

# Weather Synopsis –November 2021.

Above or about normal rainfall was reported at all of the principal meteorological stations for month of November (Fig 4). Further above normal rainy days were reported from most of the principal meteorological stations except Badulla (Fig 6).

Above normal rainfall was reported from most of the hydro catchment stations except Victoria where about normal rainfall was reported and Bowathenna and Samanalawewa where below normal rainfall was reported (Fig 5).

Highest cumulative rainfall was 1518.1 mm at Norochcholai. Highest rainfall received during 24hours, was 351mm at Norochcholai on 08<sup>th</sup> November.

Presence of the near equatorial convergence zone across Sri Lanka roughly from 07<sup>0</sup>N80<sup>0</sup>E to along 5<sup>0</sup>N90<sup>0</sup>E provided positive low level convergence, and positive cyclonic vorticity to trigger extremely heavy falls at places in northern, northwestern, northcentral, northeastern parts from 07<sup>th</sup> to 09<sup>th</sup>. Above 300mm rainfall was reported at places in northwestern, northcentral provinces on 08<sup>th</sup> November (Table 1). Various environmental features including the low level vorticity, low level convergence and upper level divergence further consolidated to produce this extreme rainfall (Figs 1, 2 and 3). According to Disaster Management Center (DMC), 26 deaths were reported and 230640 people from 65704 families in 17 districts were affected by heavy rain leading to flood/flash floods/landslides from 07<sup>th</sup> to 09<sup>th</sup> November 2021.

The near equatorial convergence zone appeared across Sri Lanka extended up to southwest Bay of Bengal and adjoining southeast Bay of Bengal providing favorable conditions to form a low pressure area over southeast Bay of Bengal on 9<sup>th</sup> November. This system intensified into a well marked low pressure area over same region at morning hours of 10<sup>th</sup>, moving west-northwestwards intensified into a depression over at evening hours of 10<sup>th</sup> and crossed north Tamil Nadu coasts close to Chennai, on 12<sup>th</sup>. This low pressure area and subsequent depression has temporary established a southwesterly wind flow across Sri Lanka bringing rainfall to the western part of the country from 10<sup>th</sup> to 15<sup>th</sup>.

Fairly widespread thunderstorm activity over entire island was reported during first 10 days and from 23<sup>rd</sup> to 30<sup>th</sup>. Scattered thunderstorm activity over Western part of the country was evident from 11<sup>th</sup> to 19<sup>th</sup>. Reduction of rainfall was apparent from 20<sup>th</sup> to 22<sup>nd</sup> November.

The maximum temperatures as well as minimum temperatures were mostly above normal in most places during the month of November 2021. However below normal maximum temperatures were reported at some places from 07<sup>th</sup> to 16<sup>th</sup> and from 24<sup>th</sup> to 27<sup>th</sup> of November. while some stations such as Trincomalee, Ratnapura, Badulla and Nuwara Eliya reported below average minimum temperatures on 21<sup>st</sup> and 22<sup>nd</sup>. The highest recorded maximum temperature was 34.6<sup>0</sup>C at Ratnapura on 02<sup>nd</sup> and the lowest recorded minimum temperature was 10.8 <sup>0</sup>C at Nuwara Eliya on 13<sup>th</sup> for the month of November 2021.

Table 1 stations received above 100mm rainfall during November 07 to 09 2021

Date	Station	24 hour Rainfall (mm)
07 <sup>th</sup> November 2021	Kukuleganga	<b>162.0</b>
07 <sup>th</sup> November 2021	Vincit Estate	<b>149.0</b>
07 <sup>th</sup> November 2021	Mathugama	<b>128.8</b>
07 <sup>th</sup> November 2021	Bentotawatte	<b>121.0</b>
07 <sup>th</sup> November 2021	Karagala	<b>118.0</b>
07 <sup>th</sup> November 2021	Andigama	<b>103.0</b>
08 <sup>th</sup> November 2021	Norochcholai	<b>351.0</b>
08 <sup>th</sup> November 2021	Nochichiyagama	<b>300.4</b>
08 <sup>th</sup> November 2021	Palavi Saltern	<b>298.0</b>
08 <sup>th</sup> November 2021	Tabbowa	<b>278.2</b>
08 <sup>th</sup> November 2021	Ranorava	<b>260.0</b>
08 <sup>th</sup> November 2021	Jaffna	<b>243.0</b>
08 <sup>th</sup> November 2021	Karandipovval	<b>225.7</b>
08 <sup>th</sup> November 2021	Rambava	<b>210.5</b>
08 <sup>th</sup> November 2021	Water Resource Board	<b>206.7</b>
08 <sup>th</sup> November 2021	Palugaswewa Estate	<b>204.0</b>
08 <sup>th</sup> November 2021	Weweltalawa	<b>200.2</b>
08 <sup>th</sup> November 2021	Trincomalee	<b>186.9</b>
08 <sup>th</sup> November 2021	Wagolla	<b>180.5</b>
08 <sup>th</sup> November 2021	Jaffna Irrigation	<b>172.4</b>
08 <sup>th</sup> November 2021	Nikaweratiya	<b>170.5</b>
08 <sup>th</sup> November 2021	Kamandaluwa	<b>168.0</b>
08 <sup>th</sup> November 2021	Chilaw R.D	<b>165.0</b>
08 <sup>th</sup> November 2021	Mihinthale	<b>164.0</b>
08 <sup>th</sup> November 2021	Mannar	<b>160.9</b>
08 <sup>th</sup> November 2021	Anuradhapura	<b>154.1</b>
08 <sup>th</sup> November 2021	Kuliyapitiya	<b>152.6</b>
08 <sup>th</sup> November 2021	Dampalessa	<b>151.6</b>
08 <sup>th</sup> November 2021	Anamaduwa	<b>149.6</b>
08 <sup>th</sup> November 2021	Chavakachcheri	<b>136.7</b>

08 <sup>th</sup> November 2021	Andigama	135.0
08 <sup>th</sup> November 2021	Horagasgara	133.9
08 <sup>th</sup> November 2021	Dummalasooriya	133.7
08 <sup>th</sup> November 2021	Mathugama	130.0
08 <sup>th</sup> November 2021	Polatagama	125.0
08 <sup>th</sup> November 2021	Kamalasram (Udu Baddawa)	123.7
08 <sup>th</sup> November 2021	Moralioya	118.5
08 <sup>th</sup> November 2021	Vogan Estate	116.6
08 <sup>th</sup> November 2021	Undugoda	112.2
08 <sup>th</sup> November 2021	Polontalawa	111.0
08 <sup>th</sup> November 2021	Padukka Estate	110.2
08 <sup>th</sup> November 2021	Hindawa	108.4
08 <sup>th</sup> November 2021	Laksapana	108.0
08 <sup>th</sup> November 2021	Watawala	107.3
08 <sup>th</sup> November 2021	Norton	104.5
09 <sup>th</sup> November 2021	Pedurutuduwa	189.0
09 <sup>th</sup> November 2021	Dodangaslanda	147.0
09 <sup>th</sup> November 2021	Dummalasooriya	133.8
09 <sup>th</sup> November 2021	Palugaswewa Estate	128.4
09 <sup>th</sup> November 2021	Achchiweli	124.3
09 <sup>th</sup> November 2021	Chilaw R.D	122.2
09 <sup>th</sup> November 2021	Weweltalawa	120.7
09 <sup>th</sup> November 2021	Bentotawatte	112.3
09 <sup>th</sup> November 2021	Polatagama	100.0

