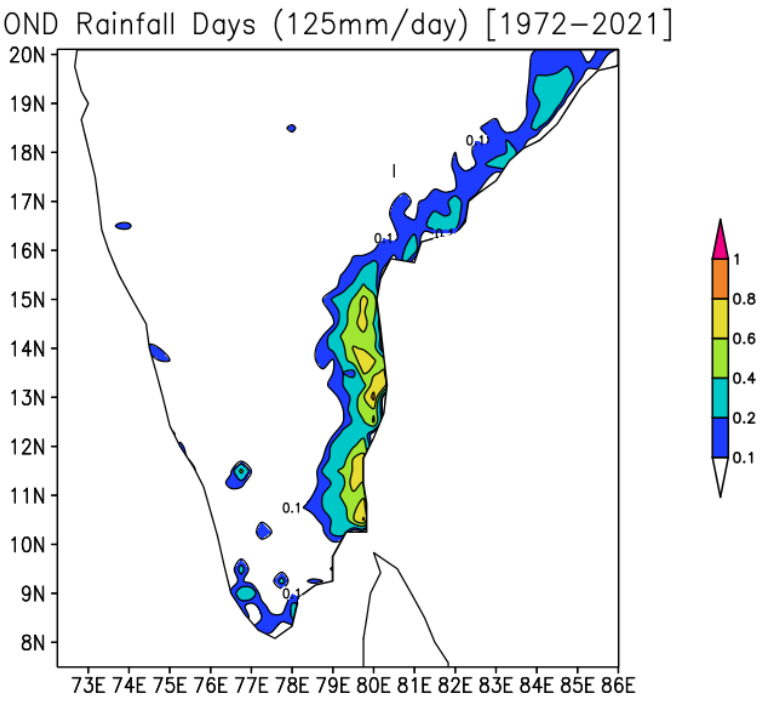


Fig. 3.7. Mean in rainfall days with more than 125 mm/day (Period: 1972-2021).

### 3.5. **Maximum Probable frequency of heavy rainfall**

Fig. 3.8 shows the maximum probable frequency of heavy rainfall (between 65 and 124 mm) during October to December calculated using data from 1951-2019. This map was taken from the IMD Climate Hazards and Vulnerability Atlas of India, 2022. A maximum probability of more than 7 days can be expected over the east-coast of Tamil Nadu and Southern parts of Kerala and Tamil Nadu. Over the interior parts of the south Peninsula, the maximum probability lies between 3-4 days.

Fig. 3.9 shows the maximum probable frequency of heavy, very heavy and extreme heavy rainfall (number of days) during the NE monsoon season (Oct-Dec). Over the east coast of north Tamil Nadu, South Coastal Andhra Pradesh and southern most districts of Tamil Nadu and Kerala, the maximum probable frequency is more than 15 days. Over other parts of coastal Pradesh, Tamil Nadu and south Kerala, the maximum probable frequency is between 10-14. Over interior parts of the south Peninsula, this number varies between 5-10 days.

Fig. 3.10. shows the maximum probable frequency of very heavy and extreme heavy rainfall (number of days) during the season. Over the eastern coast of north Tamil Nadu, south coastal Andhra Pradesh and southern most parts of Tamil Nadu and Kerala, the maximum probable frequency of very heavy and extreme rainfall is between 5 and 11 days. Over the interior parts of the south Peninsula, this number varies between 1 and 4.

Thus, the eastern coast of north Tamil Nadu and south coastal Andhra Pradesh is the region, with maximum probable frequency of heavy rainfall days during the NE monsoon season. Southern parts of Tamil Nadu and Kerala also have similar maximum probable frequency.

