



## **Twentieth Session of South Asian Climate Outlook Forum (SASCOF-20) and Climate Services User Forum (CSUF)**

**27-30 September 2021**  
(Held online due to CoViD-19 pandemic)

### **Consensus Statement on the Forecast for the 2021 October to December Season Rainfall and Temperature over South Asia**

#### **Summary**

**Below-normal rainfall is likely during the 2021 October – December (OND) season over the southern parts of the South Asia including most parts of Sri Lanka and Maldives and some parts of southeast India, where climatologically good amount of rainfall is received during the season. Below normal rainfall is also likely over the northwestern and northern parts of South Asia including some areas along the foot hills of Himalayas. These areas, however, climatologically receive very low rainfall during OND season. Above normal rainfall is likely over most parts of central, southeast and north-east regions of South Asia. Remaining parts of the region are likely to experience normal seasonal rainfall or climatological probabilities.**

**During the season, normal to above normal maximum temperatures are likely over most parts of the region except central and peninsular India and also over the southern tip of Myanmar. Similarly, above normal minimum temperatures are likely over most parts of the region except over some parts of west central and extreme northwest regions.**

**This consensus climate outlook for the 2021 OND season over South Asia has been developed through an expert assessment of the prevailing global climate conditions influencing the South Asian climate and seasonal forecasts from different climate models around the world. Currently cool neutral ENSO conditions are prevailing over equatorial Pacific region and weak negative Indian Ocean Dipole (IOD) conditions are prevailing over the Indian Ocean. These parameters are known to influence the climate variability over South Asia. Latest forecasts from many climate models indicate that La Niña conditions are likely to re-emerge during October to December season and the negative IOD conditions are likely to weaken. Careful consideration is also given to other regional and global factors as well as the intra seasonal variability of the region that can affect the rainfall and temperature patterns over the region. For more information and further updates on the seasonal climate outlook on national scale, the respective National Meteorological and Hydrological Services (NMHSs) may be consulted.**

**Introduction:**

During the October to December (OND) season, the southern parts of the South Asia receive significant amounts of rainfall which is critical for agricultural operations. The re-establishment of northeasterly trade-wind regime over South Asia associated with the southward movement of the Inter-Tropical Convergence Zone (ITCZ) ushers-in the Northeast monsoon, bringing much needed rainfall to the southern parts of India, Sri Lanka and Maldives. In Sri Lanka, the October to November period is known as second Inter Monsoon (SIM) season. It has been recognized that there is moderate seasonal predictability for the Northeast monsoon circulation over the region as the seasonal variability is strongly influenced by the slowly varying boundary forcing like sea surface temperatures. However, the predictability is limited to some extent due to the strong day to day atmospheric variability caused by the passage of the synoptic scale weather systems such as easterly waves, lows, depressions, cyclones etc. The seasonal predictability of the northeast monsoon over the region is also influenced by the Madden Julian Oscillation (MJO), which represent the major global scale intra-seasonal variability pattern.

The climate outlook for the 2021 OND season was finalized during the twentieth session of the South Asian Climate Outlook Forum (SASCOF-20) held during 27-30 September 2021 via video conferencing in the backdrop of the current extraordinary circumstances of Covid-19 pandemic prevailing in the world. The session was attended by experts representing the National Meteorological and Hydrological Services (NMHSs) of all the nine South Asian countries as well as those representing several global and regional climate agencies including World Meteorological Organization (WMO), WMO Regional Climate Centre (RCC) Pune, Indian Institute of Tropical Meteorology (IITM), Met Office (UKMO), International Research Institute for Climate and Society (IRI), Regional Integrated Multi-hazard Early-warning System (RIMES), Japan Meteorological Agency (JMA), Center for Earth System Modeling, Analysis, and Data (ESMAD) etc. The online forum deliberated on various observed and emerging climate forcing that are known to influence the climate variability of the region such as the El Niño/Southern Oscillation (ENSO) conditions over the equatorial Pacific, Indian Ocean Dipole (IOD) conditions over the Indian Ocean etc. The key features of these climate forcing are briefly discussed below.

