

Online meeting of the First Climate Research Forum for the Southern Asia region, 30 November 2021

# Regional Climate Service Activities for South Asia: Status and Future Plans

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## Regional Climate Services Activities: RCC, Pune: Background

- India Meteorological Department (IMD) established National Climate Centre (NCC), Pune in 1995 with an objective to provide various climate related services to the country (India).
- NCC has started to work as WMO recognized RCC (Pilot Phase) for the south Asia. RCC, Pune fully recognised in 2016. In this regard, efforts were made to build capacity to perform the mandatory RCC functions.
  - RCC Pune is single (multifunctional) RCC. RCC products are updated monthly.
- At present, RCC Pune is part of the office of Climate Research & Services (CRS) of India Meteorological Department, Pune. Under CRS there are dedicated divisions for providing various climate services to the south Asia.
- RCC, Pune is equipped with all the computing and internet facilities required for carrying out the mandatory RCC functions.
- RCC products are made available through IMD, Pune website (http://rcc.imdpune.gov.in/).
- RCC, Pune coordinates the South Asia Seasonal Climate Outlook Forum (SASCOF) and associated training workshops & user forums. RCC, Pune also takes lead role in the preparation of consensus forecast issued during the SASCOF forums.









### **Regional Climate Centre (RCC) Activities for South Asia**

# RCC, Pune performs the following set of mandatory functions covering the domains of long-range forecasting (LRF), climate monitoring, data services and training.

•Operational Activities for Long-range Forecasting Operational Activities for Climate Monitoring

IMDAA Data - high resolution (12km, 1-hourly) regional nalysis over India, from 1979 to 2018 and (2) NGFS Data -

18. ( For More information : Click here

olution (25km, 6-hourly) Global reanalysis, from 1999 to

- •Operational Data Services, to support operational LRF and climate monitoring
- •Training in the use of operational RCC products and services

### https://rcc.imdpune.gov.in

Regional Climate Centre (RA II Region) India Meteorological Department, Pune			
Home Climate Monitoring Climate Prediction	ERF for South Asia Climate of South Asia Regional Products	Training SASCOF-19	
What are WMO RCCs	SASCOF	Model Products for Severe Weather Guidance for South Asia	
WMO Regional Climate Centers (RCCs) are centres of excellence that create regional products including long-range forecasts that support regional and national climate activities, and thereby strengthen the capacity of WMO Members in a given region to deliver better climate services to national users.	IMD has taken responsibility for the preparation of annual regional forecast outlook for the SW Monsoon Season rainfail under the regional forum known as the (read more)	Customised NWP and ERF products are being generated for South Asian countries for general Weather forecasting, severe weather forecasting and disaster management. ( For More information:Click here)	
Mandatory RCC Functions	ABOUT NCC National Climate Centre (NCC), Pune which was established in 1006, bu India, Meteoreticated Department (JMD), with an	High-resolution simulations of 20th century climatic variations and future climate projections	
WMO RCCs perform the following set of mandatory functions covering the domains of long-range forecasting (LRF), climate monitoring, data services and training. • Operational Activities for Long-range	eest by indemeestorgical ceparateric (ind) with an objective to provide various climate related(read more) Extended Range Forecast	Have been developed at CCCR-ITM, using a global climate model with telescopic zooming (~35 km in longitude x 35 km in latitude) over the South Asian region. These high-resolution simulations, which were performed on the PRITHVI High	
Forecasting • Operational Activities for Climate Monitoring • Operational Data Services, to support operational LRF and climate monitoring • Training in the use of operational RCC products	The extended range forecasting (forecasts between 7 and 30 days) fills the gap between(read more)  MME weekly cumulative rainfall anomaly (mm)	Perfortunities to better understand several key regional scientific issues concerning climate change over South Asia - e.g., Monsoons, precipitation extremes, heat waves, droughts and floods, changes in cyclonic weather systems, hydrological cycle etc. (For More information : Click here )	
and services		New book on Assessment of Climate Change over the Indian Region	
Forecast		Reanalysis Data Services	
CFS Forecasts Climate Forecast System for India and South Asia Region		The Indian Monsoon Data Assimilation and Analysis reanalysis (IMDAA) is a regional atmospheric reanalysis over the Indian subcontinent. The IMDAA is the result of collaboration among the Met Office (MO) LIK National Center for Medium Ranna	
Hindcast Verification	<sup>10</sup> <sup>10</sup> <del>de</del> <del>de</del> <del>de</del> <del>de</del> <del>de</del> <del>de</del> <del>de</del> <del>de</del>	Weather Forecasting (NCMRWF), India and the India Meteorological Department (IMD) with funding from the National Monsoon Mission (NMM) project of the Ministry of Earth	

CFS Hindcast CFS Hindcast Verification for India and South Asia

CFS Hindcast Verification for India and S Region ...

nportant Links : IMD New Delhi | MoES | NCMRWF | NIOT | CLMRE | NOAA | IITM | Incois | WMO

Developed and Maintained by Climate Prediction Group, India Meteorological Department, Pune

