Weather Synopsis –December 2021.

Below normal rainfall was reported at most of the principal meteorological stations except Galle, and Hambantota, where above normal rainfall was reported for month of December (Fig 2). Further below normal rainy days were reported from most of the principal meteorological stations except Badulla and Galle where above normal rainy days were reported and Jaffna, Polonnaruwa, Ratmalana, Ratnapura and Bandarawela where number rainy days reported was about normal (Fig 4) . Highest cumulative rainfall was 484.9mm at Batuwanagala in Galle district Highest rainfall received during 24hours, was 142 mm at Pannalgama on 12th December.

Below normal rainfall was reported from most of the hydro catchment stations except Norton, Canyon, Laxapana and Samanalawewa where above normal rainfall was reported (Fig 3).

Northeast monsoon was established around 14th December. Fairly widespread rainfall activity over northeastern, eastern and southeastern parts with isolated very heavy falls exceeding 100mm was reported from 12th to 17th . Mainly fair weather was reported from 25th to 28th .

The maximum temperatures were mostly above normal (Fig 11). Minimum temperatures over most parts were above normal during the month except from 23rd to 29th when below normal night temperatures were experienced over most parts of the island (Fig 12). Exceptionally below normal night temperatures were reported from Nuwara Elya on 25th and from 27th to 29th (Fig 12). Ground frost also reported at some places in Nuwara Eliya from 25th to 29th . Highest recorded maximum temperature was 34.0^{0}C at Ratnapura on 29th and Lowest recorded minimum temperature was 4.2^{0}C at Nuwara Eliya on 27th.

La Niña persisted during December, 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 December 2021 (BoM, Australia). Sea surface waters in tropical Indian Ocean are warmer than average (Fig. 6)

Two shearlines were appeared with ITCZ in between them. The average position of the shear line in north Indian Ocean was laid between Equator 02^0S50^0E, $EQ60^0E$, 03^0N70^0E , 04^0N90^0E, 01^0N100^0E and 04^0N120^0E while the average position of the shear line in south Indian Ocean was laid between 07^0S60^0E, 07^0S80^0E , 07^0S90^0E, 10^0S100^0E, and 18^0S120^0E. The average position of the Inter-Tropical Convergence zone (ITCZ) was laid between 05^0S50^0E, 03^0S80^0E, 03^0S100^0E and 05^0S120^0E (Fig 5).

Madden-Julian Oscillation (MJO) was weak during the first week, became strong at the phase 5 during the second week, and weaken during the last two week of December (Fig.7).

Weather Systems

A Low Pressure Area formed over South Thailand on 30th November emerged into central parts of Andaman Sea . It was further developed into a well marked low pressure area over southeast Bay of Bengal on 2nd December morning and concentrated into a depression over southeast Bay of Bengal in the same evening. Moving north-northwestwards, it concentrated into a deep depression over west central Bay of Bengal in the morning of 3rd December then intensified further into the Cyclonic Storm "JAWAD" in the forenoon of 3rd December. It moved north-northeastwards till morning of 4th December. Thereafter, the system started recurving along the western periphery of the anticyclone over Myanmar region. It moved northwards till evening of 4th and weakened into a deep depression over westcentral Bay of Bengal at evening of 4th December. Thereafter, it moved north-northeastwards (Fig 1) and reached very close to Odisha coast, in the afternoon of 5th December and moved northeastwards and weakened into a well marked low pressure area over northwest Bay of Bengal and adjoining West Bengal & Bangladesh coasts in the morning of 6th December and into a low pressure area over the same region in the forenoon of 6th December, 2021 (Source : India Meteorological Department).

