Monsoon Mission Meeting 4-5th December 2019

Long Range Forecasts & Verification of 2019 Southwest Monsoon Rainfall Forecast

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Outline

➢ IMD's seasonal (Long Range) Forecast

➢ Statistical Model for SW monsoon Rainfall

➢ Verification of LRF for Southwest Monsoon 2019

➢ Verification of SASCOF-14 forecast

➢ Summary

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CMPG: Schedule of different Long Range Forecasts issued by IMD

| Sr. No.	Forecast for	Region for which forecast issued	Issued in	Method/ Model
1	Winter Season (Jan- March) Precipitation	Northwest India	December	Statistical, Dynamical
2	Hot Weather Season Temperature (March to May) & (April-June)	Subdivision wise	February & March	Dynamical
3	SW Monsoon Season (June to September) Rainfall	Country as a whole	April	Statistical, Dynamical
4	SW Monsoon Season (June to September) Rainfall	Country as a whole	June	Statistical, Dynamical
5	South-West Monsoon Onset	Kerala	May	Statistical
6	SW Monsoon Season (June to September) Rainfall	Four broad geographical regions: Northwest India, Northeast India , Central India and South Peninsula	June	Statistical, Dynamical
7	SW Monsoon Monthly Rainfall for July and August	Country as a whole	June	Statistical, Dynamical
8	SW Monsoon Second half of the Season (August- September) Rainfall	Country as a whole	July	Statistical, Dynamical
9	September Rainfall	Country as a whole	August	Statistical, Dynamical
10	NE Monsoon Season (October to December) Rainfall	South Peninsula	September	Statistical, Dynamical
11	Cold Weather Season (December - February) Temperature	Subdivision wise	November	Dynamical

3

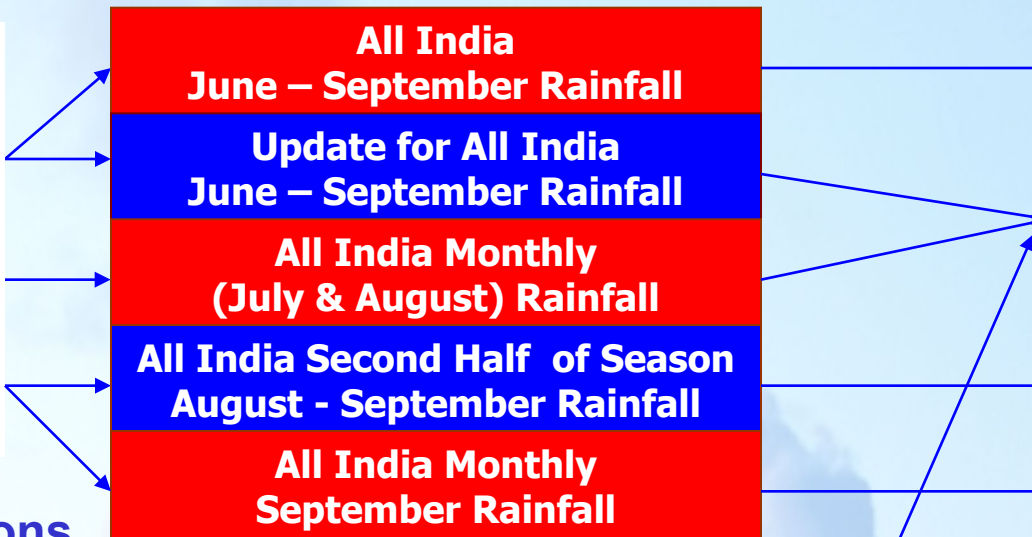# Operational Long Range Forecast For the Southwest Monsoon Issued By IMD