## **Conditions over the Pacific Ocean**

The ENSO is one of the global scale climate forcings that have significant influence on the year-to-year variability of the northeast monsoon rainfall as well as the surface temperatures over South Asia. The La Niña conditions from the beginning of the year started weakening in the month of April/May and turned into neutral (cool) ENSO conditions and continued in subsequent month of August 2021. Currently, cool neutral ENSO conditions are prevailing over the Pacific. Latest forecasts from many climate models indicate that the La Niña conditions are likely to re-emerge during the OND season.

## **Conditions over the Indian Ocean**

In addition to ENSO conditions over the Pacific, other factors such as Indian Ocean sea surface temperatures have some influence on the climate variability of the region. During May 2021, weak negative IOD conditions were observed over Indian Ocean which enhanced in the subsequent month of June and July and weakened slightly in the month of August. At present negative IOD conditions are prevailing over Indian Ocean. Recent forecasts from majority of the coupled models suggest that the negative IOD conditions are likely to weaken during OND season.

## **Consensus Outlook for the 2021 October to December Season Rainfall over South Asia:**

A consensus outlook for October to December season rainfall over South Asia has been prepared based on the expert assessment of prevailing large-scale global climate indicators mentioned above and experimental as well as operational long-range forecasts based on statistical and dynamical models generated by various operational and research centers of the world.

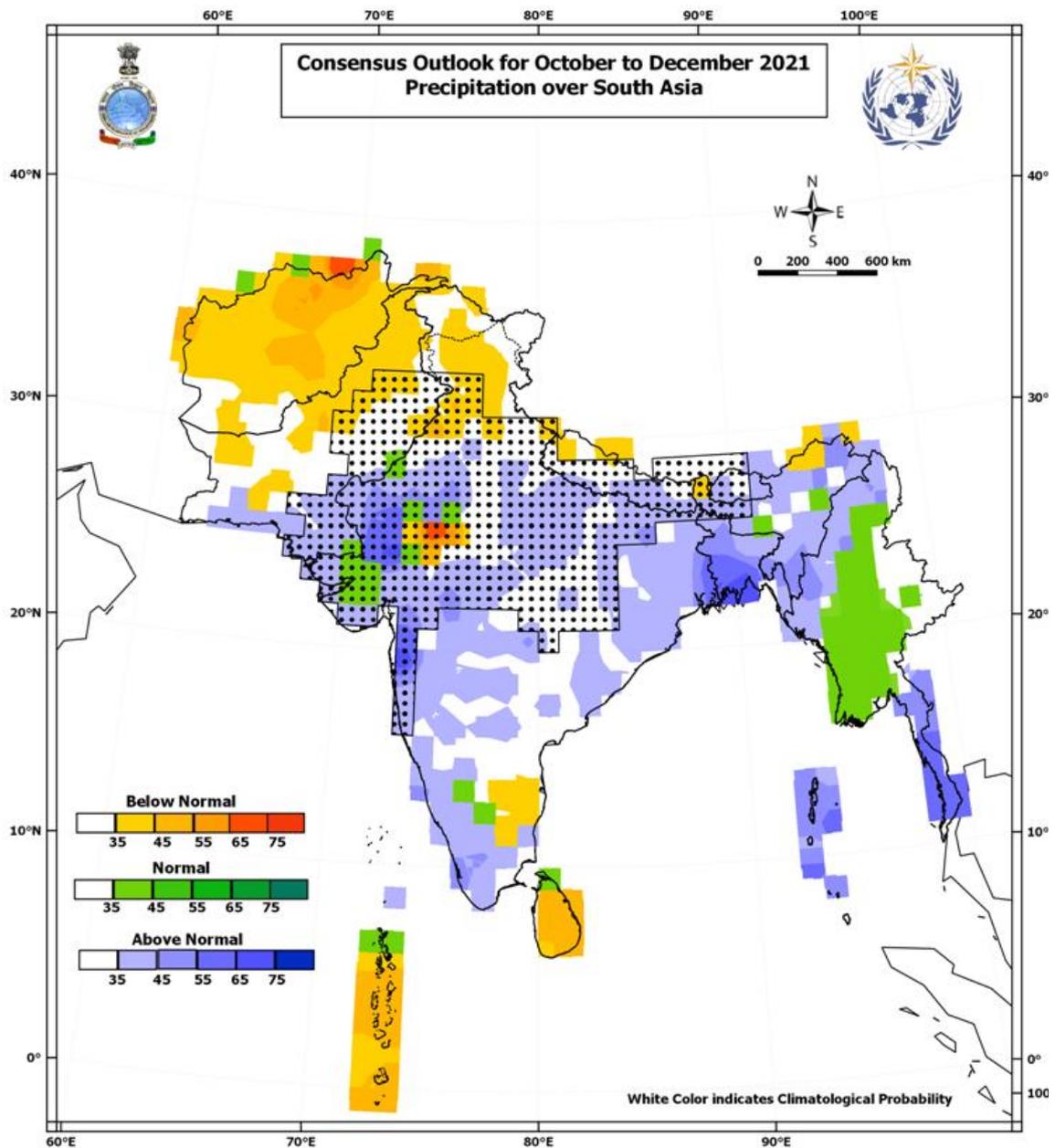
There is unanimity among the experts that a weak La Niña conditions in the equatorial Pacific Ocean is likely to develop and the negative Indian Ocean Dipole conditions over Indian Ocean are likely to weaken during October to December season. The relative impact of all these parameters needs to be considered to determine the expected state of the climate over the region during the season.

