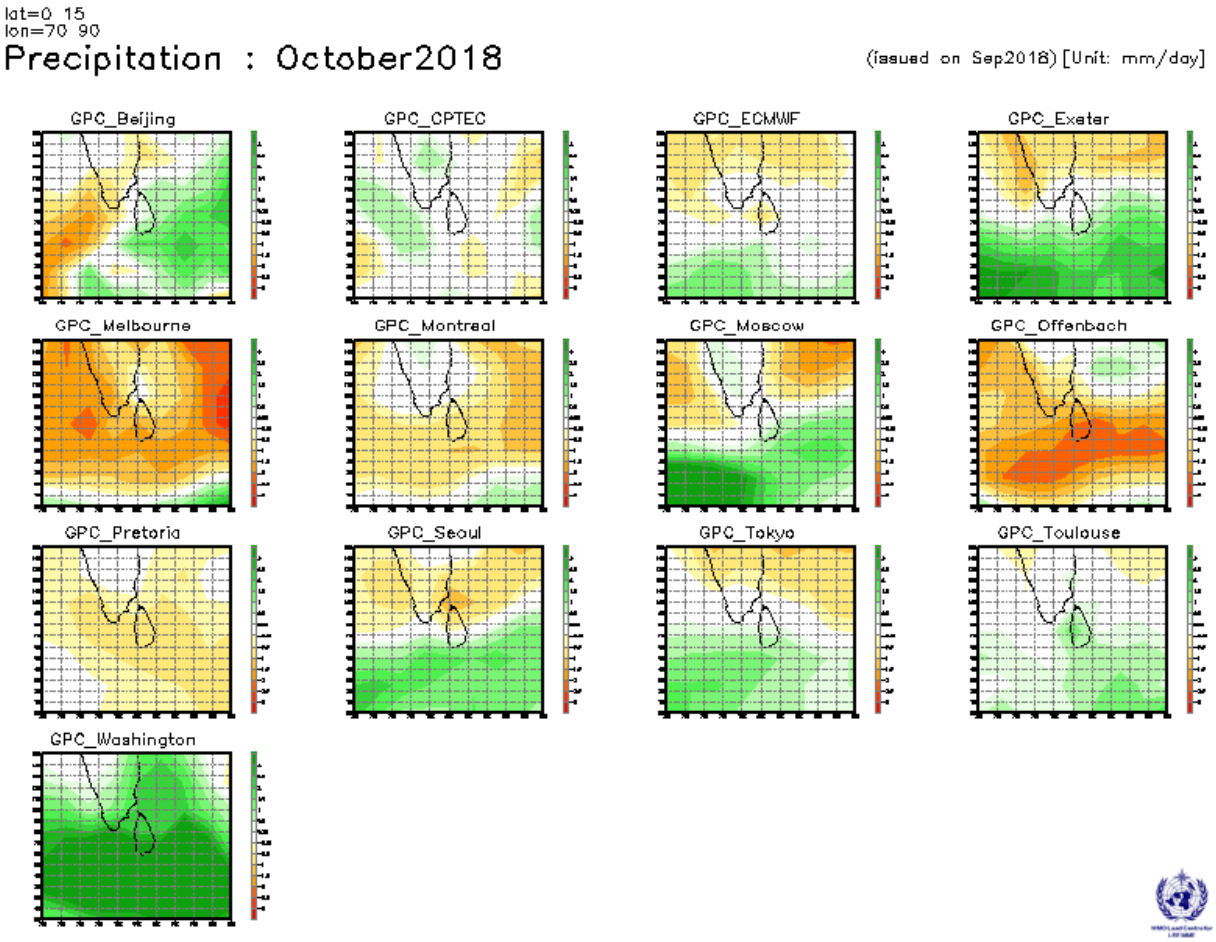


Fig 7: Individual forecast for October 2018 by dynamical models from 13 WMO global producing centers (GPC).