Month of Forecast Issue

All India

MEAN SEASONAL RAINFALL FOR JJAS
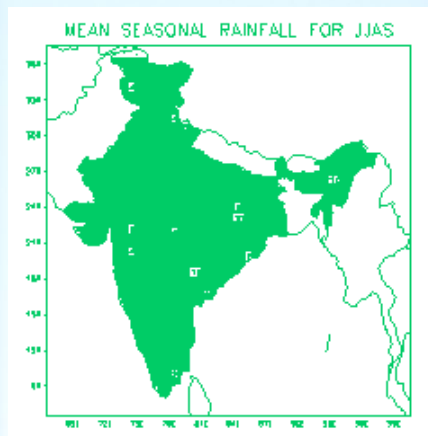
All India June – September Rainfall	→	April
Update for All India June – September Rainfall		June
All India Monthly (July & August) Rainfall		July
All India Second Half of Season August - September Rainfall		August
All India Monthly September Rainfall		

Geographical Regions

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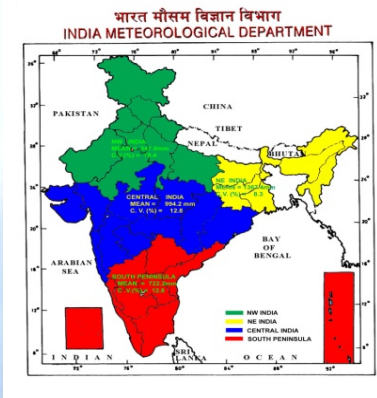
- NW India
- NE India
- Central India
- S. Peninsula

June – September Rainfall for Four Geographical Regions

In addition, Forecast for Date of Monsoon Onset over Kerala in May

26-Dec-19

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4

Skill of the statistical models currently used by IMD for the operational LRF of Monsoon Rainfall over India