The outlook for the 2021 October to December season rainfall over South Asia is shown in **Fig.1a**. The figure illustrates the most likely tercile category<sup>1</sup> as well as its probability for each of the 1° latitude x 1° longitude spatial grid boxes over the

region. The dotted area showed in the map climatologically receives very low rainfall and experience dry weather during OND season. The box-wise tercile probabilities were derived using an objective approach from an initial set of gridded forecasts from multiple GCMs and consolidated through a consensus building discussion among climate experts.

The outlook suggests that during the 2021 October to December (OND) season, below-normal rainfall is likely over the southern parts of the South Asia including most parts of Sri Lanka and Maldives and some parts of southeast India, where climatologically good amount of rainfall is received during the season. Below normal rainfall is also likely over the northwestern and northern parts of South Asia including some areas along the foot hills of Himalayas. These areas, however, climatologically receive very low rainfall during October to December season. Above normal rainfall is likely over most parts of central, southeast and north-east regions of South Asia. Remaining parts of the region are likely to experience normal seasonal rainfall or climatological probabilities. As the rainfall during the October to December season depicts strong intra-seasonal variability, it is advised to watch the extended range forecasts along with updated seasonal forecasts for better decision making. The extended range forecasts for rainfall, temperature, cyclone genesis, MJO etc. over the region can be obtained from RCC, Pune website (<http://rcc.imdpune.gov.in/exrange.html>). These forecasts are updated every week.