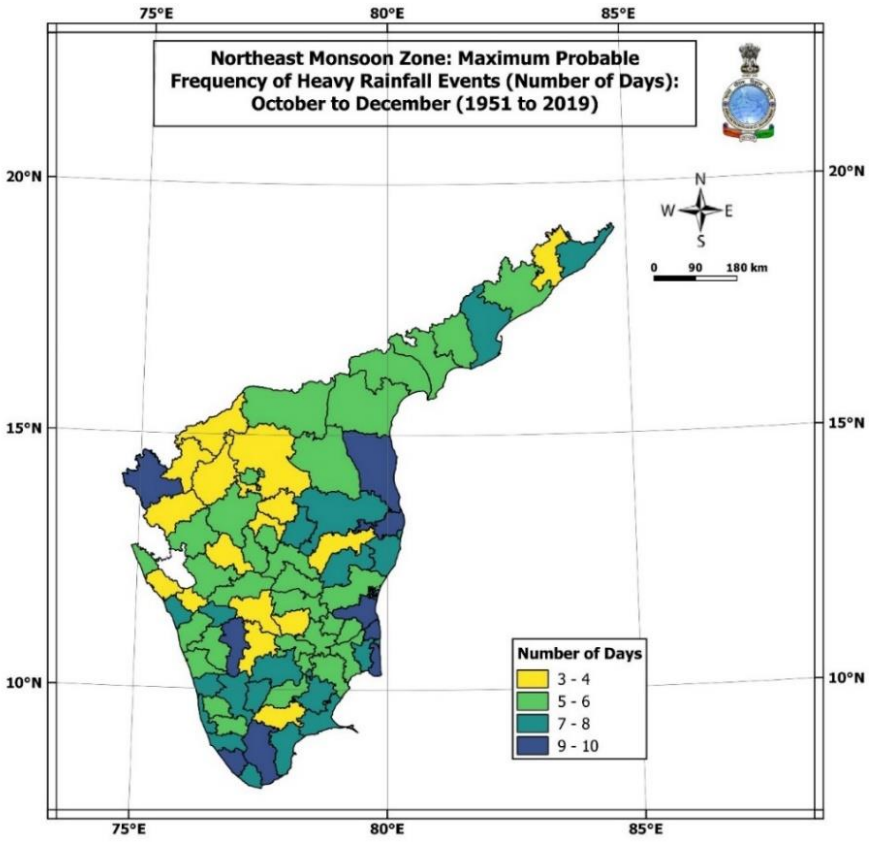


Fig. 3.8. Maximum Probable frequency of heavy rainfall events (Number of days): October-December, 1951-2019. (Source: IMD Climate Hazards and Vulnerability Atlas of India, 2022).

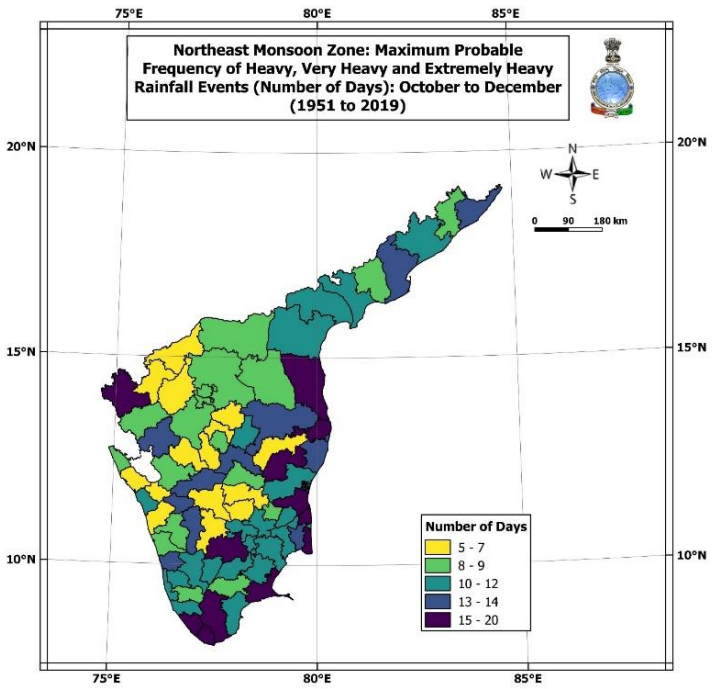


Fig. 3.9. Maximum Probable frequency of heavy, very heavy and extremely heavy rainfall events (Number of days): October-December, 1951-2019. (Source: IMD Climate Hazards and Vulnerability Atlas of India, 2022).

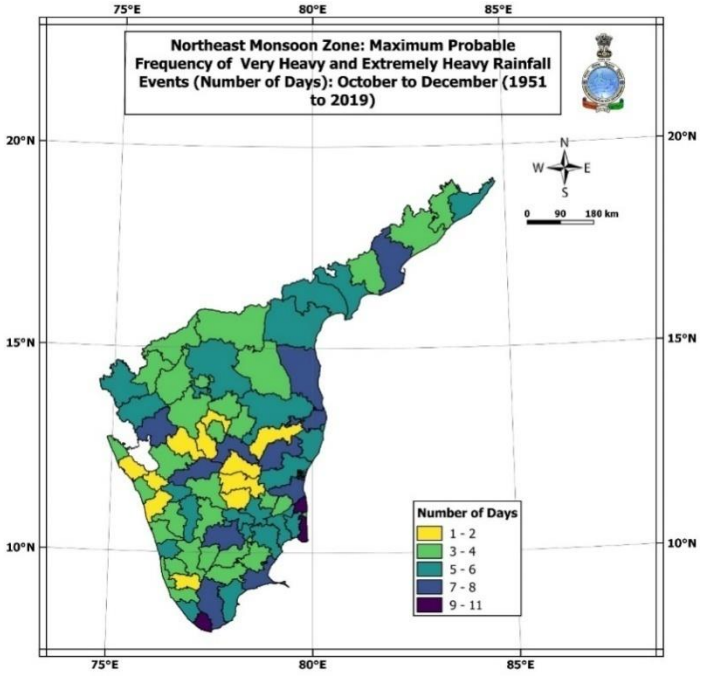


Fig. 3.10. Maximum Probable frequency of very heavy and extremely heavy rainfall events (Number of days): October-December, 1951-2019. (Source: IMD Climate Hazards and Vulnerability Atlas of India, 2022).