Forecast Period	Forecast Region	Model (Training Window Period)	CC. Actual Vs Forecast Rainfall (Period)	Root Mean Square Error (RMSE) in % of LPA (Period)
June to September	All India	5-P Statistical Ensemble Forecast System (SEFS) (23 yrs)	0.71 (1981-2014)	6.56 (1981-2014)
June to September	All India	6-P (SEFS) (23 yrs)	0.80 (1981-2014)	5.64 (1981-2014)
July	All India	6 –P Principal Component Regression (PCR) (23 yrs)	0.70 (1981-2014)	10.20 (1981-2014)
August	All India	5-P PCR (23 yrs)	0.29 (1998-2014)	11.70 (1998-2014)
September	All India	5-P PCR (23 yrs)	0.70 (1981-2014)	14.60 (1984-2011)
August-September	All India	5-P PCR (23 yrs)	0.57 (1981-2014)	10.83 (1981-2014)
June to September	Northwest India	5-P PCR (30 yrs)	0.65 (1988-2014)	12.70 (1988-2014)
June to September	Northeast India	5-P PCR (30 yrs)	0.56 (1988-2014)	10.97 (1988-2014)
June to September	Central India	5-P PCR (30 yrs)	0.44 (1988-2014)	12.1 (1988-2014)
June to September	South Peninsula	6-P PCR (30 yrs)	0.51 (1988-2014)	13.31 (1988-2014)
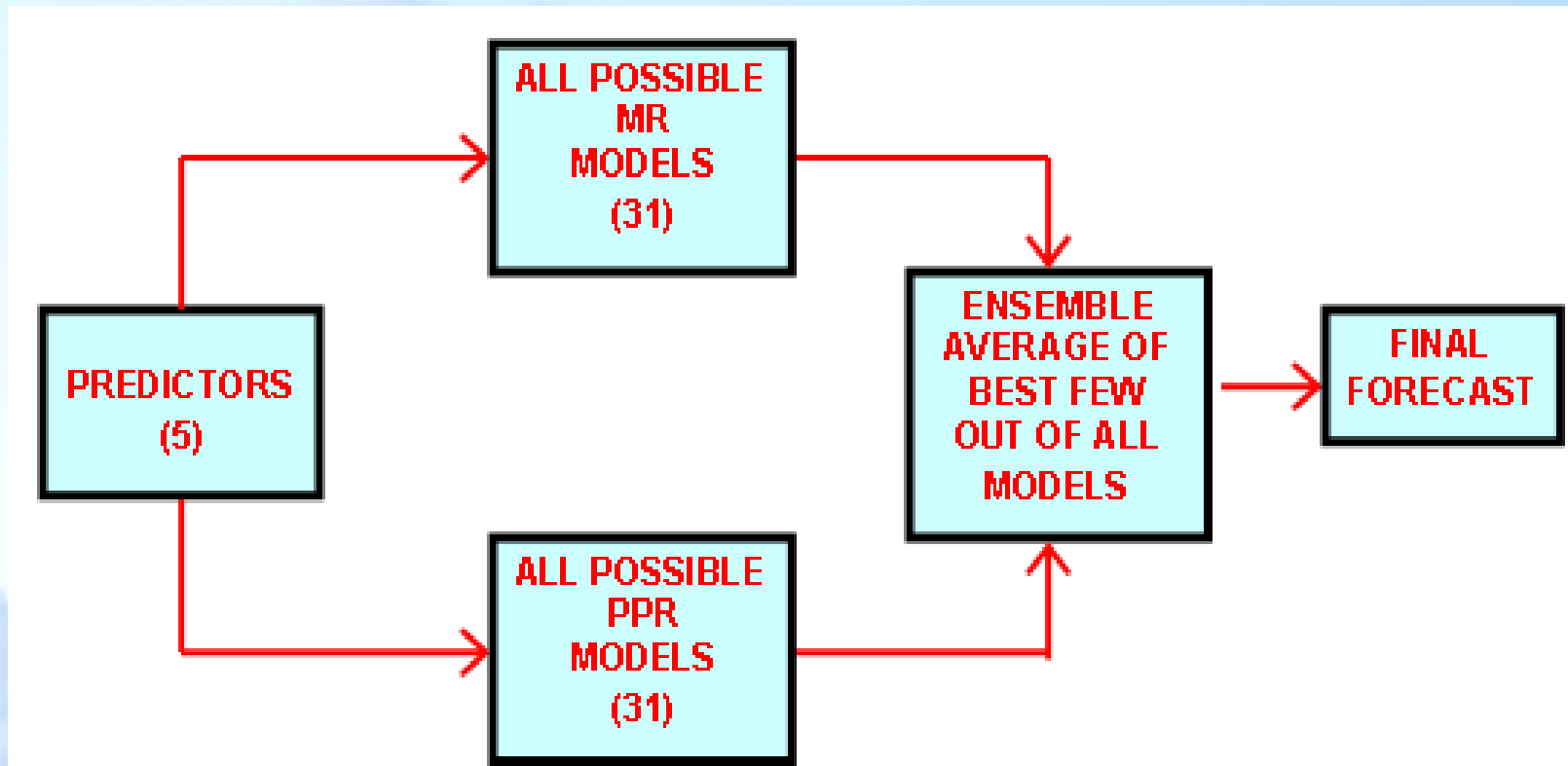
The average of the ensemble forecasts from best out of all possible MR (multiple regression) and PPR (projection pursuit regression) models gives the final forecast.

New statistical models for long-range forecasting of southwest monsoon rainfall over India

M. Rajeevan · D. S. Pai · R. Anil Kumar ·
B. Lal

Abstract The India Meteorological Department (IMD) has been issuing long-range forecasts (LRF) based on statistical methods for the southwest monsoon rainfall over India (ISMR) for more than 100 years. Many statistical and dynamical models including the operational models of IMD failed to predict the recent deficient monsoon years of 2002 and 2004. In this paper, we report the improved results of new experimental statistical models developed for LRF of southwest monsoon seasonal (June–September) rainfall. These models were developed to facilitate the IMD's present two-stage operational forecast strategy. Models based on the ensemble multiple linear regression (EMR) and projection pursuit regression (PPR) respectively, and those of June models were 0.63 and 0.38, respectively. Root mean square error of these models during the verification period (1981–2004) varied between 4.56 and 6.75% from long period average (LPA) as against 10.0% from the LPA of the model based on climatology alone. These models were able to provide correct forecasts of the recent two deficient monsoon rainfall events (2002 and 2004). The experimental forecasts for the 2005 southwest monsoon season based on these models were also found to be accurate.