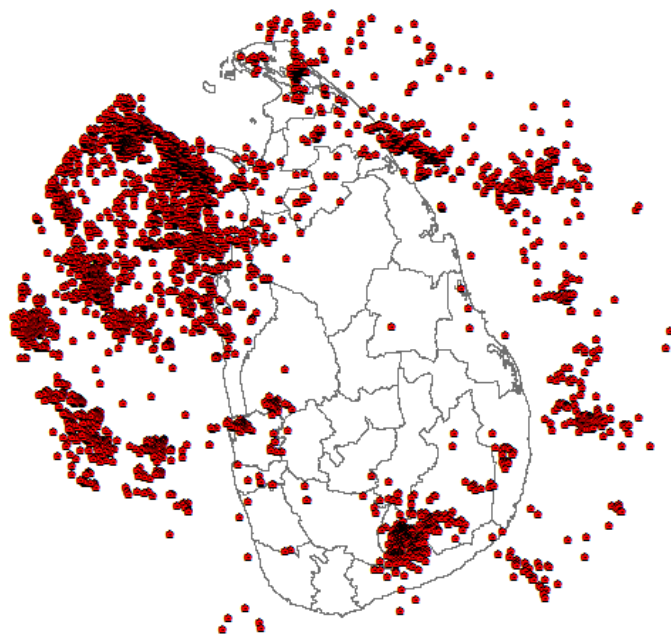
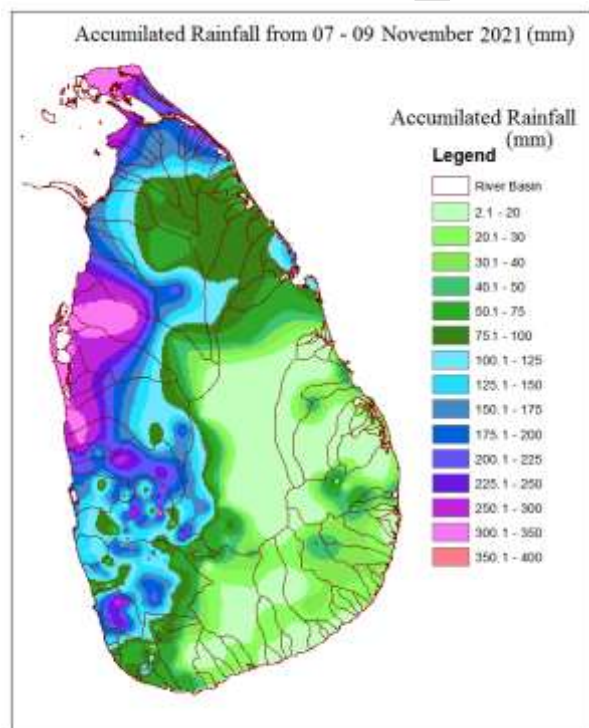


Fig 1: Accumulated rainfall (mm) from 0830am 07<sup>th</sup> November to 0830am 10<sup>th</sup> November 2021 and lightning stroke map (data from the lightning detection system donated by Chinese Government) from 07<sup>th</sup> to 10<sup>th</sup> November 2021.



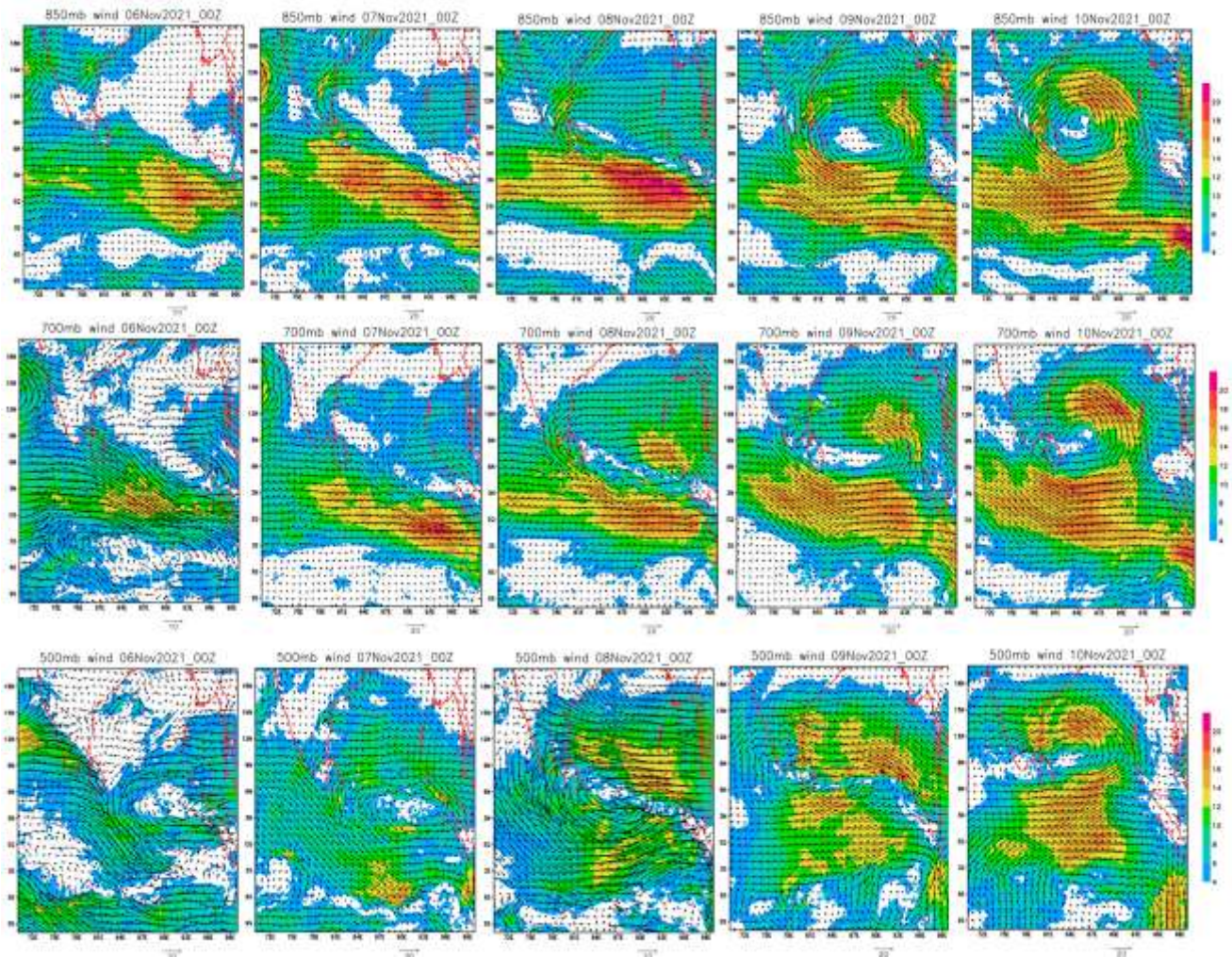


Fig 2: ECMWF 850 mb wind , 700 mb wind and 500 mb wind from 00z 06<sup>th</sup> to 10<sup>th</sup> November 2021