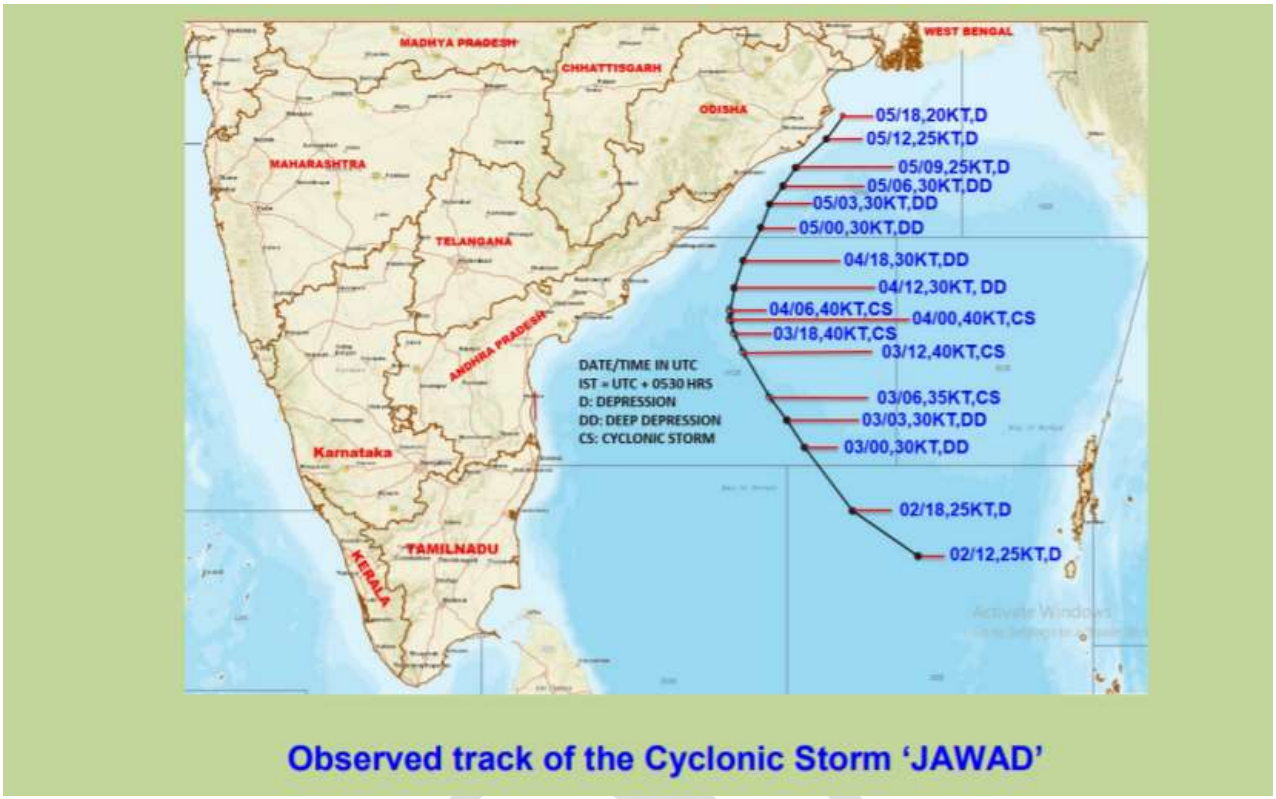

Fig1: Observed track of the Cyclonic storm "JAWAD" 2021 (Source: India Meteorological Department).

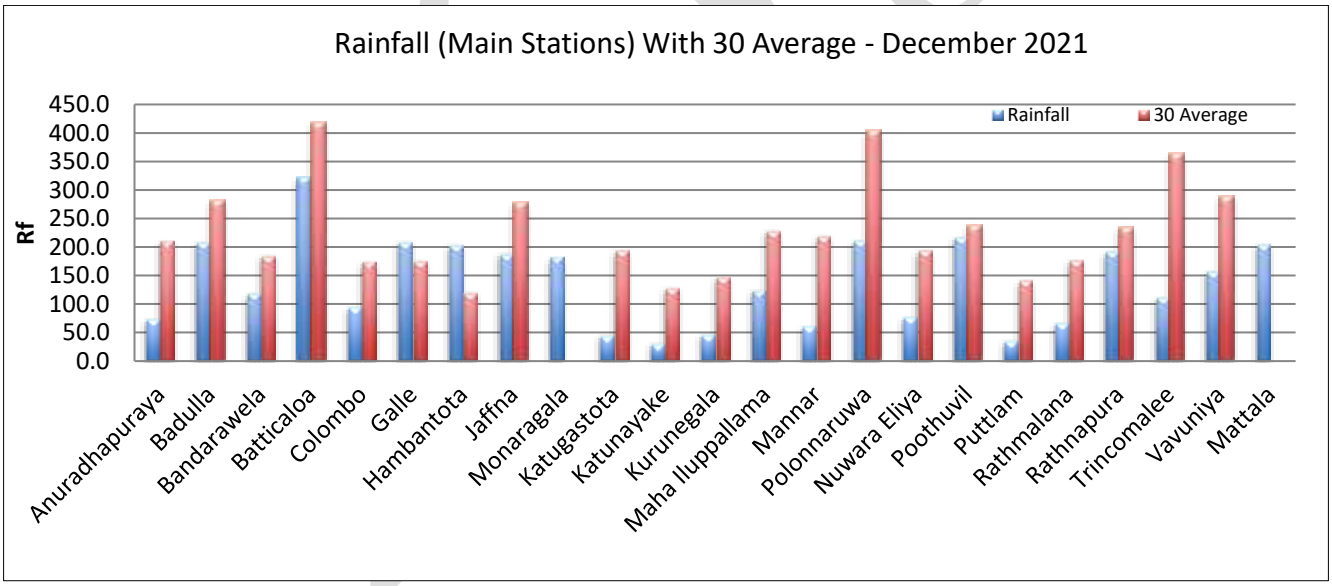

Fig 2: Monthly Total Rainfall (mm) with 30 year average (1961-1990) at Main Meteorological stations areas during December 2021