Predictors Used in the Ensemble Prediction System

S.No	Predictor Used	Issued in
1	**Europe Land Surface Air Temperature Anomaly (January)**	**April**
2	**Equatorial Pacific Warm Water Volume (February + March)**	**April**
3	**SST Gradient Between Northeast Pacific and Northwest Atlantic (December +January)**	**April and June**
4	**Equatorial SE Indian Ocean SST (February)**	**April and June**
5	**East Asia Mean Sea Level Pressure (February + March)**	**April and June**
6	**Nino 3.4 Sea Surface Temp (MAM + Tendency (MAM-DJF))**	**June**
7	**North Atlantic Mean Sea Level Pressure (May)**	**June**
8	**North Central Pacific Zonal Wind Gradient 850 hPa (May)**	**June**

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Predictors used in the Statistical Ensemble Forecasting System (SEFS) for the First Stage Forecast of the seasonal rainfall over the country as a whole: 2019

S.No	Predictor	Period
1	SST Gradient Between Northeast Pacific and Northwest Atlantic (December +January)	December +January
2	Equatorial SE Indian Ocean Sea Surface Temperature	February + March
3	East Asia Mean Sea Level Pressure	February + March
4	NW Europe Land Surface Air Temperatures	January
5	Equatorial Pacific Warm Water Volume	February +March

GEOGRAPHICAL LOCATION OF PREDICTORS USED FOR SEASONAL FORECASTING
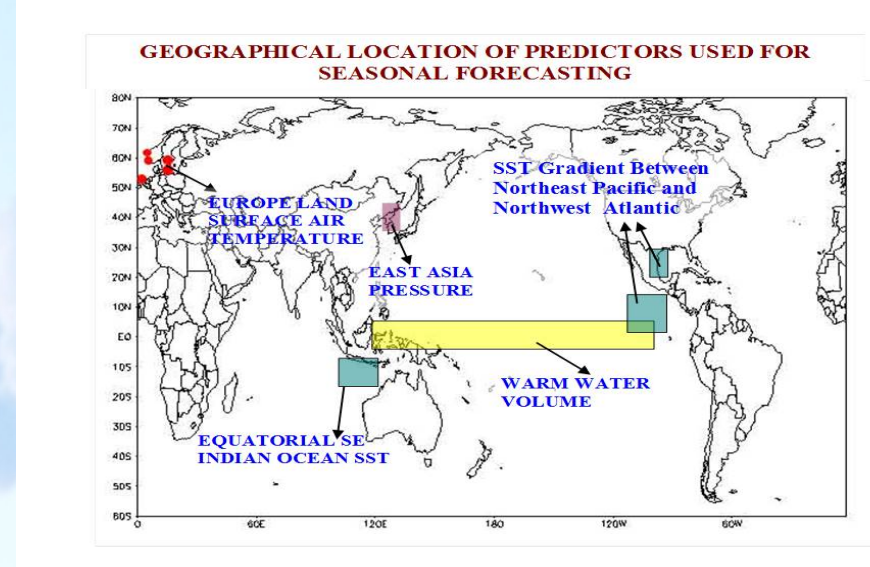
Performance of the
April Ensemble Forecasting System: 1981-2018