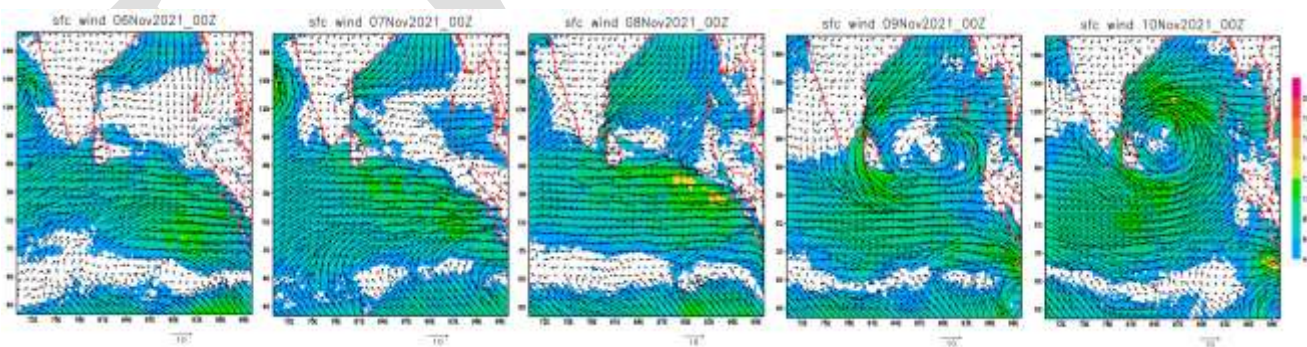


Fig 3: ECMWF 10m wind from 00z 06<sup>th</sup> to 10<sup>th</sup> November 2021

La Niña persisted during November, as indicated by well below-average sea surface temperatures (SSTs) extending from the Date Line to the eastern Pacific Ocean .Ocean Nino Index is -0.8 during September October and November and -1.0 during October, November and December (NOAA Climate prediction

Center). Neutral IOD condition was observed during November 2021 (BoM, Australia). Sea surface waters in tropical Indian Ocean are warmer than average (Fig. 8 ).

The average position of the shear line was laid between  $04^{\circ}\text{S}50^{\circ}\text{E}$ ,  $05^{\circ}\text{S}80^{\circ}\text{E}$  and  $03^{\circ}\text{S}120^{\circ}\text{E}$  . The average position of the Inter-Tropical Convergence zone (ITCZ) was laid between  $01^{\circ}\text{N}$  to  $05^{\circ}\text{N}$ , from  $50^{\circ}\text{E}$  to  $100^{\circ}\text{E}$  (Fig 7). Both shear line and ITCZ were fluctuated about  $2^{\circ} - 3^{\circ}$  north and south of their average position .

Madden-Julian Oscillation (MJO) was weak during the first week, became marginally strong (01 or closer to 1) at the phase 3, 4 and 5 during most of the remaining days (Fig. 9).

## **Weather Systems**

Under the influence of a cyclonic circulation over southeast and adjoining southwest Bay of Bengal, a low pressure area formed to the East of Sri Lanka over central parts of south BoB on 27<sup>th</sup> October, 2021. Moving westwards, it was crossed Sri Lanka on 31<sup>st</sup> and emerged into Comorin Area at morning of 1st November and into southeast Arabian Sea at the morning of 3<sup>rd</sup> November. The system moved north-northwestwards and lay as a well marked low pressure area over eastcentral Arabian Sea at the morning of 6<sup>th</sup> November. .

Under the influence of the cyclonic circulation over southeast Bay of Bengal & adjoining southwest Bay of Bengal, a low pressure area formed on 9<sup>th</sup> November 2021. Elongated zone of positive low level convergence lay over equatorial Indian Ocean and adjoining southeast Bay of Bengal together with large extended zone of positive upper level divergence over the same region provided favorable conditions to form this low pressure area, then to intensify into a well marked low pressure area over same region at morning hours of 10<sup>th</sup> November . It moved west-northwestwards and concentrated into a depression over southwest Bay of Bengal evening hours of 10<sup>th</sup> . Moving further northwestwards, it crossed north Tamil Nadu & adjoining south Andhra Pradesh coasts close to Chennai, on 12th November (Source : India Meteorological Department).

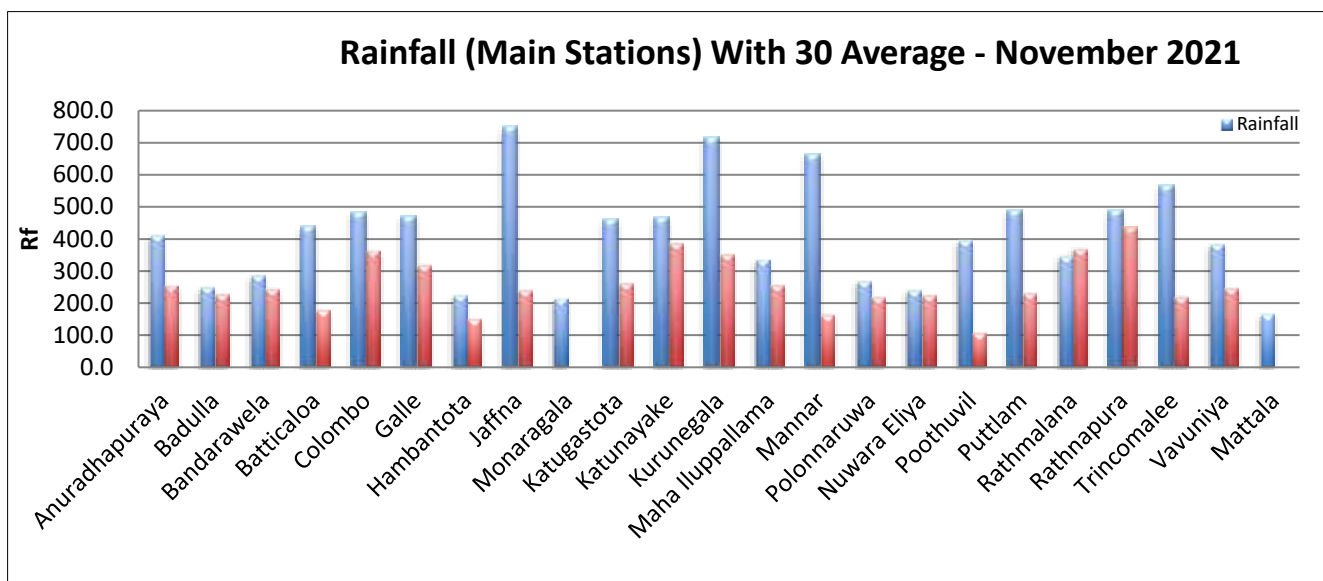


Fig 4: Monthly Total Rainfall(mm) with 30 years (1961-1990) of their averages at Main Meteorological stations areas during November 2021

