

Note: Nino3.4: ENSO Index, SOI: Southern Oscillation Index, NAO: North Atlantic Oscillation. AO: Arctic Oscillation, AMO: Atlantic Multi-decadal Oscillation, PDO: Pacific Decadal Oscillation, IOD: Indian Ocean Dipole.

It is interesting to note that the frequency of easterly waves over the Bay of Bengal during the NE monsoon season has a statistically significant correlation with Nino 3.4 and SOI. This indicates, during the El Nino years, frequency of easterly waves is enhanced, which might lead to more seasonal rainfall over the south peninsula. The relationship between the ENSO and seasonal rainfall is discussed in detail later in the chapter on the NE monsoon variability. The seasonal rainfall is positively correlated with the Nino 3.4 index. It is also interesting to note that Pacific Decadal Oscillation (PDO) plays a positive role in enhancing the frequency of easterly waves. The positive phase of the Indian Ocean Dipole (IOD) leads to more troughs and upper air circulations over south peninsula which also contribute to the seasonal rainfall.

A brief description of various synoptic systems forming during the NE monsoon season is given below with an example, just for illustration. It may be noted that the characteristics of these synoptic systems may show large variability.

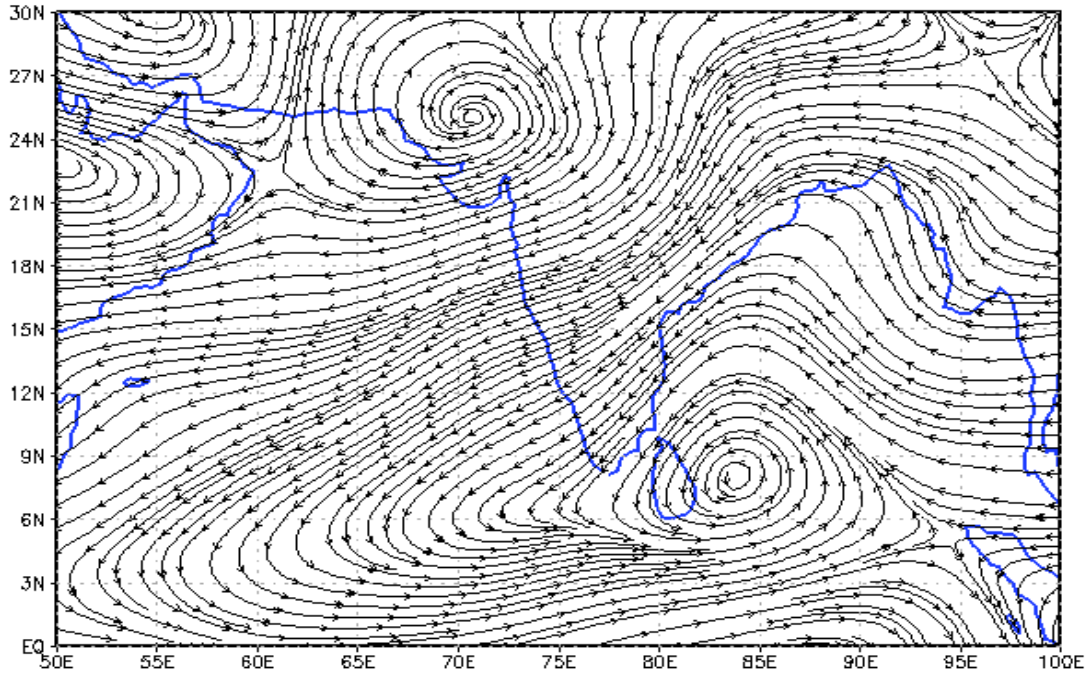
4.1. Trough of low over the Southwest Bay of Bengal (30 Oct - 05 Nov 2018)

An example of a trough of low pressure that formed over the Southwest Bay of Bengal is discussed below.

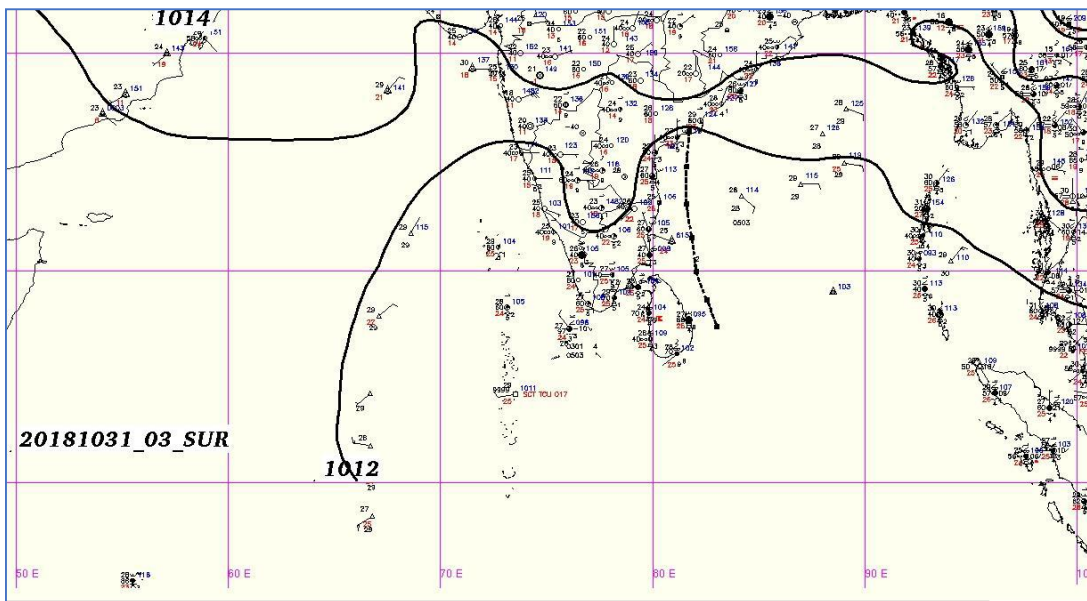
A low-level cyclonic circulation was prevailing over the southwest BOB and adjoining Sri Lanka during 27-31 Oct and trough of low at mean sea level extending from this circulation from southwest - west central BOB off TN / south CAP / Sri Lanka coast during 30 Oct - 05 Nov. Fig. 4.1. shows the different aspects of the trough of low which formed over the Southwest Bay, including satellite images and rainfall associated with the system. The average rainfall is taken from the IMD/NCMRWF merged satellite (GPM)-rain gauge dataset. The streamline pattern and mean sea level pressure chart are taken from the archives of IMD. These plot shows a north-south trough over the