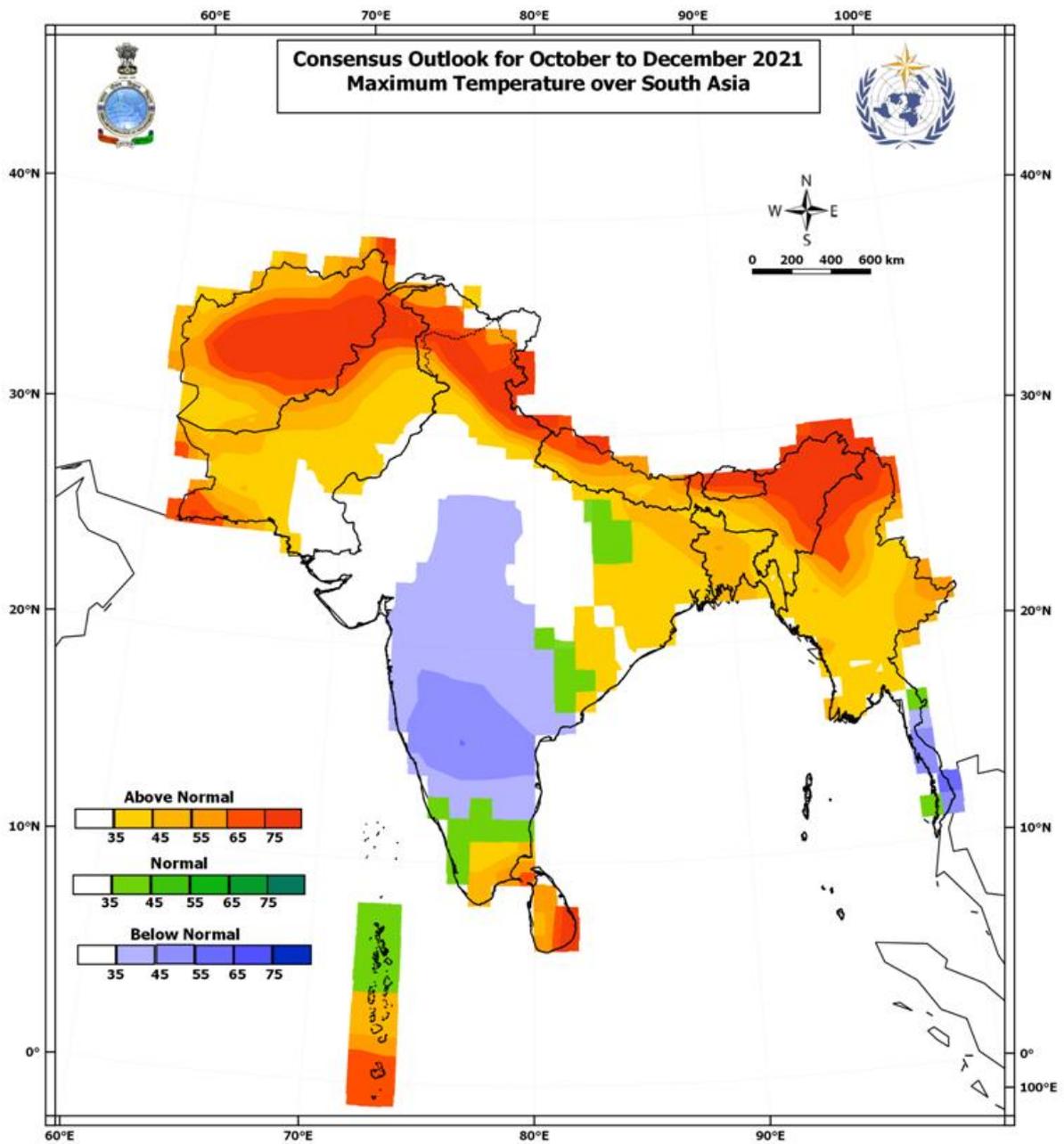
The consensus outlook for the 2021 October to December maximum and minimum temperature over South Asia is shown in **Fig.1b and 1c**. During the season, normal to above normal maximum temperatures are likely over most parts of the region except central and peninsular India and also over the southern tip of Myanmar. Similarly, above normal minimum temperatures are likely over most parts of the region except over some parts of west central and extreme northwest regions.