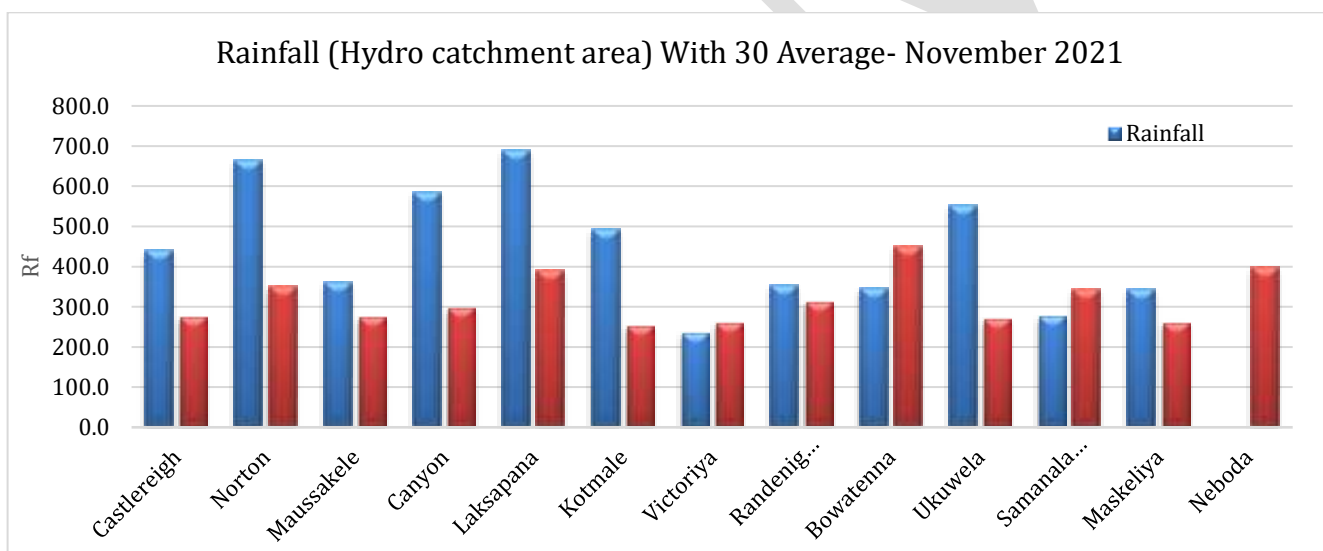


Fig 5: Monthly Total Rainfall (mm) with 30 years (1961-1990) of their averages at Hydro catchment areas during November 2021



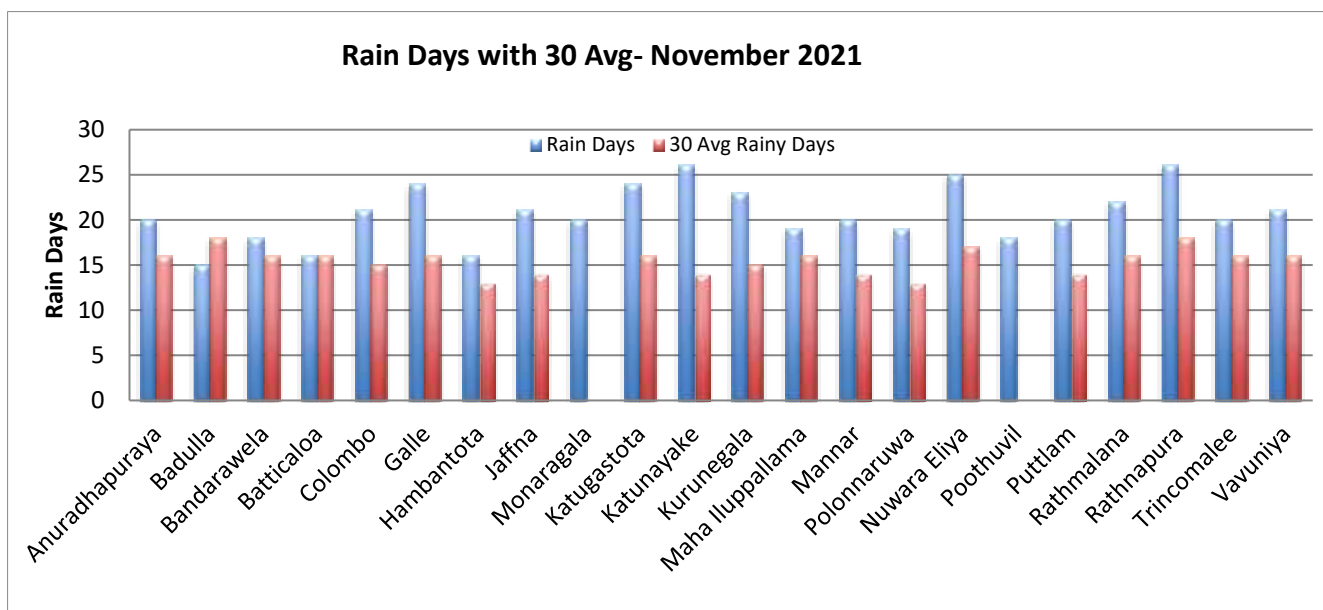


Fig 6: monthly total no of rainy days with 30 years (1961-1990) of their averages at main Meteorological stations during November 2021

