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**Ninth Session of  
South Asian Climate Outlook Forum (SASCOF-9) *Nay Pyi Taw,*  
*Myanmar, 27-29 September 2016***

**Consensus Statement on the Forecast for the 2016 Northeast  
Monsoon Season (October – December) Rainfall and  
Temperature over South Asia**

**Summary**

Normal rainfall is most likely over most parts of south Asia during the 2016 Northeast monsoon season (October – December). However, below normal rainfall is likely over some areas of southeast peninsular India, Sri Lanka and Maldives. Below normal rainfall is also likely over some areas of north and eastern parts of the region. Above normal rainfall is likely over western and northwestern parts of Pakistan and some northeastern parts of the region. During the season, normal to slightly above normal temperatures are likely, over most parts of the region.

This consensus forecast outlook for the 2016 northeast monsoon season rainfall and temperature over South Asia have been developed through an expert assessment of the prevailing global climate conditions and forecasts from different climate models from around the world. Currently cool neutral ENSO conditions prevail in the Pacific Ocean and it is equally probable that these conditions are likely to continue or border line La Nina conditions are likely to develop during the northeast monsoon season. It is also recognized that other regional and global factors as well as the intra seasonal features of the region can affect the rainfall and temperature patterns over the region.

For more information and further updates on the northeast monsoon outlook on national scale, the respective National Meteorological and Hydrological Services (NMHSs) may be consulted.

A separate consensus statement for winter season (December 2016 to February 2017) will be issued in the second half of November 2016.

## **Introduction:**

During the northeast monsoon season (October to December), many parts of South Asia receive significant amounts of rainfall which coincides with one of the major agricultural seasons of the region. The reestablishment of prevailing north easterly trade-wind regime over South Asia associated with the southward movement of the ITCZ ushers-in the so-called “Northeast Monsoon” (NEM), bringing 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 NE Monsoon circulation over the region as the seasonal variability is strongly influenced by the slowly varying boundary forcings like sea surface temperatures. However, the predictability is also limited to some extent due to the strong day to day atmospheric variability caused by the passage of the synoptic scale 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 intraseasonal variability pattern.

The climate outlook for the 2016 northeast monsoon season (October to December) was prepared during the ninth session of the South Asian Climate Outlook Forum (SASCOF-9), which is the second session devoted exclusively for the Northeast monsoon season and was held at Nay Pyi Taw, Myanmar, 27-28<sup>th</sup> September 2016. The forum meeting was attended by several experts from various South Asian countries such as Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan, and Sri Lanka. The Forum deliberated on various observed and emerging climatic features that are known to influence the climate 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 conditions are as follows.

## **ENSO Conditions over the Pacific Ocean**

The El Niño/Southern Oscillation (ENSO) is one of the global scale climate phenomena 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 strong El Nino event of 2015-2016 after peaking in December, 2015 started to weaken thereafter. In March 2016, conditions became warm neutral and further cooling of SSTs over equatorial Pacific

thereafter resulted in the establishment of cool neutral ENSO conditions. Currently, the atmospheric conditions over the Pacific also reflect patterns consistent with the observed changes in the oceanic conditions. Latest forecasts indicate that cool neutral ENSO conditions may continue or the border line La Nina conditions may develop during the northeast monsoon season. However, in the early part of next year (2017), there is strong possibility of conditions over equatorial Pacific to be in the cool neutral ENSO level.

### **Conditions over the Indian Ocean**

In addition to ENSO conditions over the Pacific, other factors such as Indian Ocean SSTs have some influence on the climate of the region. The negative Indian Ocean Dipole (IOD) conditions are prevailing over equatorial Indian Ocean since late June 2016. Recent forecasts from coupled models suggest negative IOD conditions to weaken but continue during the OND season and turn to neutral IOD conditions during the early part of 2017.

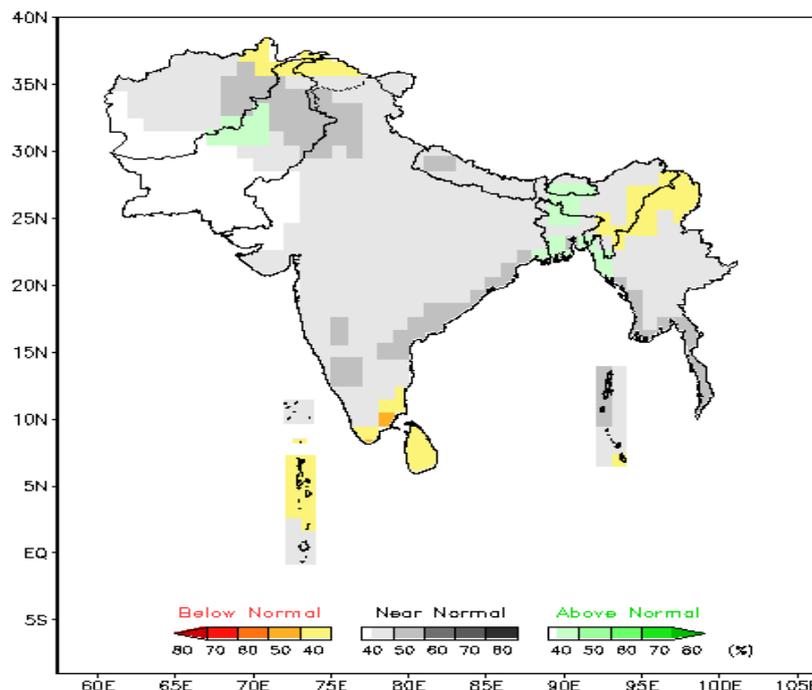
### **Consensus Outlook for the 2016 Northeast Monsoon Rainfall over South Asia:**

A consensus outlook for northeast monsoon 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 centres of the world.