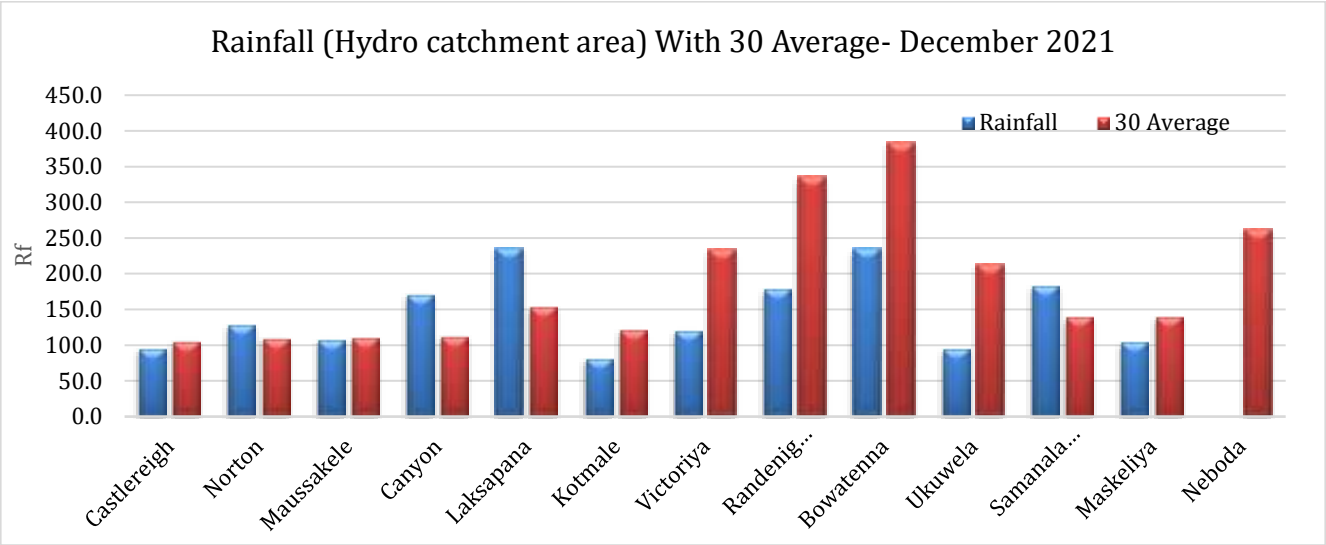

Fig 3: Monthly Total Rainfall (mm) with 30 year average (1961-1990) at Hydro catchment areas during December 2021

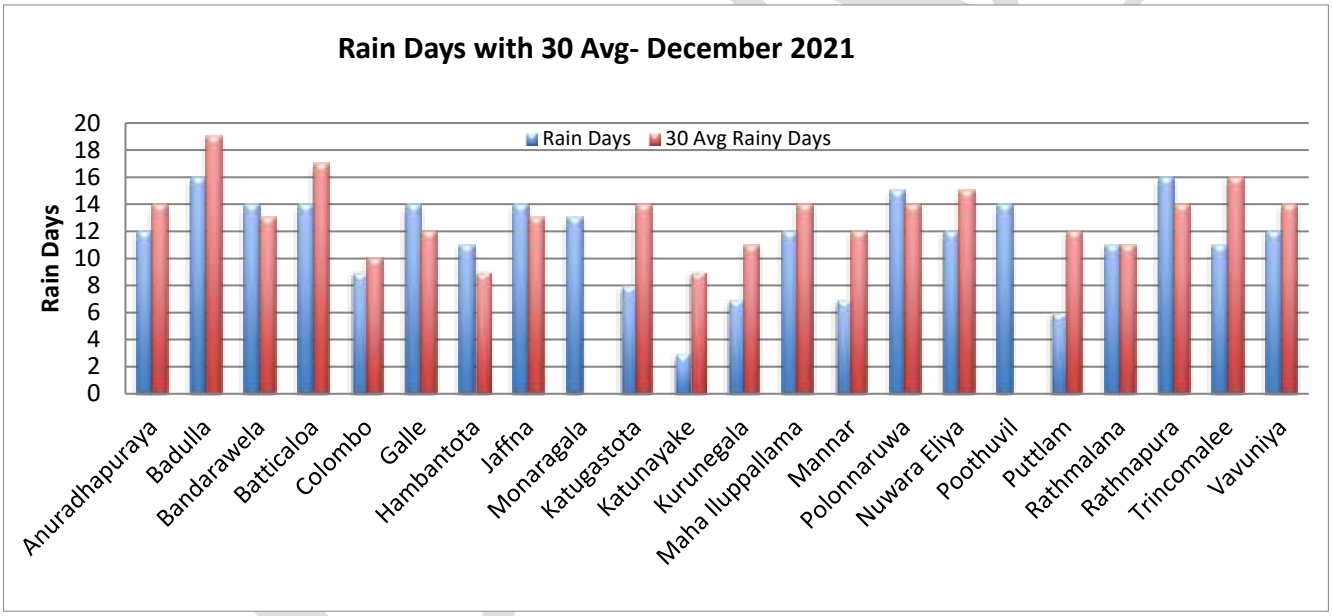

Fig 4: monthly total number of rainy days with 30 year average (1961-1990) at main Meteorological stations during December 2021