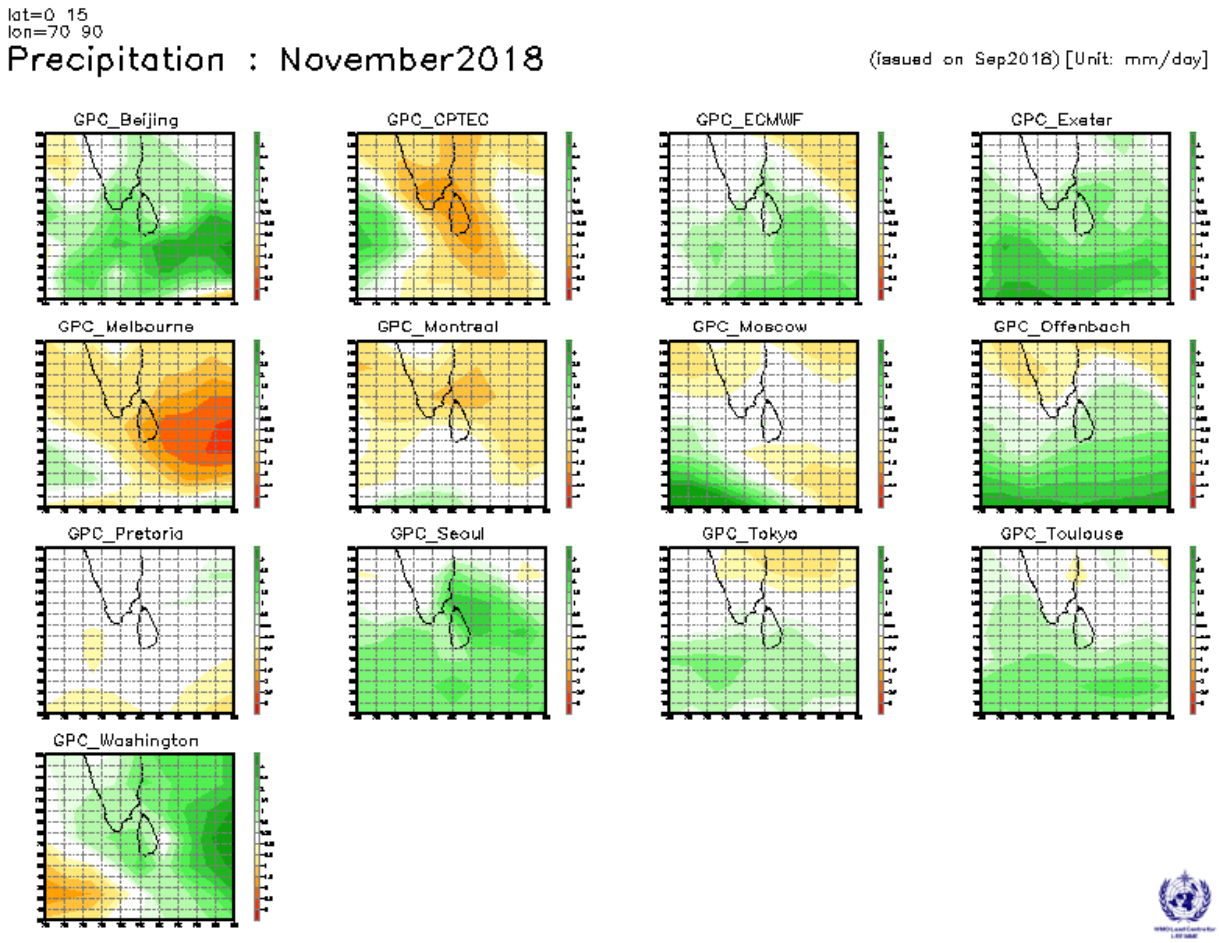


Fig 8: Individual forecast for November2018 by dynamical models from 13WMO global producing centers (GPC).

Figures 7, 8 and 9 show the monthly forecast from individual global producing centers (GPC) for October, NovemberandDecember2018 respectively.

Out of 13 GPC forecasts 4 GPC models predicted below normal rainfall and 2 GPC models predicted above normal rainfall for October (Fig 7).There is no signal for October over Sri Lanka from 7 GPC forecast outputs (Fig 7). Accordingly there are equal chances of receiving below normal, near normal and above normal rainfall for month of October 2018 for Sri Lanka.

Out of 13 GPC forecasts 6 GPC models provide above normal and another 3 models predicted below normal rainfall for November (Fig 8). There is no signal for November over Sri Lanka from 4 GPC forecast outputs (Fig 8). Accordingly there is a higher chance of receiving above normal rainfall for November 2018.

Out of 13 GPC forecasts 4 GPC models predicted below normal rainfall and only one model predicted above normal rainfall for December 2018 (Fig 9). There is no signal for December 2018 over Sri Lanka from 8 GPC model outputs. Accordingly there is no signal for month of December 2018. It indicates that there are equal chances of receiving below normal, near normal and above normal rainfall for December 2018.