PERFORMANCE OF ENSEMBLE FORECAST SYSTEM
(1981-2018): April

C.C = 0.70
RMSE = 6 % of LPA

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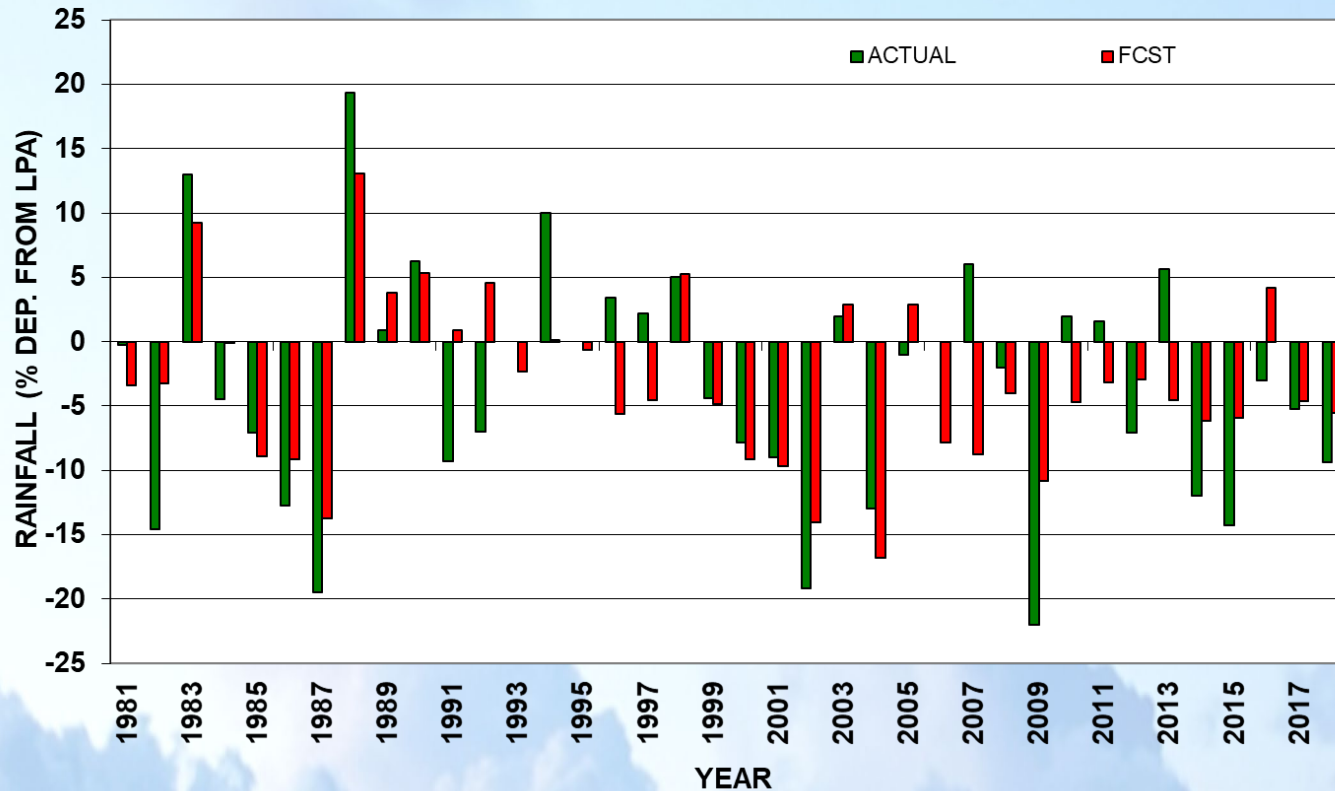
Performance of Operational Forecast (Empirical Model) for All India Seasonal Rainfall (1989-2018):