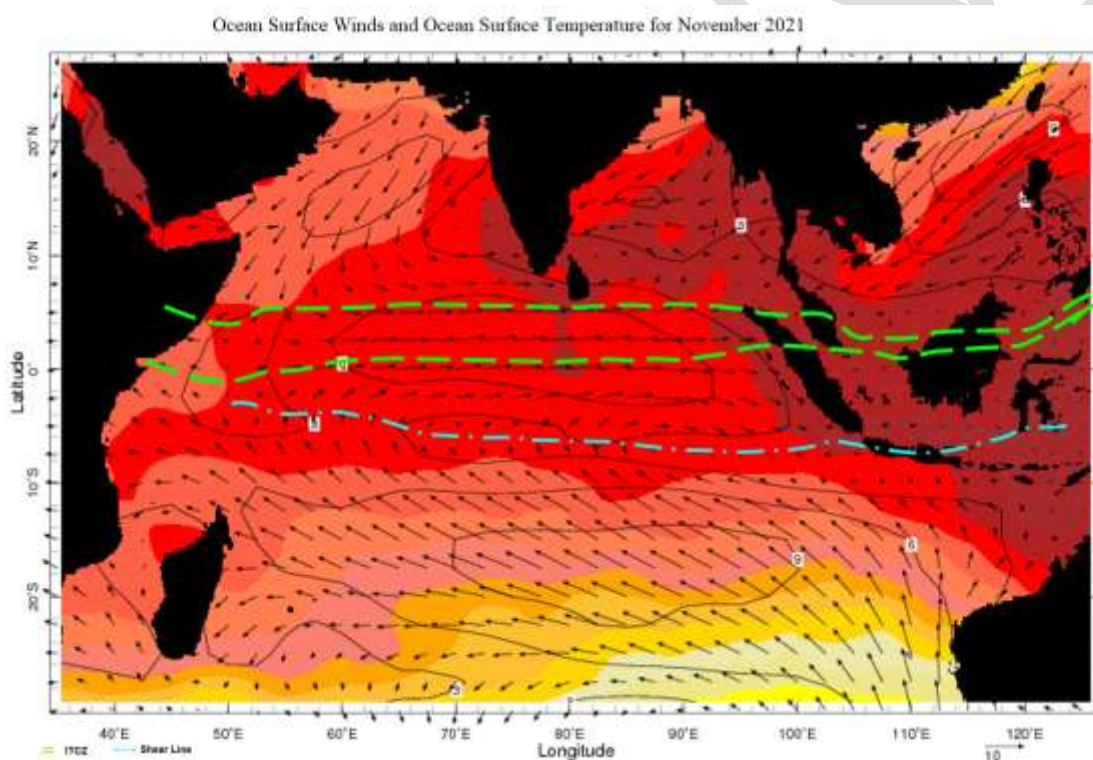


Fig 7: Ocean Surface Winds and Ocean Surface Temperature for November 2021

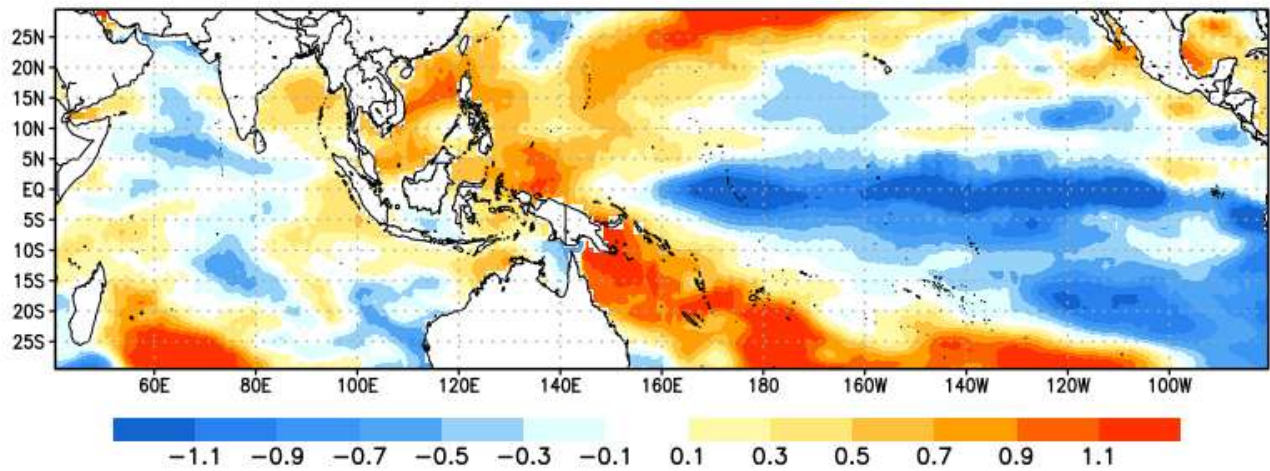


Fig 8: Sea Surface Temperature anomalies for November 2021

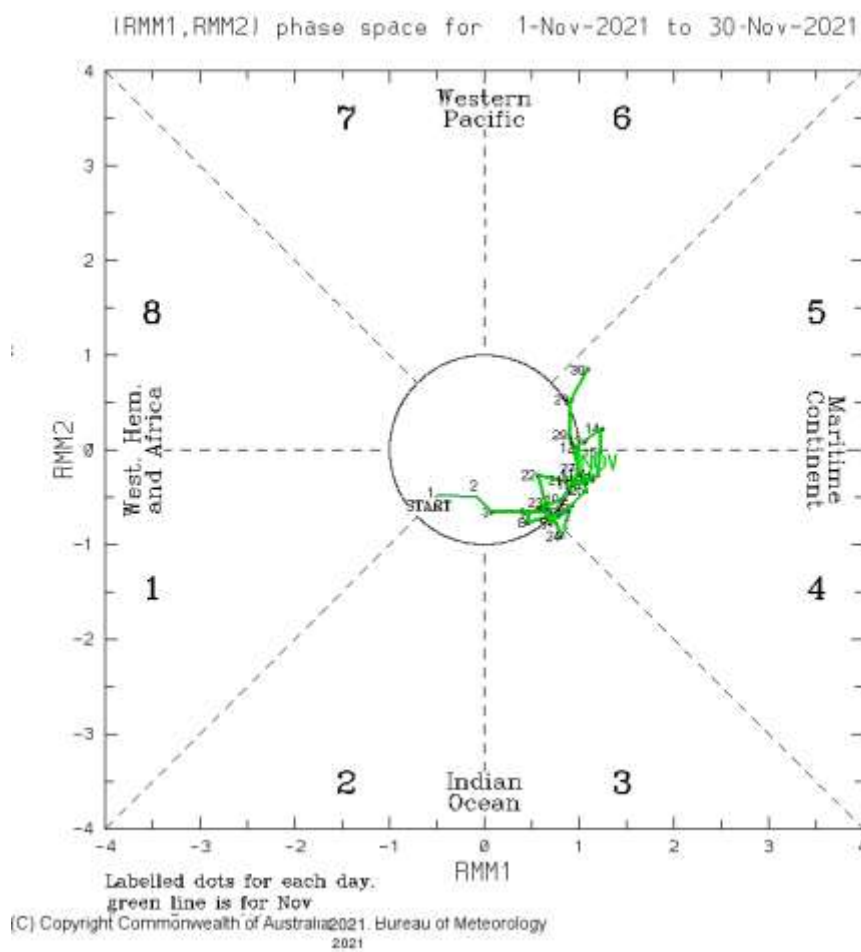


Fig 9: Phase diagram of MJO Index



**Surface pressure and winds:** The surface pressure was below average except from 04<sup>th</sup> to 05<sup>th</sup> and from 29<sup>th</sup> to 30<sup>th</sup> when it was above average. Mild pressure gradient was observed on 07<sup>th</sup>, from 11 to 15 and 17<sup>th</sup> to 20<sup>th</sup>. Moderate Pressure gradient was observed 05<sup>th</sup>, on 08<sup>th</sup>, on 10<sup>th</sup> on 16<sup>th</sup>. Pressure distribution was even or fairly even during remaining days of November.

The surface wind was calm and variable in direction during most of November month.