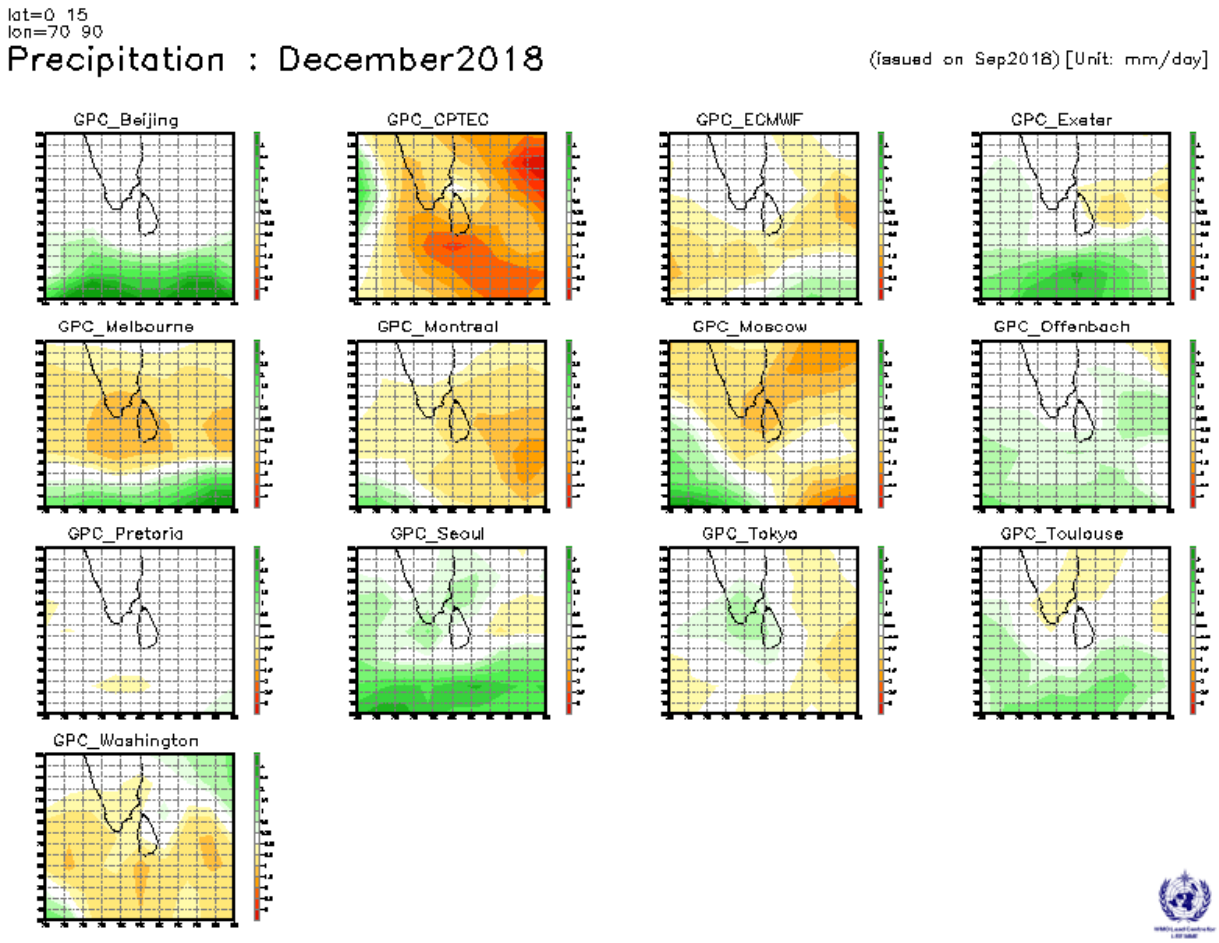


Fig 9: Individual forecast for December 2018 by dynamical models from 13 WMO global producing centers (GPC).

(b) Statistical downscaling of CFSv2 global forecast output

(b.1) Probabilistic Forecast for OND season 2018 using Climate Predictability tool (CPT)

The probabilistic rainfall forecast for OND 2018 for Sri Lanka by downscaling CFSv2 SST using CPT is given below.

The district wise average rainfall is given in the column 2 of the table 1. Chance (probability) of receiving below/about/above average is given in the columns 3, 4, and 5 respectively in the table1.

According to CPT there is a higher chance of receiving above normal rainfall in all the districts during OND season 2018.

Table 1 :Probabilistic Rainfall Forecast for OND season2018 using CPT

District	**Average rainfall (mm) –OND**		**Probability%**	
		Below	Normal	Above
Colombo	924.3	25	25	50
Kalutara	1124.8	25	25	50
Galle	1038.8	25	25	50
Matara	900.8	25	25	50
Hambantota	556.1	20	20	60
Ampara	794.8	20	20	60
Batticaloa	873.4	20	20	60
Trincomalee	846.8	20	20	60
Mullaithivu	804.2	25	25	50
Jaffna	809.5	30	25	45
Killinochchi	814.6	30	25	45
Mannar	634.5	25	25	50
Puttalam	590.6	25	25	50
Gampaha	816.7	25	25	50
Kegalle	1043.5	20	20	60
Ratnapura	973.2	20	20	60
Monaragala	780.5	20	20	60
Badulla	954.4	20	20	60
Pollonnaruwa	880.1	20	20	60
Vavuniya	757.2	25	25	50
Anuradapura	699.3	20	20	60
Kurunegala	708.8	20	20	60
Matale	927.2	20	20	60
Kandy	841.8	20	20	60
Nuwaraeliya	872.3	20	20	60

