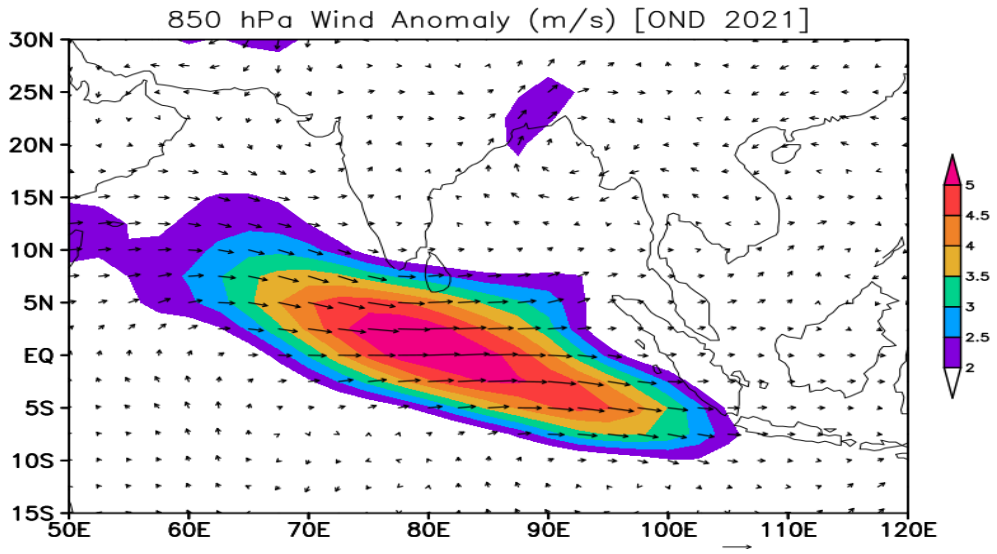

Fig. 6.16 b. 850 hPa wind anomalies during OND 2021. Source: ERA5 reanalysis.

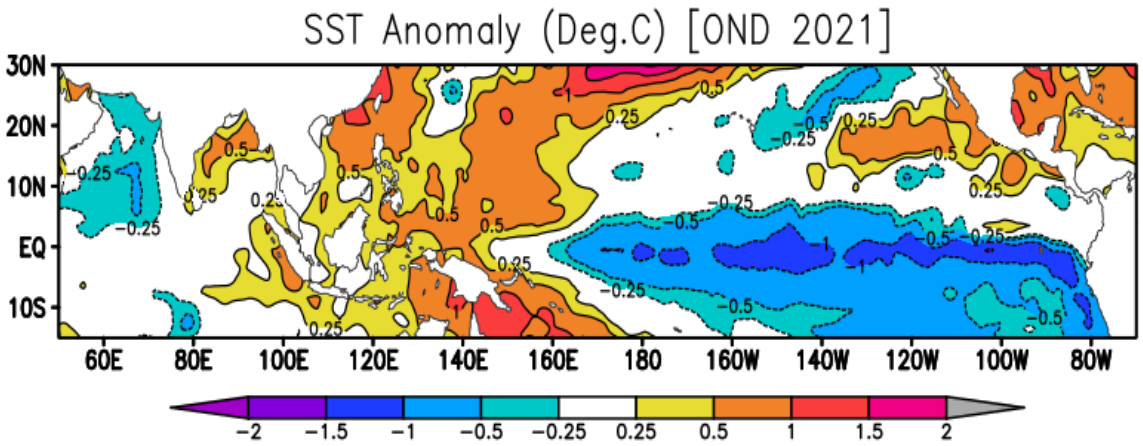

Fig. 6.16 c. SST anomalies during OND 2021. Source: NOAA OI SST data.

6.5. **Seasonal Forecasting of NE Monsoon**

India Meteorological Department (IMD) has been attempting to prepare long-range forecasting of NE Monsoon rainfall (Oct-Dec) using indigenously developed statistical models based on principal component analysis (PCA). The parameters used for the statistical models are shown in Fig. 6.17. Overall, five predictors are used for long range prediction of NE monsoon rainfall. Out of these five predictors, four predictors are

derived from the Indian and West Pacific regions, while the fifth parameter is derived from the Atlantic Ocean. Since the inter-annual variability of NE monsoon rainfall is quite large (25%), developing a skillful statistical prediction scheme could be challenging. IMD, however, shares the long-range forecasts confidentially with the concerned state governments every year. Therefore, more research studies are required to understand the inter-annual variability of NE monsoon rainfall better and develop skillful long-range forecast models.