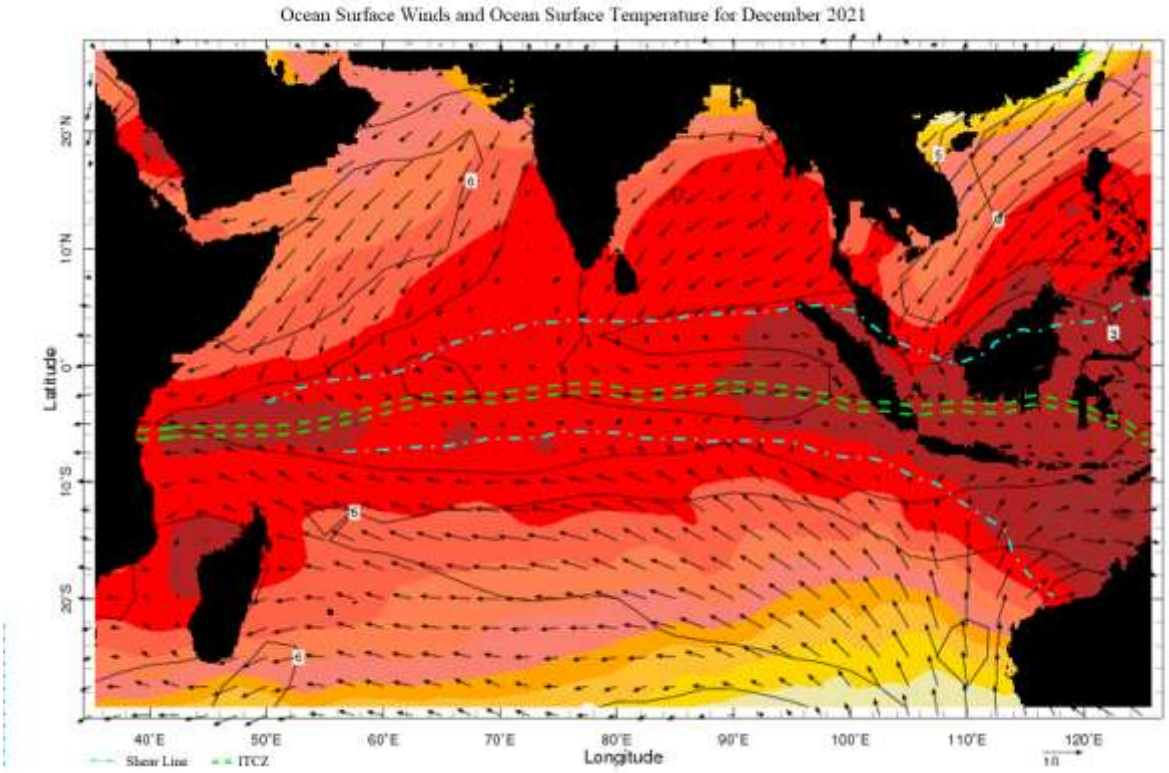

Fig 5: Ocean Surface Winds and Ocean Surface Temperature for December 2021

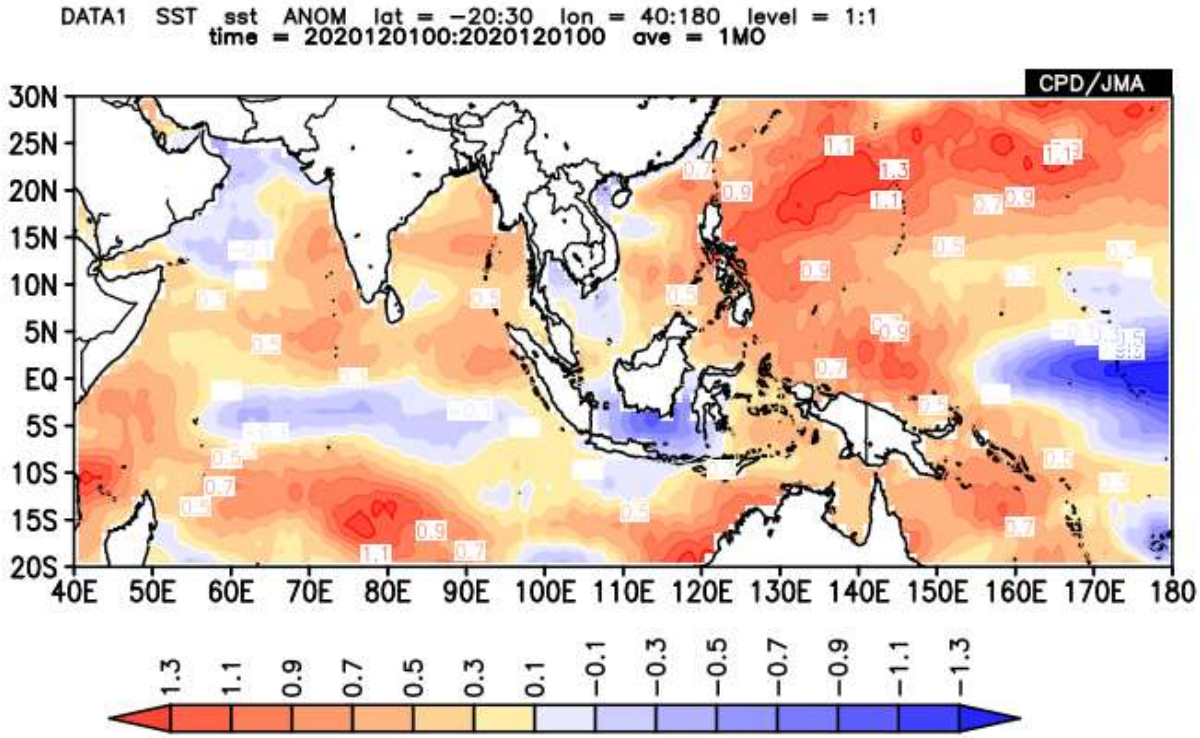

Fig 6: Sea Surface Temperature anomalies for December 2021

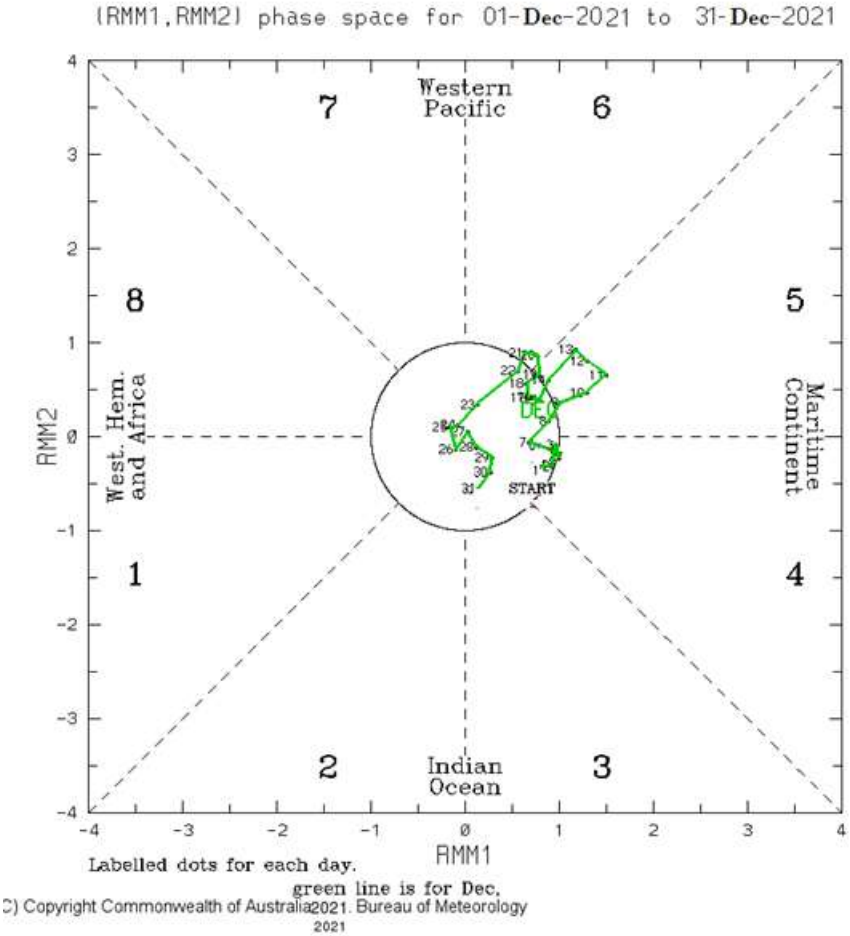

Fig 7: Phase diagram of MJO Index

Surface pressure and winds: The surface pressure was above average except from 01st to 03rd and on 06th , on 08th and from 14 to 15th when it was about or below average. Pressure distribution was even or fairly even during most of December except on 14th when mild pressure gradient was observed. The surface wind was Northeasterly in direction during most of month of December.

Upper winds:

At 850hPa, Northeasterly wind flow is dominated over the island. Anomalous anti-cyclonic circulation appeared over east of Sri Lanka at 850mb level provided necessary conditions for reduction in Rainfall (Fig 8).

At 700 hPa, Northeasterly wind flow is dominated over the island. Anomalous northeast-southwest oriented ridge is appeared across Sri Lanka provided necessary conditions for reduction in Rainfall (Fig 9).

At 500 hPa, Northeasterly wind flow is dominated over the island. Anomalous northwesterly flow appeared across Sri Lanka at 500mb level (Fig 10).

The 200 hpa the upper tropospheric ridge was laid from 06^0S40^0E, EQ70^0E, 09^0N80^0E, and 14^0N120^0E

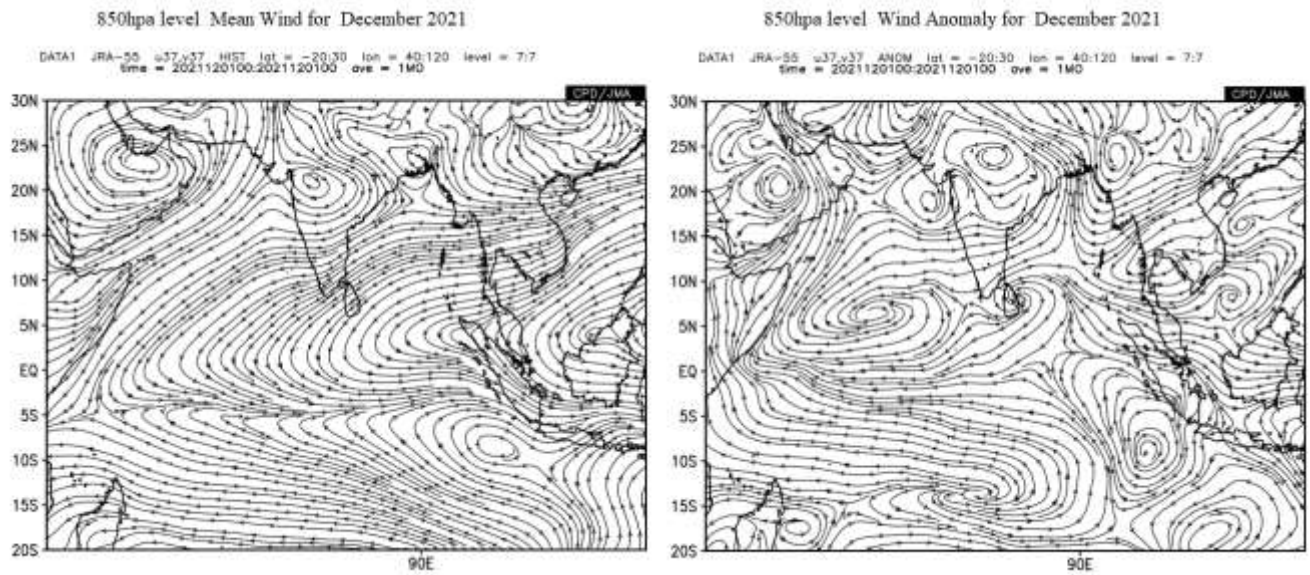

Fig. 8 Monthly average wind pattern at 850hpa level during the month of December 2021 (JRA55)