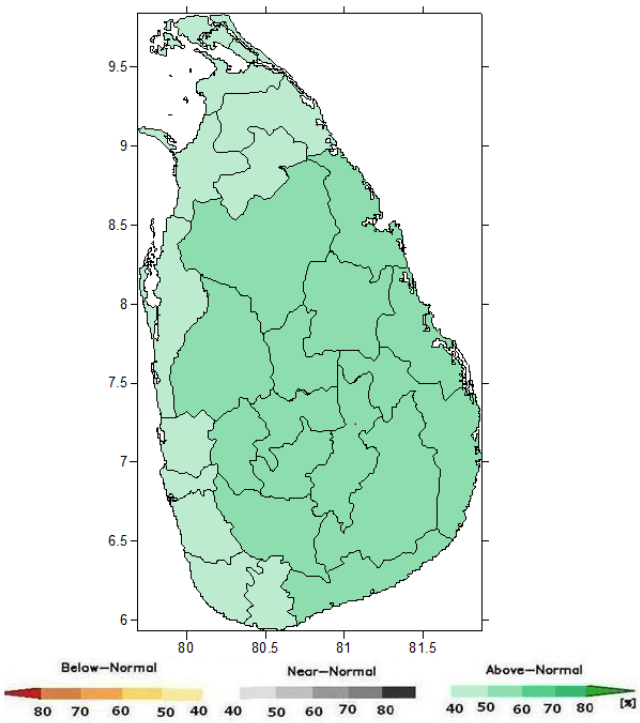


Fig 10: Probabilistic rainfall forecast for October-December 2018 using CPT

(b.2) Probabilistic Forecast for OND season 2018 using RIMES FOCUS System

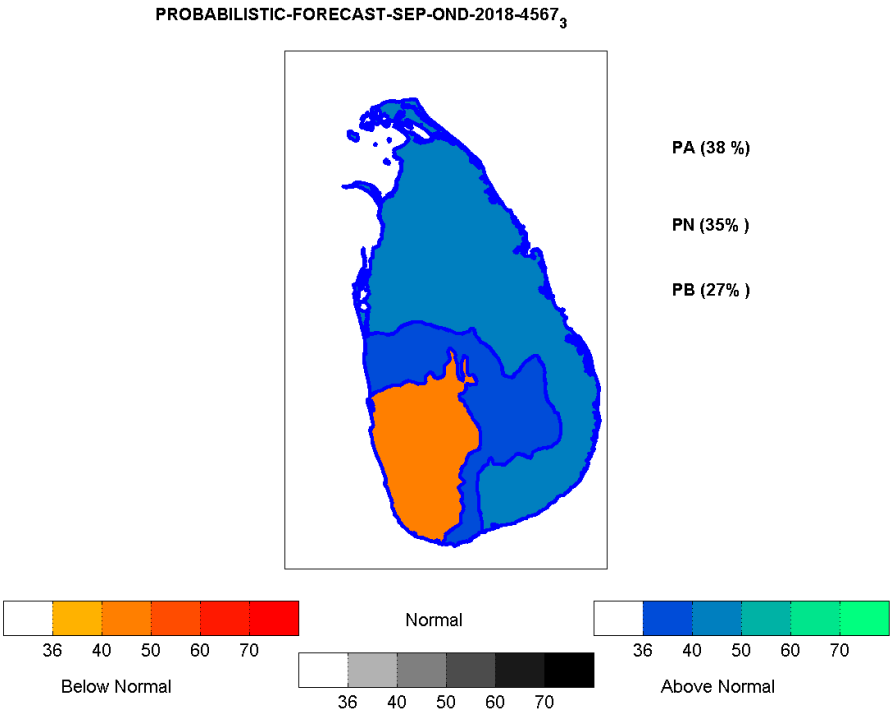


Fig 11. Probabilistic rainfall forecast for October-December 2018 using RIMES FOCUS System

The probabilistic rainfall forecast for OND 2018 for Sri Lanka by downscaling for 3 climatic zones (Fig 11) indicates higher chances of receiving above normal rainfall in dry zone and intermediate zone. Below normal rainfall can be expected in wet zone.

(b.3) Probabilistic Forecast for OND season 2018 using a regression model

The probabilistic rainfall forecast for OND 2018 using a regression model developed with guidance provided by Tokyo Climate Center (TCC) given below.