The city of Chennai experienced three phases of heavy rainfall that resulted in devastating floods during November and early December, 2015. Chakraborty (2015) examined synoptic aspects of this flood event in detail. The study revealed that propagating convective systems from the west Pacific Ocean intensified further over the warm Indian Ocean before moving north towards the Indian land region. This northward propagation was guided by two highs of mid-troposphere to the east and west of the Indian region. While the high to the east was typical of an El Nino year, that the west was associated with global phase shift of upper tropospheric Rossby wave. The study revealed that similar highs to the west were present during other years of heavy rainfall along the east coast of Peninsular India.

Fig. 3.11 shows Spatial variation of correlation coefficient between monthly mean rainfall over the Indian landmass and area averaged 500 hPa geopotential height over 30-60$^0$E, 20-45$^0$N (Middle-east) in November for the period 1948-2014. It suggests that a high GPH over the Middle East is positively correlated with high amount of rainfall over central and south India land regions. The highest positive correlation is found along the east coast of the Indian peninsula over Tamil Nadu and Andhra Pradesh. The study concluded that an anomalous mid-tropospheric high to the west of the Indian region can induce anomalous northerly to the north that does not allows propagating systems to mover further north and west. This results in dry conditions in the northwest Indian region and wet conditions to the southeast Indian peninsula. It suggests that an anomalous high over Middle east in November can help increase the northeast monsoon rainfall over the south peninsula.

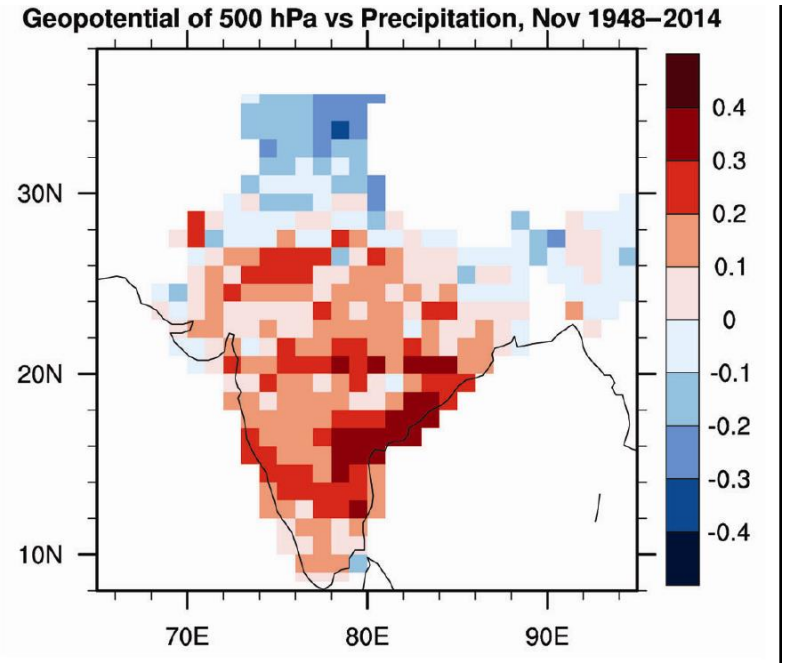


Fig. 3.11. Spatial variation of correlation coefficient between monthly mean rainfall over the Indian landmass and area averaged 500 hPa geopotential height over 30-60$^0$E, 20-45$^0$N in November for the period 1948-2014 (After Chakraborty, 2016).

Nageswara Rao et al., (2019) made an extensive analysis of NE monsoon rainfall using IMD gridded data set. Their analysis revealed that the seasonal rainfall has increased over Tamil Nadu, Rayalaseema, as well as South Peninsula because of an increase in the number of high-intensity rainfall events in the recent period with respect to the earlier period (1901–1958), while it has decreased over the other sub-divisions. The percentage contribution of moderate rainfall events to the seasonal rainfall is more compared to the other events.

The study by Koteswara Rao et al., (2020) revealed there will be an increase in precipitation in near future (about 5%). The future climate projections also indicate that both the intensity and frequency of precipitation extremes in most parts of the South peninsular India may increase under the warming scenarios during the northeast monsoon season.