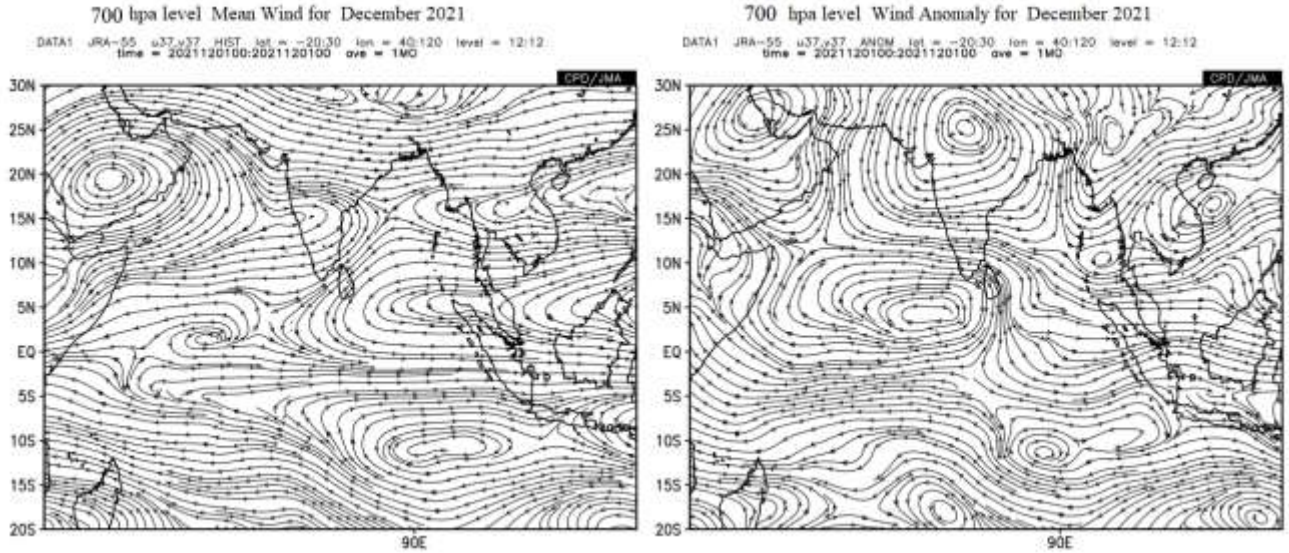

Fig. 9 Monthly average wind pattern at 700hpa level during the month of December 2021 (JRA55)

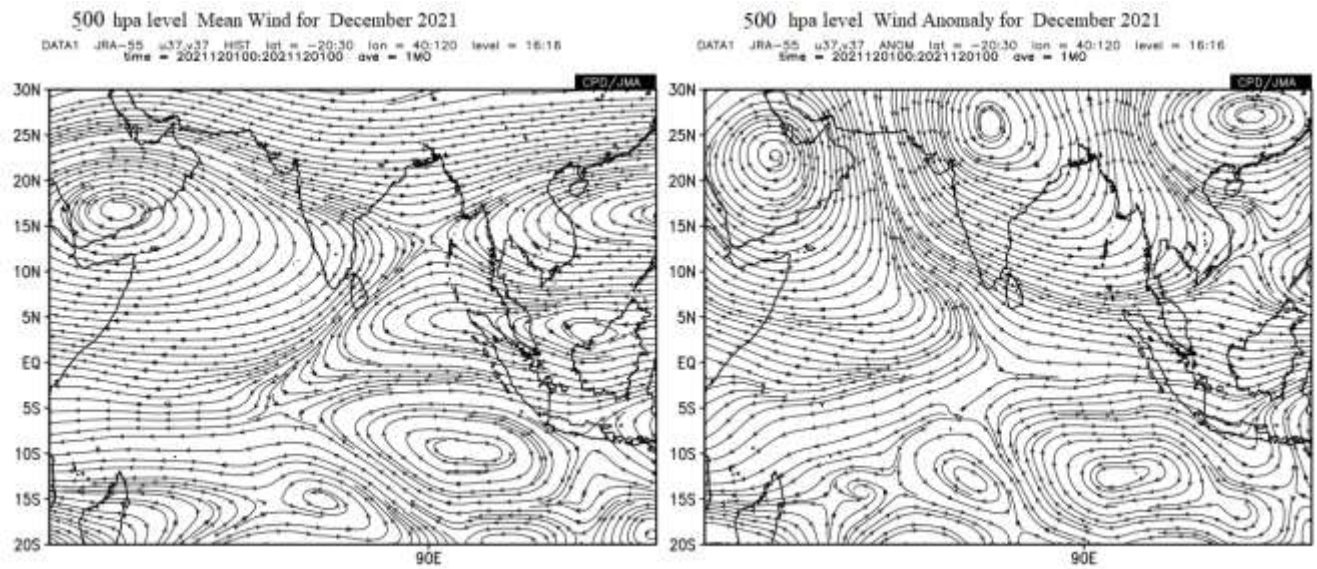

Fig. 10 Monthly average wind pattern at 500hpa level during the month of December 2021 (JRA55)

Temperature Field:

The maximum temperatures were mostly above normal. 3^0C to 4^0C above normal day temperatures were reported in Katugastota during first 12 days (Fig 11). Below normal maximum temperature were reported at some places from 13th to 18th, during the onset of Northeast Monsoon. Highest recorded maximum temperature for the month of December 2021 was 34.0^0C at Ratnapura on 29th (Table 3a).