Gampaha, Kaluthara, Galle, Hambantota, Rathnapura, Anuradhapura, Mannar, Vavuniya and Mullativu districts have more chance (higher probability) of receiving above normal rainfall. Kegalle, Badulla, Matara, Ampara and Batticaloa districts have more chance (higher probability) of receiving near normal rainfall during OND season 2018. Kurunegala, Puttalam, Monaragala, Polonnaruwa, Trincomalee and Killinochchi districts have more chance of receiving below normal rainfall during OND season 2018 (Fig 12).

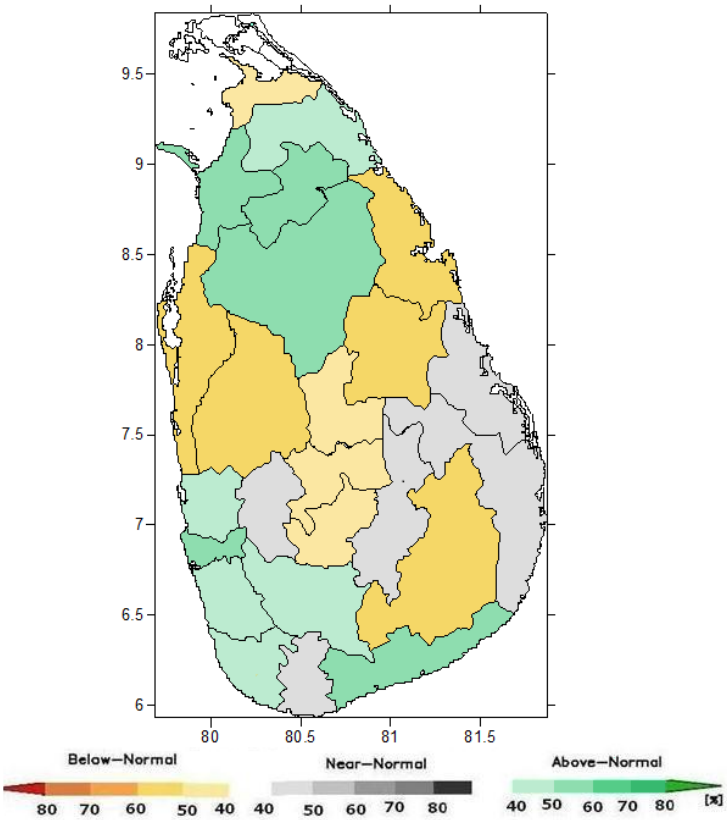


Fig 12: Probabilistic Forecast for OND season 2018 using a regression model

Summary : Consensus Seasonal Rainfall outlook for October, November, December (OND) Season 2018

Table 2: SUMMARY of MODEL FORECAST for OND season for SRI LANKA

SUMMARY of MODEL FORECAST for OND season for SRI LANKA							
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Regression Model	Impact of Global conditions	Final
OND season 2018	No signal	No signal	AN	Dry zone & intermediate zone- above normal Wet zone – Below normal	BN, Kurunegala, Puttalam, Monaragala, Polonnaruwa, Trincomalee and Killinochchi districts, AN to near normal elsewhere	AN	AN Central and southern parts , Near normal in Northern part
Oct 2018	No signal	No signal	AN			AN	AN
Nov 2018	No signal	AN				AN	AN
Dec 2018	No signal	No signal				AN to near normal	AN to near normal

BN: Below Normal **N**: Normal **AN**: Above Normal **CP**: Climatological Probability

Consensus Forecast for OND Season in Sri Lanka

Most of the global model forecasts provide no signal for OND season. According to WMO multi model ensemble prediction there is no signal for OND season indicating equal chances of receiving below normal, near normal and above normal rainfall for that season. Climate predictability tool provides higher chance of receiving above normal rainfall for all districts. Regression model indicates above normal rainfall for districts located in Western parts.

Weak El Niño is likely to develop During OND season 2018. Neutral to Positive IOD conditions are also likely during October, November and December 2018. Previous studies conducted by the Department of Meteorology, identified that enhancement of rainfall in October to December during El Niño years as well as positive IOD years. Predicted global climate conditions such as

weak El Nino and neutral to Positive IOD in OND 2018 favors above normal rainfall in October November and December 2018.

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT and other statistical tools and consensus outlook developed at the 13th session of South Asian Climate Outlook Forum for winter (Winter-SASCOF13), there is higher chance of receiving above normal rainfall over most parts of the island except northern part during OND season 2018 (Fig 13). Near normal rainfall is likely to occur in northern parts during OND season 2018 .

However, the predictability is also limited to some extent due to the strong day to day atmospheric variability caused by the passage of the synoptic scale systems such as lows and depressions etc and intra-seasonal Oscillations such as Madden Julian Oscillations (MJO).