PERFORMANCE OF OPERATIONAL FORECAST: JJAS
Rainfall Over Country as a Whole
(1988-2018)
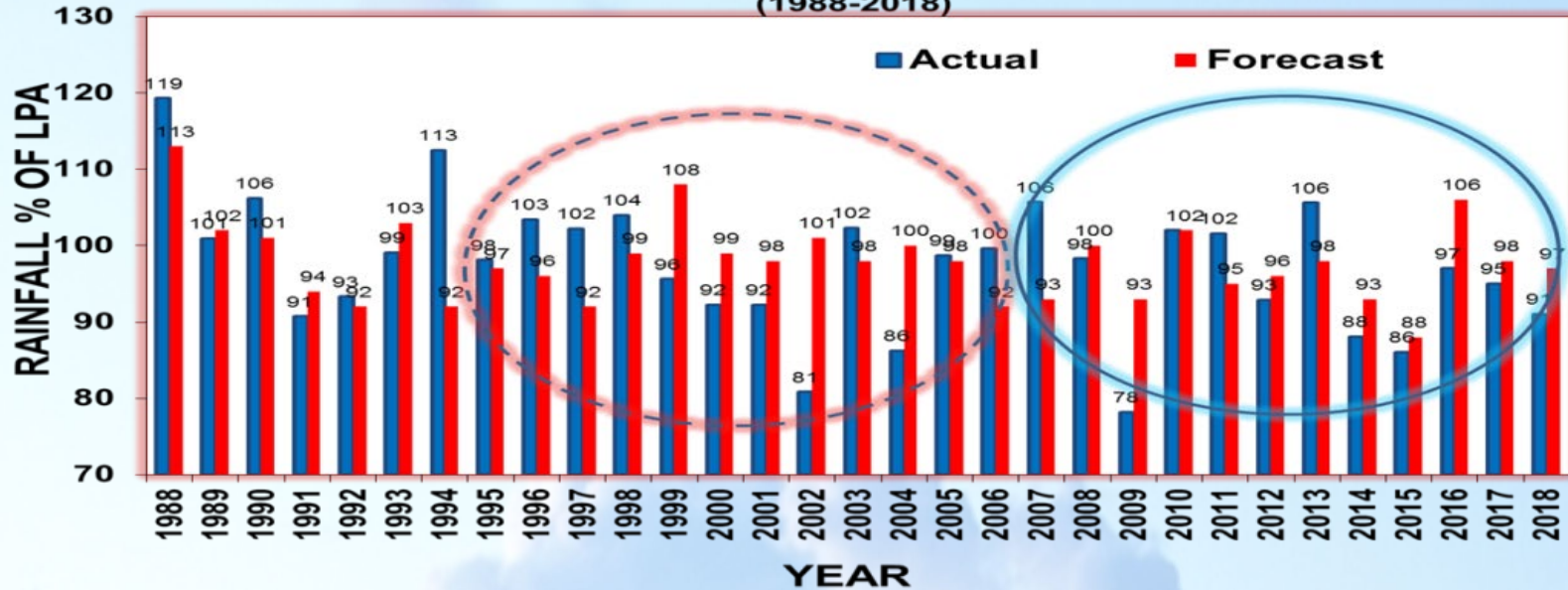
Statistical ensemble forecasting system introduced in 2007.
The average absolute error (difference between forecast and actual rainfall) during the last 12 years (2007-2018) since 2007 was 5.95% of LPA compared to the average absolute error of 7.94% of LPA during the 12 years (1995 -2006) just prior to that period.

During 1995-2006, the forecast was within the ±8% of actual values during 8 years. Within these 8 years, forecast was within ±4% during 3 years. On the other hand during 2007-2018, the forecast was within the ±8% of actual values during 8 years with forecast within ±4% during 5 years.

These clearly indicate improvement made in the operational forecast system in the recent 12 years period compared to earlier 12 years period.

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PCR model for the Forecasting date of Monsoon onset over Kerala

No	Name of Predictor	Period	C.C (1975-2000)
1	Zonal Wind at 200hpa over Indonesian region	16th -30th Apr	0.48
2	OLR Over South China Sea	16th- 30thApr	0.40
3	Pre-Monsoon Rainfall Peak Date	Pre-monsoon April-May	0.48
4	Minimum Surface air Tem. over NW India	1st -15th May	-0.37
5	Zonal Wind at 925hpa over Equatorial South Indian Ocean	1st -15th May	0.52
6	OLR Over Southwest Pacific	1st -15th May	-0.53

Year	Actual Onset Date	Forecast Onset Date
2005	7th June	10th June
2006	26th May	30th May
2007	28th May	24th May
2008	31st May	29th May
2009	23rd May	26th May
2010	31st May	30th May
2011	29th May	31st May
2012	5th June	1st June
2013	1st June	3rd June
2014	6th June	5th June
2015	31st May	5th June
2016	8th June	7th June
2017	30th May	30th May
2018	29th May	29th May
2019	8th June	6th June