### Upper winds:

**At 850hPa,** Westerly wind flow is dominated over the island. Cyclonic circulation appeared to the northeast of Sri Lanka at 850mb level provided favorable conditions for cloud formation (Fig 10).

**At 700 hPa,** Cyclonic circulation embedded in East-west oriented trough is apparent over northern half of Sri Lanka at 700mb level providing favorable conditions for cloud formation (Fig 11).

**At 500 hPa,** Cyclonic circulation embedded in East-west oriented trough is apparent over Sri Lanka at 500mb level providing favorable conditions for cloud formation (Fig 12).

**The 200 hpa** the upper tropospheric ridge was laid about 12°N60°E, 18°N 80°E, 15°N100°E, and 14°N120°E .

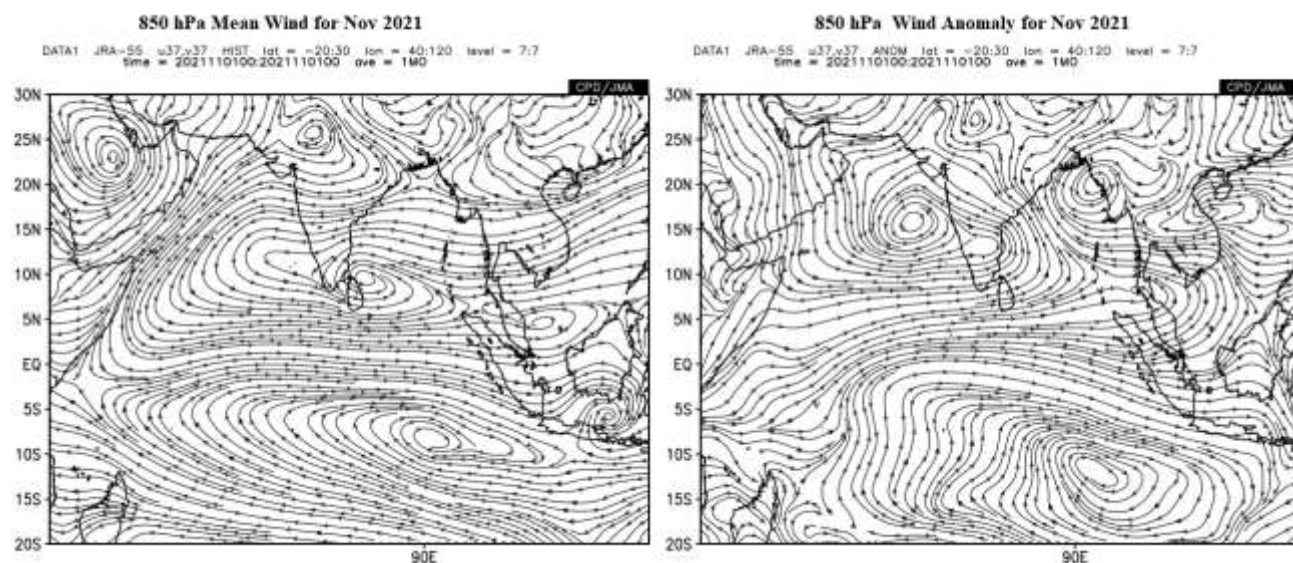


Fig. 10: Monthly average wind pattern at 850hpa level during the month of November2021 (JRA55)

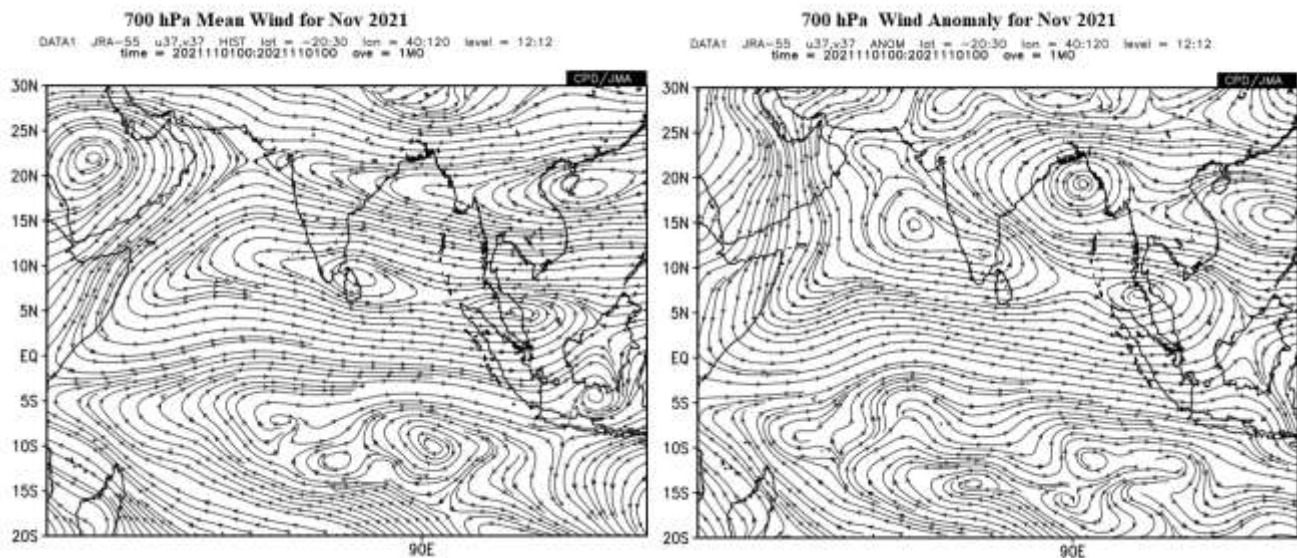


Fig. 11: Monthly average wind pattern at 700hpa level during the month of November 2021 (JRA55)