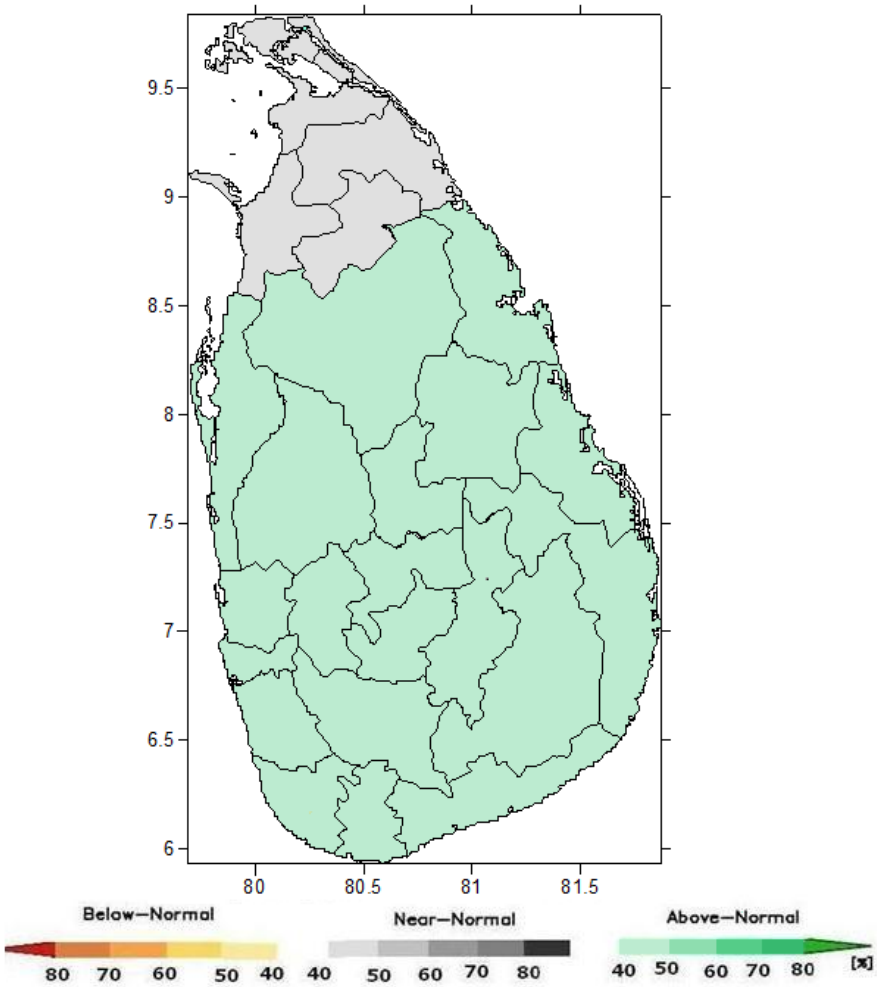


Fig 13.Consensus Probabilistic rainfall forecast for October–December2018

Probabilistic Temperature Forecast for October –December (OND) 2018

The probabilistic Temperature forecast for October, November and December season (OND) 2018 for Sri Lanka as given below.

The district wise average Maximum Temperature and Minimum Temperatures are given in the column 2 of the table 3 and 4 respectively. Chance (probability) of receiving below/about/above average is given in the columns 3, 4, and 5 respectively in the table 3 and table 4 respectively.

There is a higher chance of receiving slightly above average Maximum Temperatures in Anuradapura, Batticaloa, Trincomalee, Puttalam, Kurunegala, Gampaha, Colombo, Kandy, NuwaraEliya, Ratnapura, Galle and Hambantota Districts and about average Maximum Temperatures in Badulla District and slightly below average Maximum Temperatures in Mannar, Vavuniya, and Ampara Districts (Fig 14) for the OND season 2018.

There is a higher chance of receiving slightly below average Minimum Temperatures in Anuradhapura, Puttalam, Kurunegala, Kandy, NuwaraEliya, Ratnapura, Badulla Hambantota and Batticaloa districts and slightly above average Minimum Temperatures in Mannar, Vavuniya, Trincomalee, Gampaha, Colombo, Galle and Ampara districts (Fig 15) for the OND season 2018.

The probabilistic forecast for Maximum Temperature and Minimum Temperatures for OND season 2018 for Sri Lanka is given below.