Minimum temperatures over most parts were above normal during the month except from 23rd to 29th when below normal night temperatures were experienced over most parts of the island. Exceptionally below normal night temperatures were reported from Nuwara Elya on 25th and from 27th to 29th (Fig.12). Lowest recorded minimum temperature was 4.2^0C at Nuwara Eliya on 27th (Table 3b).

Maximum and Minimum departures from normal day/night temperature were shown in table 3.

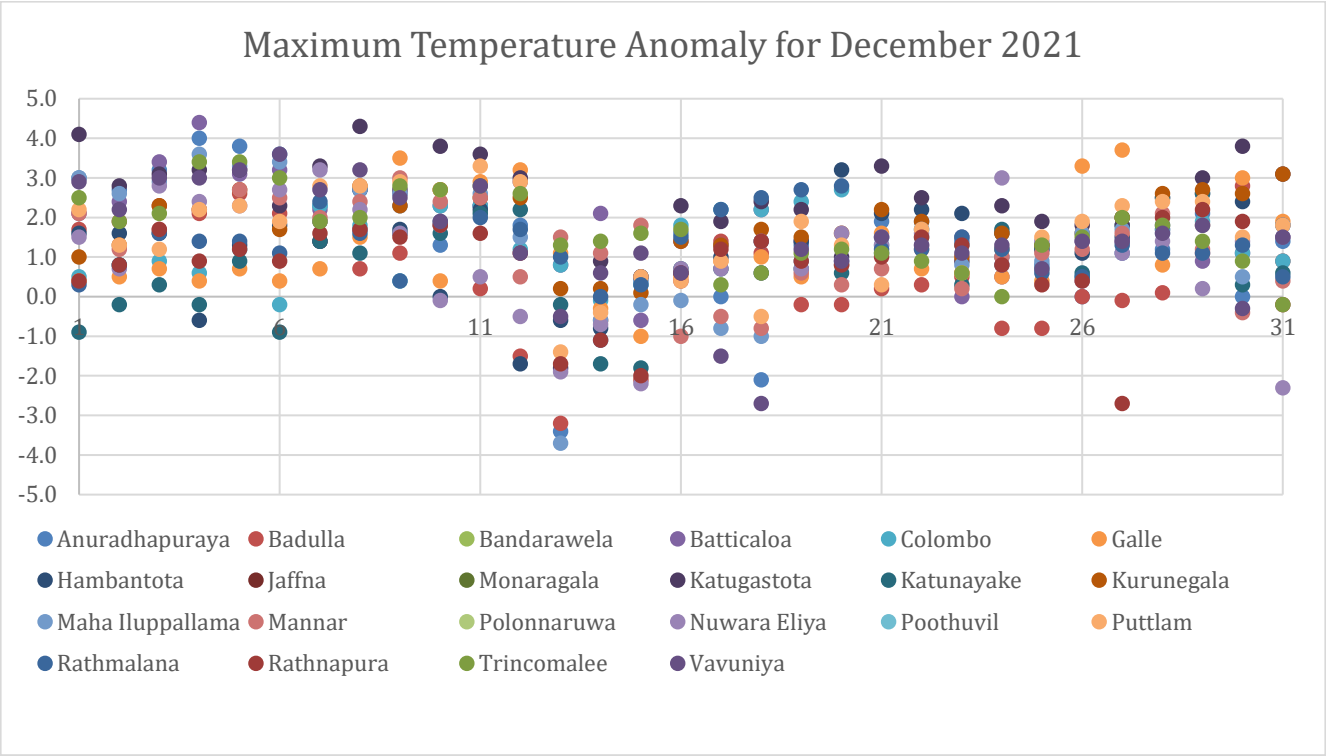

Fig 11 Maximum Temperature anomaly (^{0}C) for December 2021

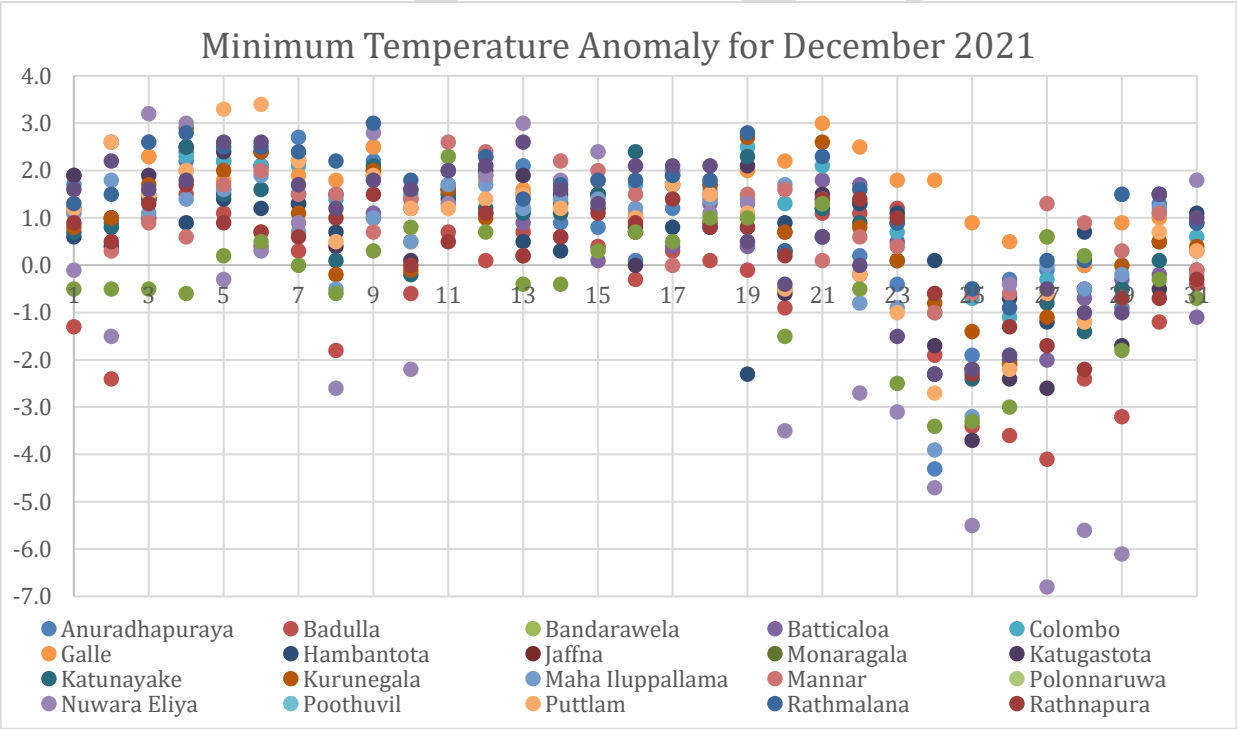

Fig 12 Minimum Temperature anomaly (^{0}C) for December 2021

Below normal rainfall was reported at most of the principal meteorological stations except Galle, and Hambantota, where above normal rainfall was reported for month of December (Fig 1). Maximum percentage was reported from Hambantota (169.3%) while minimum from Katugastota station (23.7%) (Table 2). Below normal rainy days were also reported from most of the principal meteorological stations except Badulla and Galle where above normal rainy days were reported and Jaffna, Polonnaruwa, Ratmalana, Ratnapura and Bandarawela where number rainy days reported was about normal . Highest cumulative rainfall was 484.9mm at Batuwanagala in Galle district Highest rainfall received during 24hours, was 142 mm at Pannalgama on 12th December.

Below normal rainfall was reported from most of the hydro catchment stations except Norton, Canyon, Laxapana and Samanalawewa where above normal rainfall was reported (Fig 2).

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 1and 2.

Table-01-Monthly Total Rainfall (mm) with 30 years (1961-1990) of their averages at Hydro catchment areas

Hydro Catchment	Dec 2021	Average	% (percentage of average)
Castlereigh	96.0	105.9	90.6%
Norton	129.2	110.0	117.5%
Maussakele	108.1	110.2	98.1%