**Fig.1a. Consensus outlook for 2021 OND season Rainfall over South Asia. The dotted area showed in the map climatologically receives very less rainfall and generally experience dry weather during OND season.**

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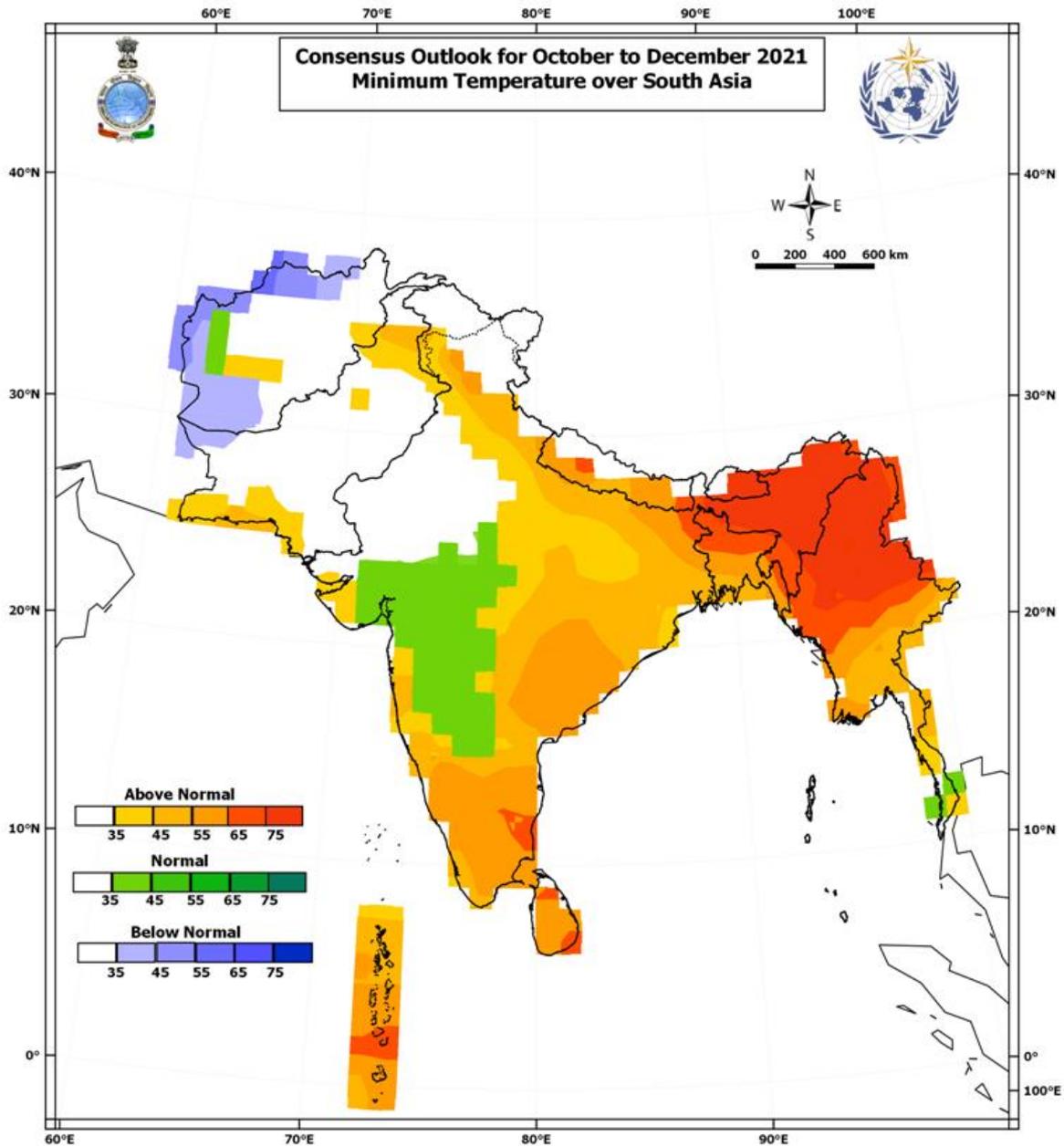
Tercile categories have equal climatological probabilities, of 33.33% each.



**Fig.1b. Consensus outlook of probability of the most likely category for the 2021 OND season Maximum Temperature over South Asia.**

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Tercile categories have equal climatological probabilities, of 33.33% each.