There is unanimity among the experts that the prevailing cool neutral La Nina conditions in the equatorial Pacific are likely to continue or reach to border line La Nina conditions during the OND season. However, it is recognized that there is some uncertainty on the potential impacts of weak La Nina on the climate of the region due to strong day to day atmospheric variability generally observed in the region. Based on the historical data, it has been observed that during La Nina years, in general, southern parts of the region including southern Peninsular India, Sri Lanka and Maldives receive normal to below normal rainfall. However, it is important to note that La Nina is not the only factor that decides the performance of northeast monsoon over the region. Other relevant climate drivers such as the state of the Indian Ocean Dipole, the Tropical Atlantic SST etc. are also important. The relative impact of all these parameters needs to be considered to determine the expected state of the monsoon over the region.

The outlook for the 2016 northeast monsoon rainfall over South Asia is shown in **Fig.1**. 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 box-wise tercile probabilities were derived by synthesis of the available information and expert assessment. It was derived from an initial set of gridded objective forecasts and modified through a consensus building discussion of climate experts.

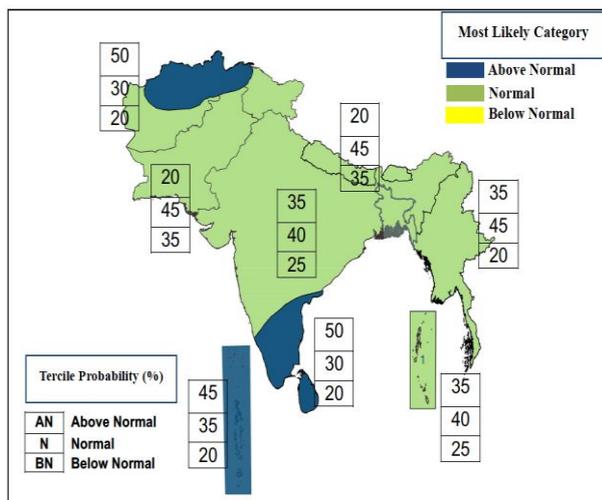
The outlook suggests that during the 2016 northeast monsoon season (October – December), normal rainfall is most likely over most parts of south Asia during the 2016 Northeast monsoon season (October – December). However, below normal rainfall is likely over some areas of southern part of the region consisting of southeast peninsular India, Sri Lanka and Maldives. It may be mentioned that these areas of the region climatologically receive good amount of rainfall during the season. Below normal rainfall is also likely over some areas of north and eastern parts of the region. Above normal rainfall is likely over western and northwestern parts of Pakistan and some northeastern parts of the region. During the season, normal to slightly above normal temperatures are likely, over most parts of the region.



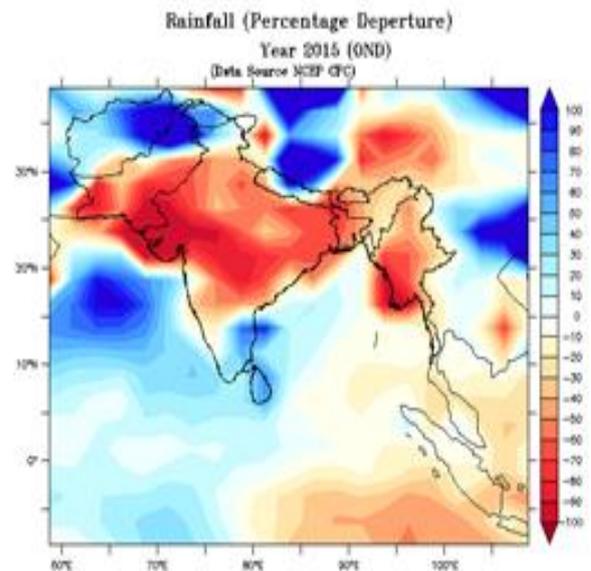
**Fig.1. Consensus outlook for the 2016 northeast Monsoon Rainfall over South Asia.**

<sup>1</sup>Tercile categories have equal climatological probabilities, of 33.33% each.

## Verification of the Consensus Forecast for the 2015 NE Monsoon Season Rainfall



**Fig.2.** Consensus forecast map of the 2015 Northeast monsoon Rainfall over South Asia.



**Fig.3.** The observed rainfall anomaly (percentage departure) during the 2015 Northeast Monsoon Season over South Asia.

The consensus outlook map (**Fig.2**) for the northeast monsoon season (June to September) of 2015, developed in the seventh session of the South Asian Climate Outlook Forum (SASCOF-6) had indicated normal to above normal rainfall over southern parts of South Asia including southeast peninsular India, Sri Lanka and Maldives. The consensus outlook also indicated above normal rainfall over northern most parts of the region and normal rainfall in over remaining areas of the region. As seen, the observed rainfall anomaly map (**Fig.3**) also suggests above normal rainfall over southern part and northern most parts of the region. These are also the regions which generally receive good amount of rainfall during the season. Thus the consensus forecast for the 2015 Northeast monsoon season rainfall was clearly able to indicate the main feature of the observed rainfall anomaly pattern