Performance of the PCR Model for Monsoon Onset over Kerala: 1997-2015
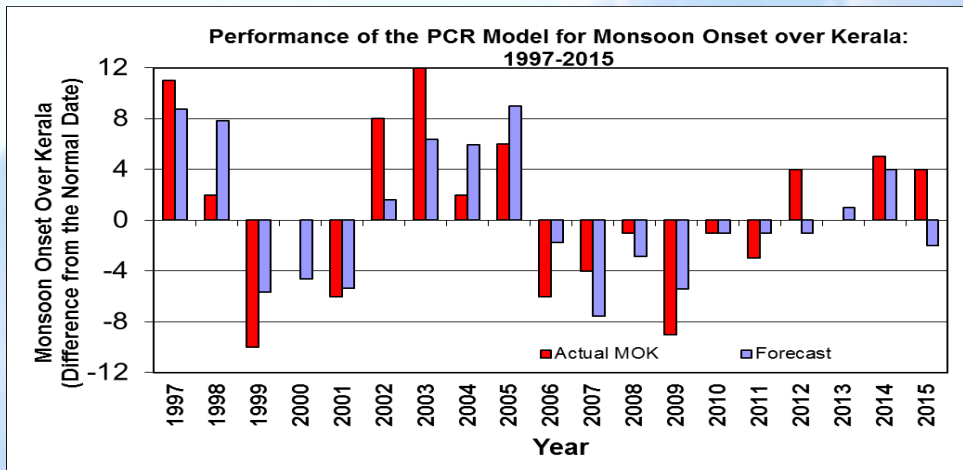
Model error = 4 days

The forecast issued for the 2019 monsoon onset over Kerala was accurate. Thus the forecast issued for MOK date since 2005 has been within the forecast limits during all the 15 years except in 2015.

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ESSO-IMD Operational Forecast for 2019 Monsoon Rainfall & Verification

Region	Period	Forecast (% of LPA)			Actual Rainfall (% of LPA)
		15th April	31th May	1st August	
All India	June to September	96 ± 5	96 ± 4		110
Northwest India	June to September		94 ± 8		98
CentralIndia	June to September		100 ± 8		129
Northeast India	June to September		91 ± 8		88
South Peninsula	June to September		97 ± 8		116
All India	July		95 ± 9		105
All India	August		99± 9		115
All India	August to September			100 ± 8	130

The forecasts for the seasonal rainfalls over two broad geographical regions (Northwest India and Northeast India) and that for July rainfall over the country as a whole were with in the forecast limit and correct. Also, the forecasts for the rainfall over the country as whole during the season and second half of the monsoon season and forecast for the Central India and South Peninsula were underestimate to the actual rainfall and were not correct.

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Probabilistic Forecast 2019

April Forecast

Category	Rainfall Range (% of LPA)	Forecast Probability (%)	Climatological Probability (%)
Deficient	< 90	17	16
Below Normal	90 - 96	32	17
Near Normal	96 -104	39	33
Above Normal	104 -110	10	16
Excess	> 110	2	17

May 31st Forecast

Category	Rainfall Range (% of LPA)	Forecast Probability (%)	Climatological Probability (%)
Deficient	< 90	15	16
Below Normal	90 - 96	32	17
Normal	96 -104	41	33
Above Normal	104 -110	10	16
Excess	> 110	2	17