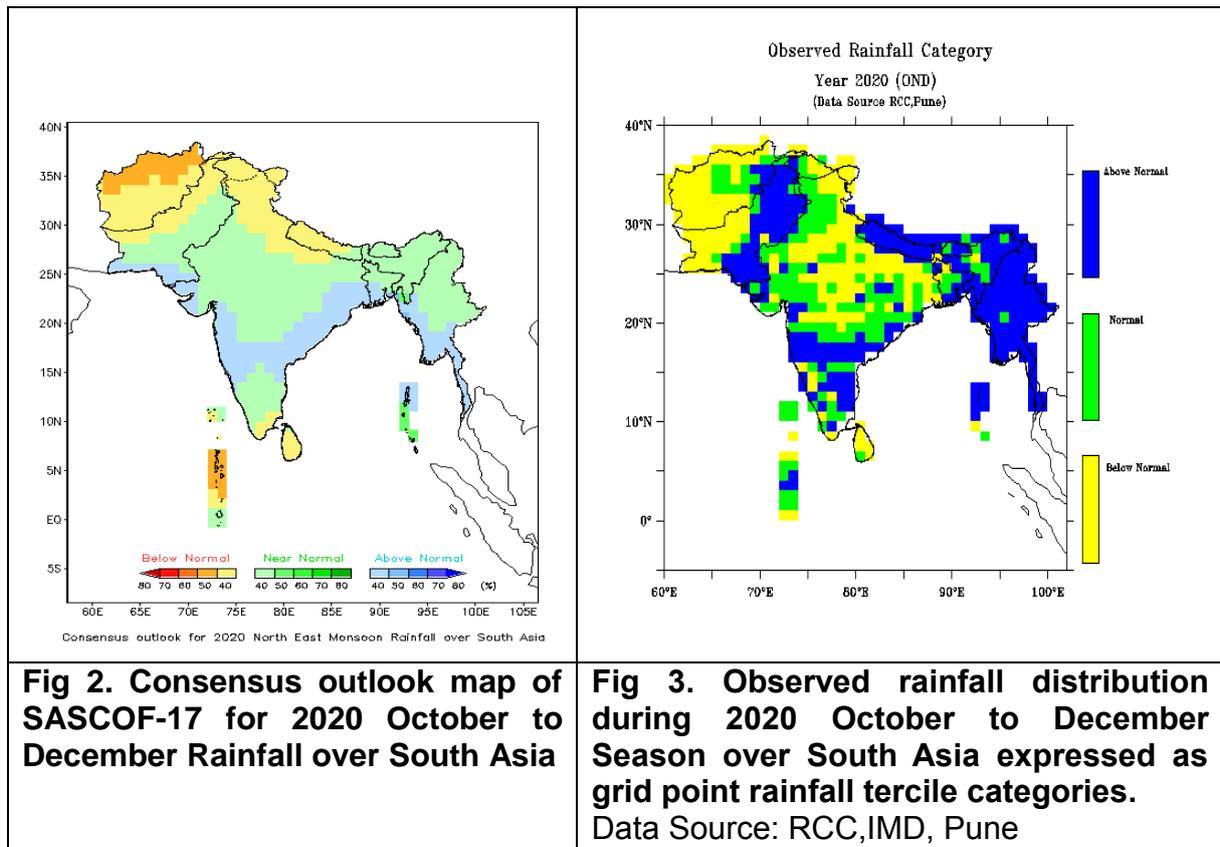


**Fig.1c. Consensus outlook of probability of the most likely category for the 2021 OND season Minimum Temperature over South Asia.**

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Tercile categories have equal climatological probabilities, of 33.33% each.