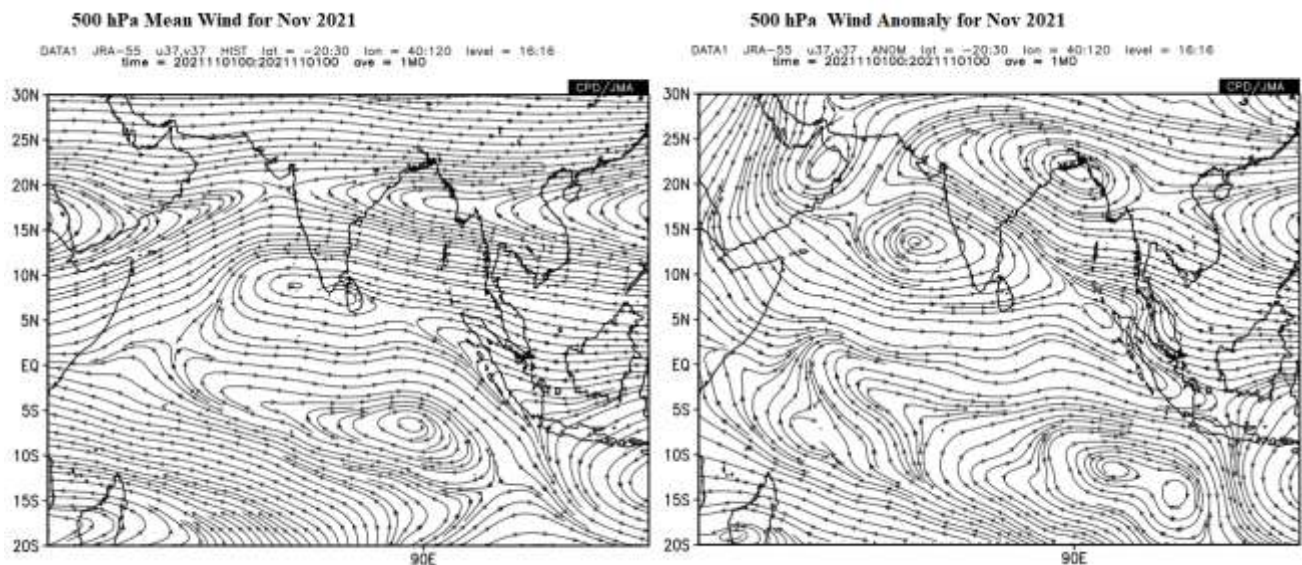


Fig. 12: Monthly average wind pattern at 500hpa level during the month of November 2021 (JRA55)

### Temperature Field:

The maximum temperatures as well as minimum temperatures were mostly above normal in most places during the month of November 2021 (Fig 13). However below normal maximum temperatures were reported at some places from 07<sup>th</sup> to 16<sup>th</sup> and from 24<sup>th</sup> to 27<sup>th</sup> of November. The highest recorded maximum temperature was 34.6<sup>0</sup>C at Ratnapura on 02<sup>nd</sup> November 2021 (Table4a)..

Above normal minimum temperatures were reported in most places during the month of November 2021 while some stations such as Tricomalee, Ratnapura, Badulla and Nuwara Eliya reported below

average minimum temperatures on 21<sup>st</sup> and 22<sup>nd</sup>(Fig 14). The lowest recorded minimum temperature was 10.8 °C at Nuwara Eliya on 13<sup>th</sup> for the month of November 2021 (Table 4b).

Maximum and Minimum departures from normal day/night temperature were shown in table 4.