Table 3: probabilistic forecast for Maximum Temperature for OND season 2018

District	**Average Maximum Temperature (^{0}C) –(OND)**		**Probability %**	
		Below	Normal	Above
Anuradhapura	30.5	40	20	40
Badulla	27.1	30	40	30
Batticaloa	29.4	40	15	45
Colombo	30.1	35	20	45
Galle	28.9	40	15	45
Hambantota	29.8	35	25	40
Katugastota	28.3	20	40	40
Katunayake	30.9	35	30	45
Mannar	29.6	45	20	35
MahaIlluppallama	30.4	30	30	40
NuwaraEliya	19.6	30	25	45
Pottuvil	30.5	50	25	25
Puttalam	30.4	35	25	40
Ratnapura	31.6	35	25	40
Ratmalana	30.4	40	20	40
Trincomalee	29.7	35	25	40
Vavuniya	30.3	45	30	25
Kurunegala	30.7	35	20	45
Bandarawela	23.5	20	45	35

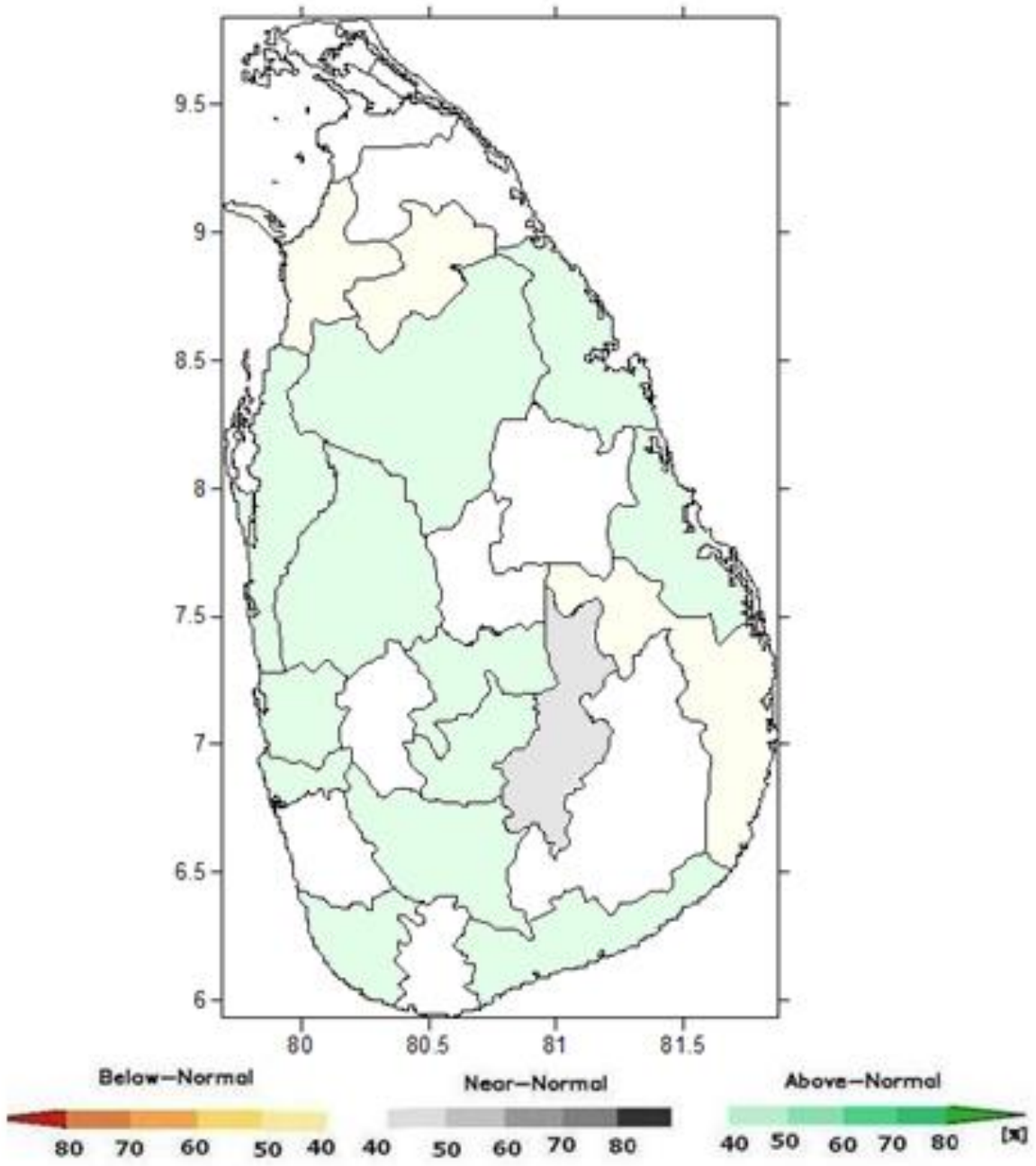


Fig 14: Probabilistic forecast for Maximum Temperatures for OND season 2018