Rajeevan et al. (2012) suggested that present-day dynamical models have serious problems in properly simulating mean monsoon rainfall and its teleconnections. Coupled climate models do not correctly simulate the sign of the ENSO-NE Monsoon rainfall relationship. Furthermore, there is absolutely no skill with the present dynamical models in predicting inter-annual variability of NE monsoon.

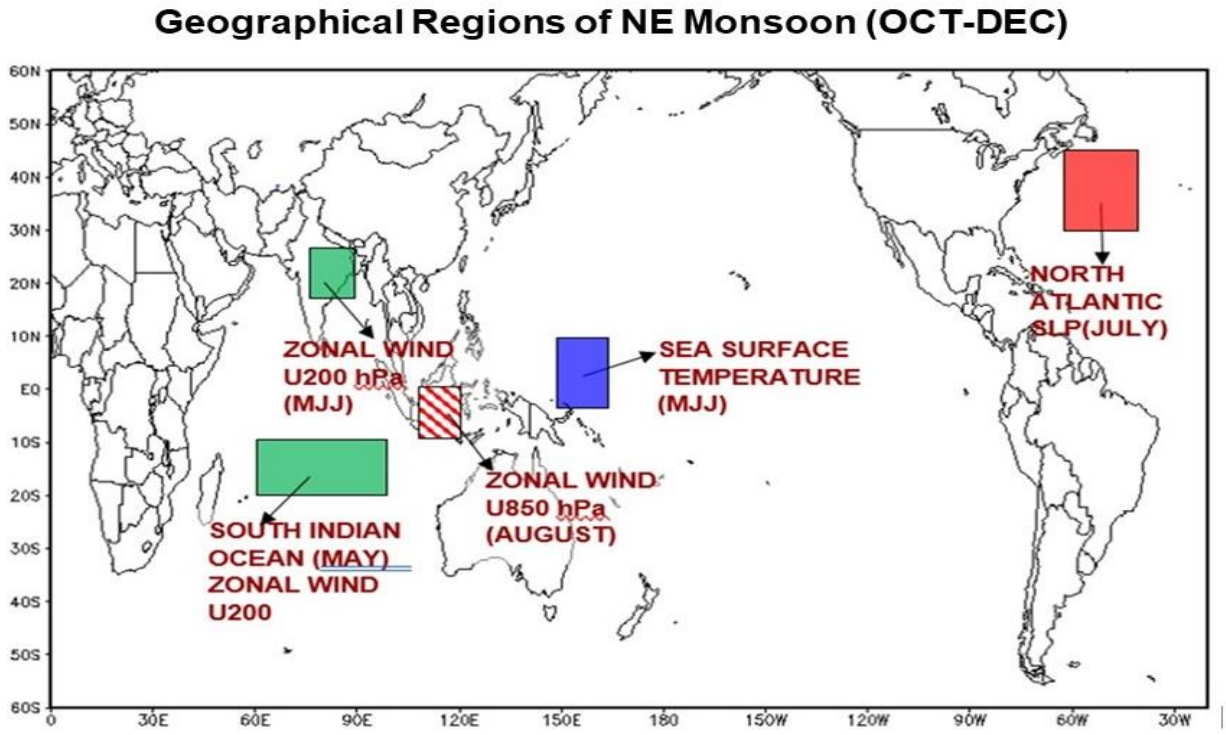

Fig. 6.17. The parameters used in the statistical model for the long-range forecasting of NE Monsoon rainfall by the India Meteorological Department.

The study by Acharya et al. (2011) suggested that the general circulation models considered in the study are not able to simulate the observed interannual variability of rainfall. They attributed this to inaccurate response of the models to sea surface temperatures. They found that the multi-model ensemble scheme improved the accuracy of simulations. The study by Sengupta and Nigam (2019) revealed that the historical twentieth-century climate simulations informing the Intergovernmental Panel on Climate Change's Fifth Assessment (IPCC-AR5) showed varied deficiencies in the NEM rainfall distribution and a markedly weaker (and often unrealistic) ENSO–NEM rainfall relationship.

Prasanna et al. (2021) examined the fidelity of the eight Asia-Pacific Economic Cooperation (APEC) Climate Center (APCC) models in representing the inter-annual variability and decadal shift in the northeast monsoon (NEM; October–December) rainfall over Southern Peninsular India (SPI). The observations showed a clear inter-annual and inter-decadal variability of NE monsoon rainfall. The analysis suggested that most of the models exhibited poor skill in representing the inter-annual variability. Only APCC model rainfall is in phase with observed SPI rainfall variations on the inter-annual time scale. More research work is required to improve both the statistical and dynamical models in making reliable long-range forecasts of NE Monsoon rainfall in the coming years.

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