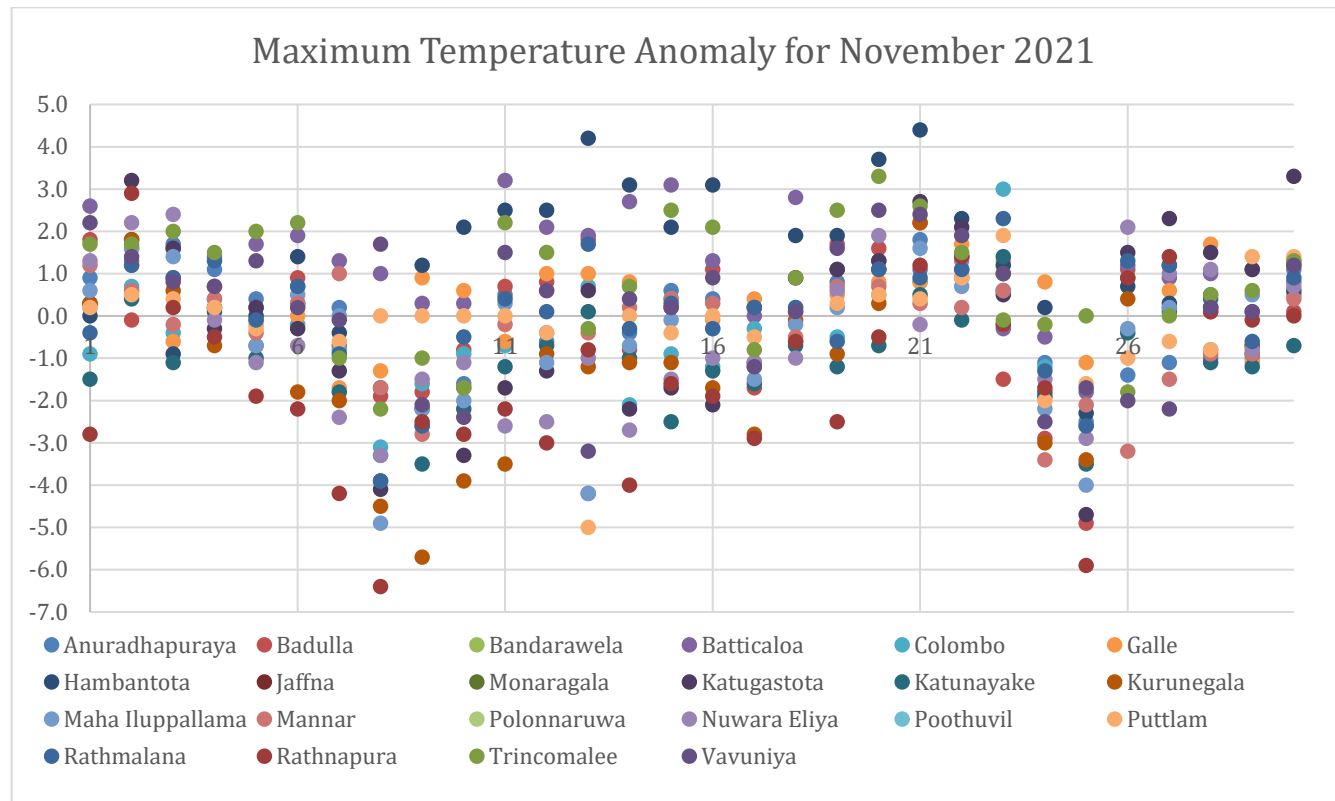


Fig 13 Maximum Temperature anomaly (°C) for November 2021

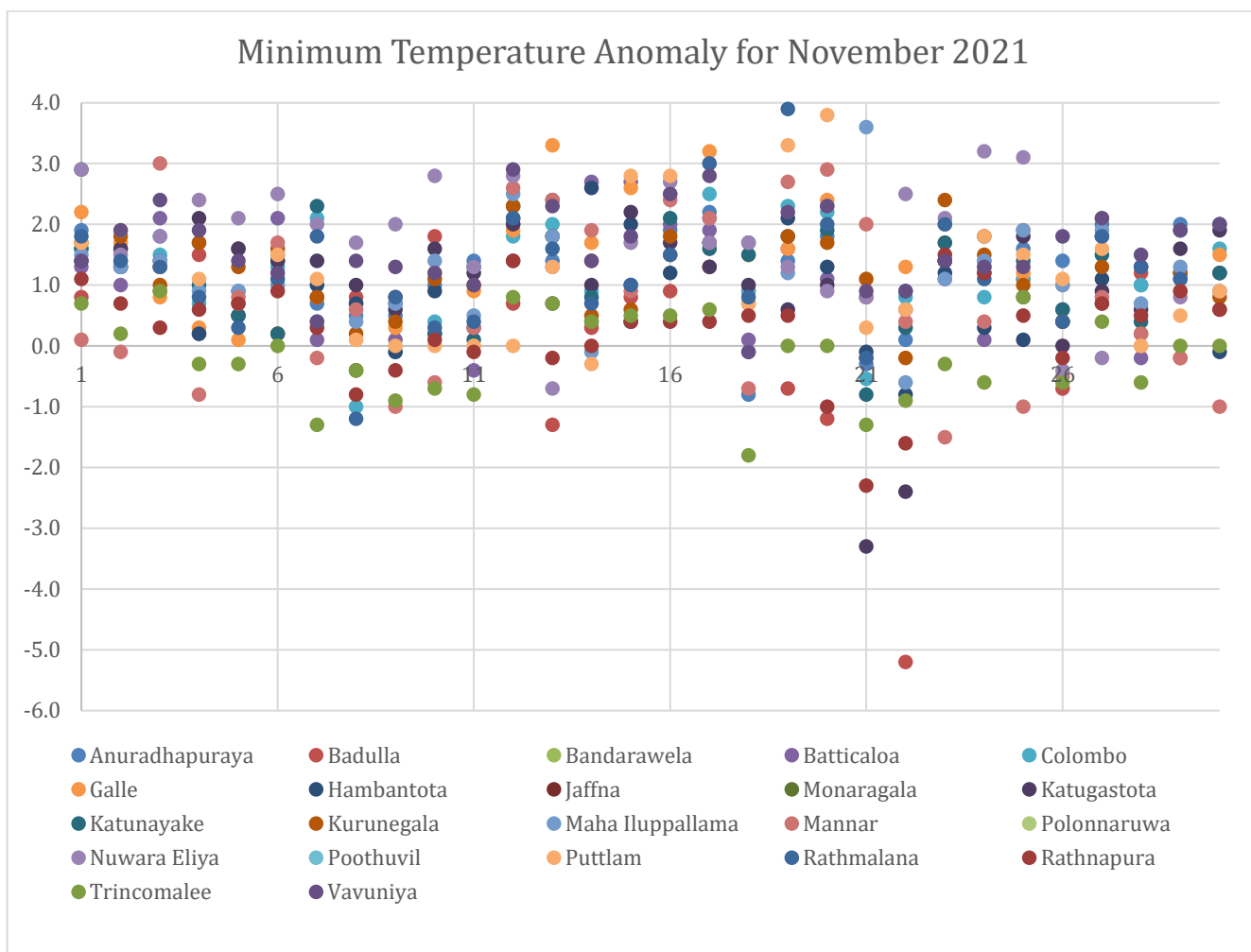


Fig 14 Minimum Temperature anomaly ( $^{\circ}\text{C}$ ) for November 2021

Above or about normal rainfall was reported at all of the principal meteorological stations for month of November (Fig 4). Maximum percentage was reported from Mannar (400.1%) while minimum from Ratmalana station (94.0%) (Table 2). Highest cumulative rainfall was 1518.1 mm at Norochcholai. Highest rainfall received during 24hours, was 351mm at Norochcholai on 08<sup>th</sup> November.

Above normal rainy days were also reported from most of the principal meteorological stations except Badulla.

Above normal rainfall was reported from most of the hydro catchment stations except Victoria where about normal rainfall was reported and Bowathenna and Samanawewa where below normal rainfall was reported.

The monthly total rainfall and the number of rain days at the principal meteorological stations, total rainfall at hydro catchment areas, are shown in tables 1 and 2.



Table 1 :The monthly total rainfall and the number of rain days at the principal meteorological stations

Meteorological station	Monthly Total rainfall(mm)			Monthly Total No of rainy Days		
	2021-Nov	Average	%	2021-Nov	Average	%
Anuradhapuraya	413.0	254.5	162.3%	20	16	125.0%
Badulla	251.6	230.4	109.2%	15	18	83.3%
Bandarawela	288.8	247.3	116.8%	18	16	112.5%
Batticaloa	439.5	180.0	244.2%	16	16	100.0%
Colombo	483.4	365.4	132.3%	21	15	140.0%
Galle	471.7	322.7	146.2%	24	16	150.0%
Hambantota	226.7	152.2	148.9%	16	13	123.1%
Jaffna	750.7	242.8	309.2%	21	14	150.0%
Monaragala	215.8			20		
Katugastota	461.3	263.7	174.9%	24	16	150.0%
Katunayake	467.8	389.7	120.0%	26	14	185.7%
Kurunegala	716.7	354.4	202.2%	23	15	153.3%
Maha Iluppallama	335.3	258.1	129.9%	19	16	118.8%
Mannar	665.0	166.2	400.1%	20	14	142.9%
Polonnaruwa	271.0	220.4	123.0%	19	13	146.2%
Nuwara Eliya	242.1	226.8	106.7%	25	17	147.1%
Pothuvil	398.4	109.6	363.5%	18	na	
Puttlam	488.5	232.1	210.5%	20	14	142.9%
Rathmalana	349.3	371.4	94.0%	22	16	137.5%
Rathnapura	487.4	436.8	111.6%	26	18	144.4%
Trincomalee	566.3	222.1	255.0%	20	16	125.0%
Vavuniya	385.9	248.4	155.4%	21	16	131.3%
Mattala	168.4			15		

Table-02-Monthly Total Rainfall (mm) with 30 years (1961-1990) of their averages at Hydro catchment areas

Hydro Catchment	Nov2021	Average	% (percentage of average)
Castlereigh	440.9	276.4	159.5%
Norton	664.0	350.5	189.4%
Maussakele	361.2	275.8	131.0%
Canyon	583.7	299.8	194.7%
Laksapana	689.1	390.6	176.4%
Kotmale	492.5	253.1	194.6%
Victoriya	237.9	261.8	90.9%
Randenigala	352.8	315.0	112.0%
Bowatenna	346.2	450.8	76.8%
Ukuwela	552.2	272.1	202.9%
Samanala Wewa	278.5	342.4	81.3%
Maskeliya	342.7	261.4	131.1%
Neboda		397.8	

Note that the meteorological day in this text is reckoned as the 24hr period from 08.30hrs to 08.30hrs following day

Table-02- total rainfall and the number of rain days at the principal meteorological stations recorded in the month against the respective averages (1961-1990).

Table 4(a) - Extremes of Maximum Temperatures			November	2021
	Maximum		Highest Std.Div	
	Value	Offsets		
		(-) (+)		
Value	34.6 <sup>0</sup> C	6.4	4.4	2.13
Station	Ratnapura	Anuradhapuraya	Hambantota	Ratnapura
Date	02/11	08/11	21/11	

Table 4(b) -Extremes of Minimum Temperature November 2021				
	Minimum		Highest Std.Div	
	Value	Offsets		
		(-) (+)		
Value	10.8C	5.2	3.9	1.36
Station	NuwaraEliya	Badulla	Ratmalana	Mannar
Date	13/11	22/11	19/11	

Prepared by National Meteorological Centre (NMC)

Department of Meteorology