### **Important Products**

- Global monthly and seasonal forecast anomaly maps of Rainfall and Temperature (Updated Every month)
- ENSO & IOD Forecast Bulletins (Every month)
- Seasonal Forecast Outlook of Rainfall and Temperatures over South Asia (updated every month)
- Consensus forecast for South Asia under SASCOF
- Extended range forecasts of rainfall and temperatures for the next four weeks
- A regional atmospheric reanalysis data over the Indian subcontinent called Indian Monsoon Data Assimilation and Analysis reanalysis (IMDAA) prepared by NCMRWF, Noida
- High-resolution simulations of 20th century climatic variations and future climate projections over south Asia



The long range forecasting products are prepared using the Monsoon Mission Climate Forecasting System (MMCFS)





## South Asia Seasonal Climate Outlook Form (SASCOF)

Target Region: South Asia (9 countries)

**Co-ordinating Institution: RCC, Pune, India Meteorological Department (IMD)** 

Target Seasons: SW Monsoon (JJAS), NE Monsoon (OND), winter (DJF)

Parameters: Rainfall for all seasons. Temperature for OND and DJF

Major forcings on the regional climate: ENSO, IOD, Winter and spring Eurasian Snow Cover, Northern Hemisphere surface air temperature during spring season, sea surface temperature patterns over Atlantic Ocean, mid latitude flow pattern north of Asia etc.

Potential applications of seasonal outlooks: Agriculture (selection crops, crop yield forecast), Disaster preparedness and risk reduction (impact of floods and droughts), Public health (disease outbreaks like Malaria, cholera etc.), Energy sector (expected energy demand scenarios), water management (reservoir) etc.

**RCOF frequency:** Physical sessions in April for SW Monsoon & in September for NE Monsoon. online session in November for winter season (December to February):

Sources of funding: Financial support for conducting SASCOF activities mainly come from WMO through its various funding agencies like The United States Agency for International Development (USAID), Department of the Environment, Government of Canada etc. Participation of the experts from IMD and IITM, Pune is funded by the respective institutions. From SASCO-13, funding support is also received from the UK Met Office under UK aid-funded Asia – Regional Resilience to Changing Climate (ARRCC) programme which is co-sponsored by World Bank and the UK's Department for International Development (DFID). In recent years RIMES, Bangkok also plays important role in the co-ordination of the SASCOF activities.



Annual cycle of monthly mean rainfall over eight south Asian countries. The mean was computed using data for the period 1951-2000

S. No.	Country	Main rainfall periods	
1	Afghanistan	Winter (DJF), Spring (MAM)	
2	Bangladesh	Pre-monsoon (MAM), Summer Monsoon (JJAS)	
3	Bhutan	Winter (DJF), JJAS (summer monsoon)	
4	India	Winter (JF) for north India, pre-monsoon (MAM) for south peninsula and northeast India, SW Monsoon (JJAS) for most parts of the country and post monsoon (OND) for south Peninsula.	
5	Maldives	May to September (summer Monsoon ), October to January (winter monsoon)	
6	Myanmar	Pre-monsoon (AM), Summer Monsoon (JJAS), post monsoon (ON).	
7	Nepal	Winter (DJF), JJAS (summer monsoon)	
8	Pakistan	Winter (DJF), JAS (summer monsoon)	
9	Sri Lanka	First inter-monsoon (MA), SW Monsoon (MJJAS), second inter-monsoon (ON)	





### **Evolution in the Method used for Preparing** the Regional Forecast Outlook for the SW Monsoon Season





**2016 - 2020** Grid wise( 1º lat. x 1º lon.)

most likely tercile category

and its probability.

Derived from an initial set of

gridded objective forecasts

based on blending the grid

point forecasts prepared by individual NMHS using

various dynamical, statistical

and hybrid methodsand

modified through a

consensus process



Following Guidance on Operational Practices for Objective Seasonal Forecasting, WMO 2019

#### 2021 onwards

Objective method based on MME of a set of CGCMs .Grid wise most likely tercile category as well as its probability for each of the 1° latitude x 1° longitude grid boxes .

Showed better performance then earlier methods during recent years



#### भारत मौसम विज्ञान विभाग INDIA METEOROLOGICAL DEPARTMENT



In the first year (2010), forecast outlook consisted of only rainfall forecast for the south Asia as a whole.

No forecast map and no mention about the spatial distribution of season rainfall.

#### 2011-2015

Forecast map depicted areas of most likely tercile categories (using yellow, green and blue shades) over the region, and probabilities for each tercile categories over broad areas of same color shade.

### Seasonal Outlook to Economic Impact Based Forecasting based on on SASCOF outlooks for 2020







# **Future Plans**

- Improvement in the seasonal forecasting over smaller regions
- Development of MME tools for generating LRF products (for both rainfall and temperatures) for India and Other south Asian countries for all seasons of the calendar year with monthly update
- Supplement seasonal forecast with extended range forecasts
  - Co-production of sector specific tailor made climate prediction products including impact based forecasts with help of various stakeholders