Canyon	171.6	113.1	151.8%
Laksapana	236.3	154.5	153.0%
Kotmale	81.7	121.5	67.3%
Victoriya	121.0	233.8	51.8%
Randenigala	179.6	335.9	53.5%
Bowatenna	235.6	383.8	61.4%
Ukuwela	95.7	212.9	45.0%
Samanala Wewa	183.5	140.2	130.9%
Maskeliya	105.4	140.4	75.1%
Neboda		261.8	

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

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

	Monthly Total rainfall(mm)			Monthly Total No of rainy Days		
Meteorological station	2021-Dec	Average	%	2021-Dec	Average	%
Anuradhapuraya	74.9	210.9	35.5%	12	14	85.7%
Badulla	209.8	281.5	74.5%	16	19	84.2%
Bandarawela	120.0	186.2	64.4%	14	13	107.7%
Batticaloa	322.7	418.5	77.1%	14	17	82.4%
Colombo	95.6	175.3	54.5%	9	10	90.0%
Galle	210.6	176.9	119.1%	14	12	116.7%
Hambantota	205.0	121.1	169.3%	11	9	122.2%
Jaffna	189.6	278.2	68.2%	14	13	107.7%
Monaragala	183.6			13		
Katugastota	46.3	195.7	23.7%	8	14	57.1%
Katunayake	31.7	129.7	24.4%	3	9	33.3%
Kurunegala	47.7	149.0	32.0%	7	11	63.6%
Maha Iluppallama	124.7	230.0	54.2%	12	14	85.7%
Mannar	62.6	221.2	28.3%	7	12	58.3%
Polonnaruwa	213.4	404.2	52.8%	15	14	107.1%
Nuwara Eliya	78.6	196.0	40.1%	12	15	80.0%
Poothuvil	218.9	237.1	92.3%	14	na	#VALUE!
Puttlam	37.3	142.7	26.1%	6	12	50.0%
Rathmalana	68.2	177.8	38.4%	11	11	100.0%
Rathnapura	193.7	235.3	82.3%	16	14	114.3%
Trincomalee	113.2	364.5	31.1%	11	16	68.8%
Vavuniya	158.8	289.6	54.8%	12	14	85.7%
Mattala	206.4			12		

Table 3(a) - Extremes of Maximum Temperatures December 2021				
	Maximum			Highest Std.Div
	Value	Offsets (-)	Offsets (+)	
Value	34.0^{0}C	3.7	4.4	5.49
Station	Ratnapura	Maha Iluppallama	Batticoloa	Mulaitiv
Date	29/12	13/12	04/12	

Table 3(b) -Extremes of Minimum Temperature December 2021				
	Minimum			Highest Std.Div
	Value	Offsets (-)	Offsets (+)	
Value	4.2^{0}C	6.8	3.4	3.02
Station	NuwaraEliya	NuwaraEliya	Puttalum	NuwaraEliya
Date	27/12	27/12	06/12	

Prepared by National Meteorological Centre (NMC)

Department of Meteorology