southwest Bay of Bengal and adjoining Tamil Nadu coast. This trough is observed on the sea level also. The presence of this trough had caused extensive rainfall off the coasts of Tamil Nadu and Sri Lanka (Fig. 4.1 c).

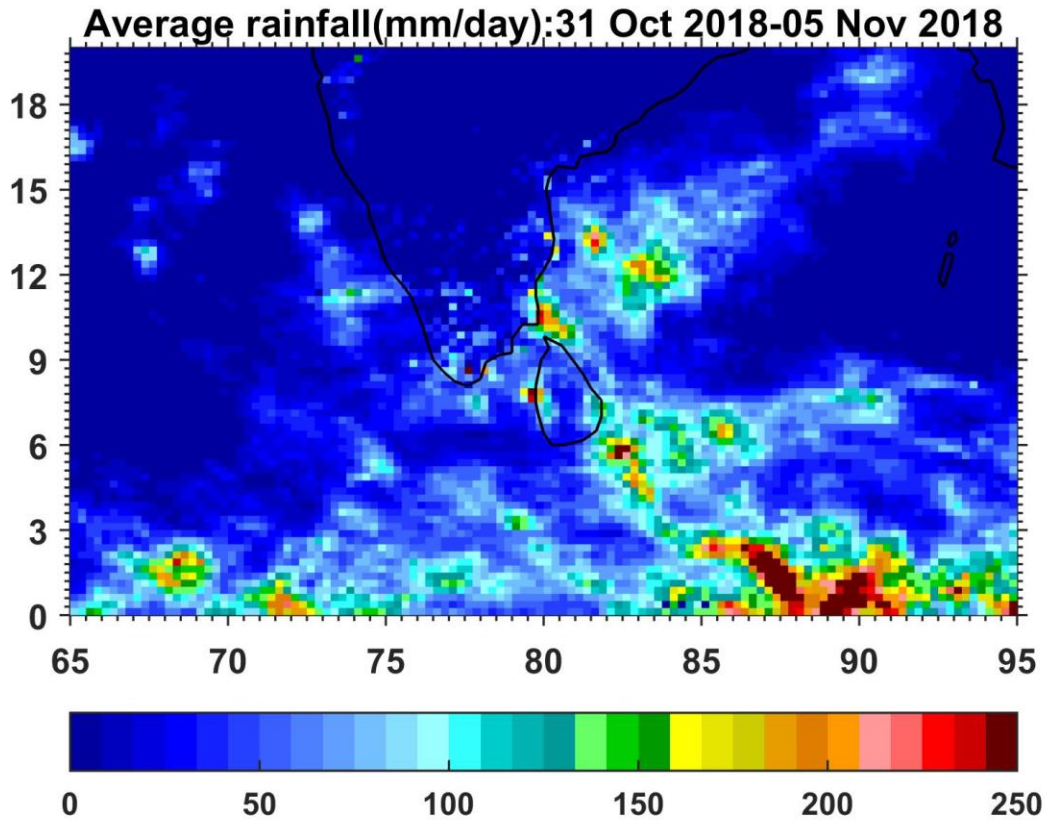
850 hPa Streamline pattern
26–30 Oct 2018



(a)



(b)



(C)

Fig. 4.1. a) 850 hPa streamline analysis during 26-30 Oct, 2018 b) Isobaric analysis on 31 Oct, 2018 and c) average rainfall (mm/day) during 31 Oct to 05 Nov, 2018.

4.2. Upper air east-west trough

During the NE Monsoon season, occurrence of an east-west trough across the south peninsula is very common. This could be associated with the presence of ITCZ over the region. One good example of the east-west trough is shown in Fig. 4.2 a-c. During 14-16 Nov 2021, an east-west trough was present passing across the south peninsula. The east-west trough provides large scale convergence and associated rainfall activity over the region, as seen in the vertical velocity (ω) shown in Fig. 4.2 b. Associated with this east-west trough large scale rainfall activity was observed over the south Peninsula and the Arabian sea.