## Verification of consensus outlook for 2020 October to December Season



**Fig 2. Consensus outlook map of SASCOF-17 for 2020 October to December Rainfall over South Asia**

**Fig 3. Observed rainfall distribution during 2020 October to December Season over South Asia expressed as grid point rainfall tercile categories.**  
Data Source: RCC,IMD, Pune

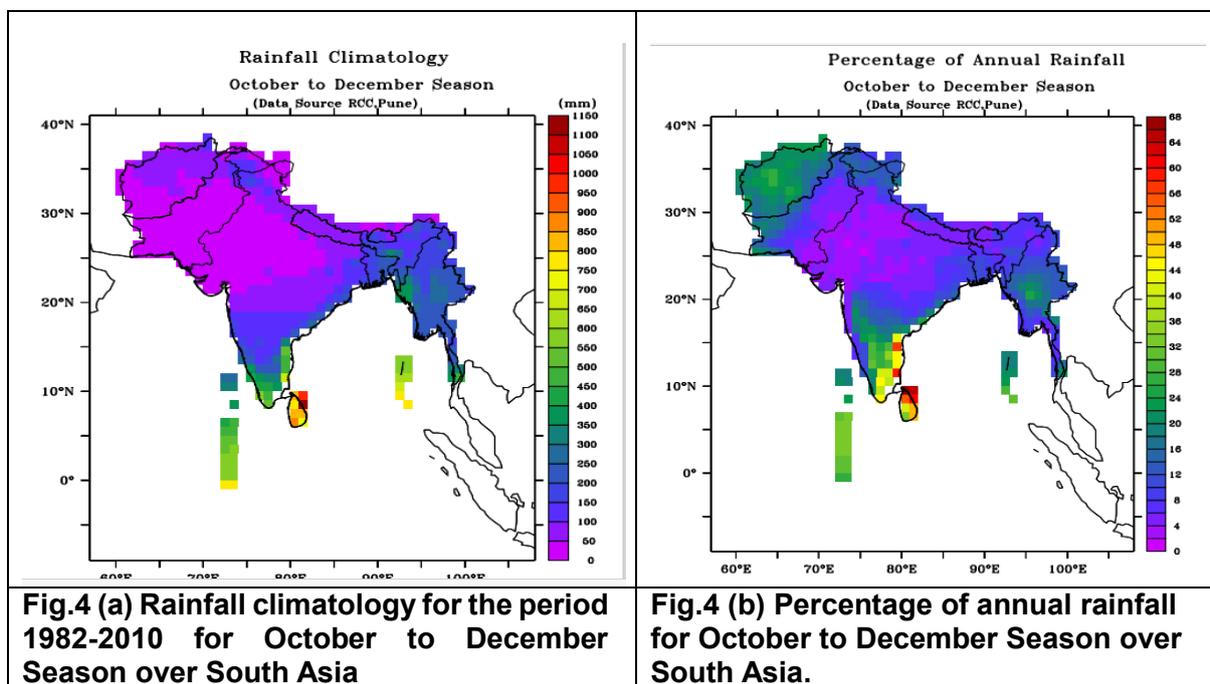
The consensus forecast outlook map (Fig.2) for the 2020 October to December season suggested below-normal rainfall over the southern parts of South Asia, including some parts of extreme southeastern India, most parts of Sri Lanka and the Maldives, and also over the northwestern and northern parts of the region including some areas along the foothills of Himalayas. Above normal rainfall over the land areas around north and the central Bay of Bengal, most parts of north and central peninsular India and southern parts of Myanmar. The rainfall forecast was normal over the remaining parts of the region.