Table 4: Probabilistic forecast for Minimum Temperatures for OND season 2018

District	**Average Minimum Temperature (^{0}C) –OND)**		**Probability %**	
		Below	Normal	Above
Anuradhapura	22.6	60	15	25
Badulla	18.7	60	20	20
Batticaloa	23.9	45	25	30
Colombo	23.3	35	25	40
Galle	23.6	20	20	60
Hambantota	23.7	60	20	20
Katugastota	19.9	60	20	20
Katunayake	22.9	35	25	40
Mannar	24.6	30	25	45
MahaIlluppallama	22.2	60	15	25
NuwaraEliya	11.4	60	15	25
Pottuvil	23.2	30	30	40
Puttalam	23.0	60	10	30
Ratnapura	22.6	60	15	25
Ratmalana	23.0	30	15	55
Trincomalee	24.3	30	25	45
Vavuniya	22.2	30	30	40
Kurunegala	22.2	60	15	25
Bandarawela	15.6	45	30	25

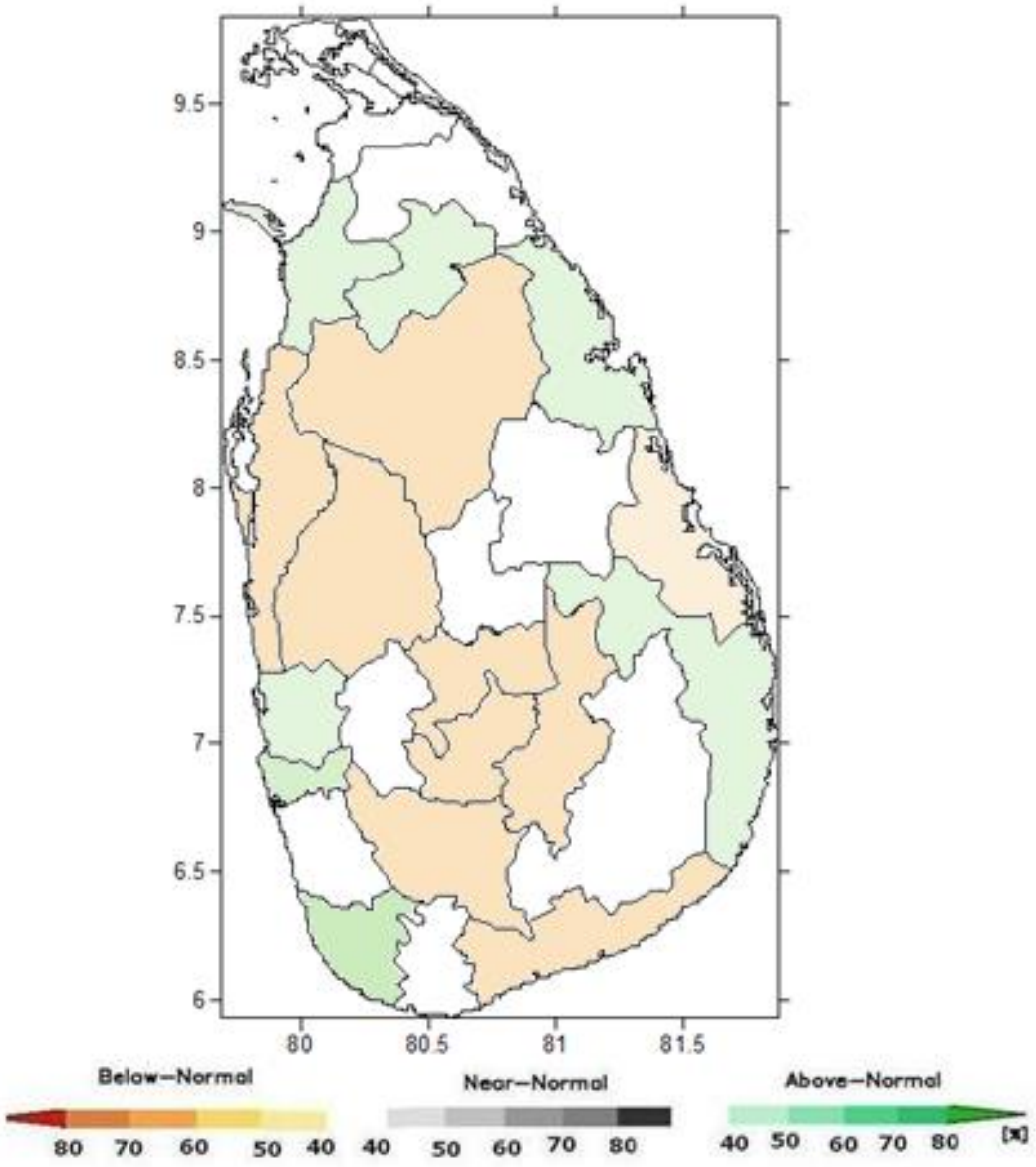


Fig 15: Probabilistic forecast for Minimum Temperatures for OND season2018