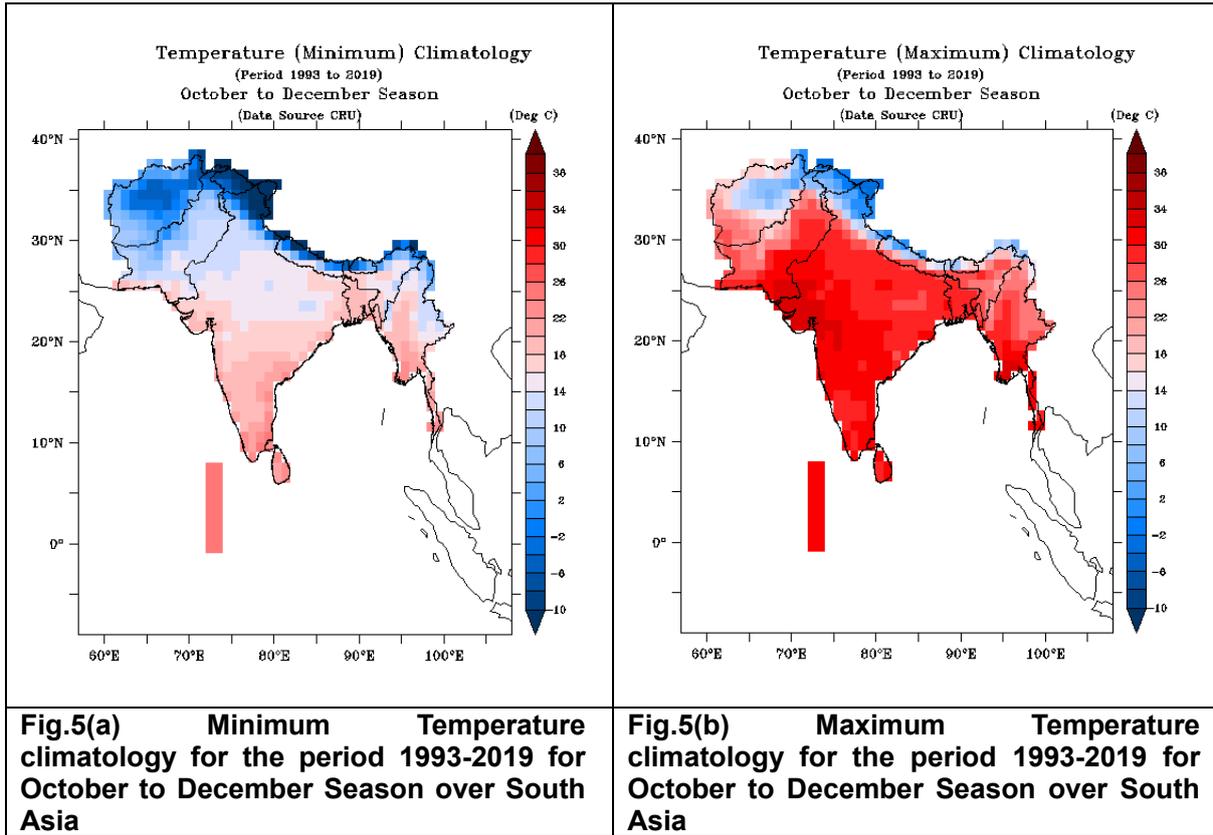
Fig. 3 shows the observed rainfall distribution during the 2020 October to December Season expressed in terms of tercile categories. It can be seen that below normal rainfall was received over most of the areas of north-west South Asia, including Pakistan and Afghanistan, northern parts of India along the foothills of Himalayas, and over most parts of Sri Lanka and some parts of Maldives. Above normal rainfall was received over most areas of east and north-eastern parts of the region, some parts of central peninsular India and over eastern Pakistan. The remaining areas of the region received normal rainfall.

From the above Figures 2 & 3, it is visible that many areas of the region where a climatologically good amount of rainfall is received during the season like south India, Maldives and south Myanmar, both the forecasted and realized rainfall categories were same. In addition, the below-normal rainfall forecasted over the north and northwestern parts of the region and over Sri Lanka matched very well with the observed category. However, the rain received over the Nepal region was above normal, where the forecast was below normal rainfall. The consensus outlook for the 2020 October to December season rainfall was accurate in most areas, particularly those where climatologically good rain is received during the season.

### Climatological Information of Rainfall and Temperature over South Asia Region during October to December Season

The long-term historical patterns of the rainfall over South Asia during October to December Season (Fig.4 a & b), characterized by remarkable spatial variability, provide the general reference points at the respective locations for the rainfall anomalies indicated in the outlook.





The long-term historical patterns of the Temperature (Minimum and Maximum) over South Asia during October to December (Fig.5 a & b), characterized by large spatial variability, provide the general reference points at the respective locations for the temperature anomalies indicated in the outlook.