Rainfall Anomalies Predicted by the CFS T382 (Initialized with April & May Initial Conditions)
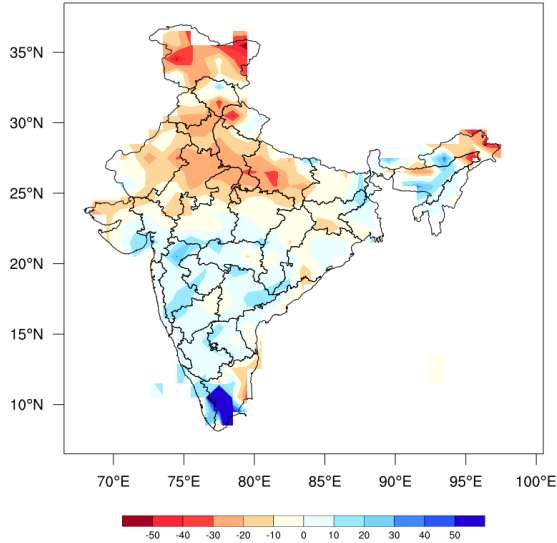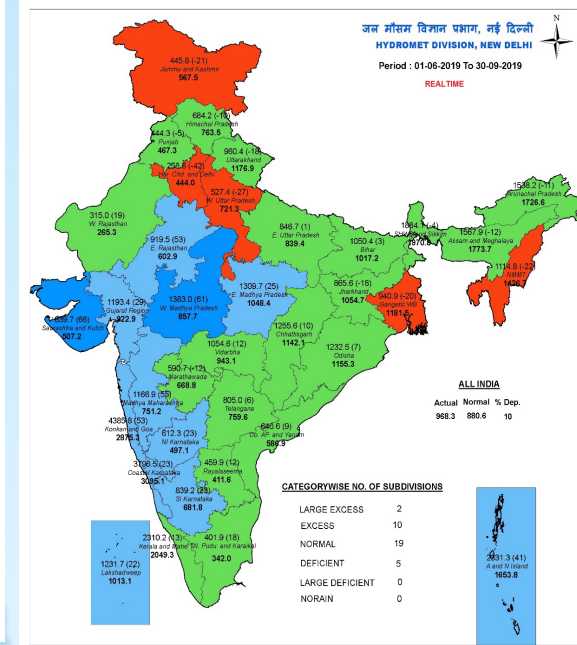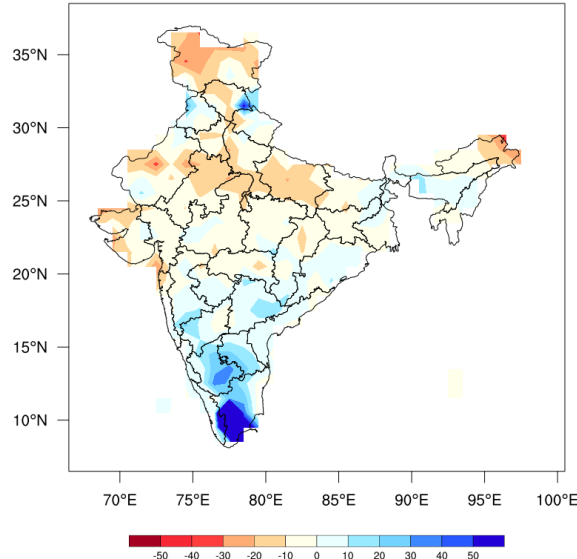
IC	C.C (1981-2008)	Forecast for 2019 (% of LPMA)
April	0.35	94
May	0.23	97

Forecasts from various Indian Institutes

S.No.	Institute	Model	Forecast (% of LPA)
1.	Space Applications Centre (SAC), Ahmedabad	Empirical model based on Genetic Algorithm	91%
2.	IMD, New Delhi	Hybrid Model (CFS)	97%
3.	Onkari Prasad (Retired IMD)	South Indian Ocean convergence zone based relation	Weak monsoon
4.	IISc, Bangalore	Stacked Auto-encoder method	99.5%
5.	School of Earth Ocean and Climate Sciences, IIT, Bhubaneswar	MME of 6 dynamical models	-

The experimental forecasts from most of the models indicated normal monsoon season rainfall over the country as whole.

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Seasonal Forecasts from International Climate Centers

S. No	Centre issuing the Forecast	Method	Inference for 2019
1.	ECMWF, UK	Coupled Model	**JJA & JAS (Issued: May 2019):** Normal rainfall is likely over most parts of India. Normal to below normal rainfall is likely over parts of eastern India and neighboring regions near foothills of Himalaya.
		EUROSIP Multi Model Ensemble (MME): 5 Coupled Models	**JJA and JAS (Issued: May 2019):** Normal to below normal rainfall is likely over the most parts of the country. However, there is slight possibility to have above normal rainfall over some of the west coastal region.
2.	International Research Institute for Climate and Society, USA	MME 7 Models (AGCM & CGCM)	**JJA & JAS (Issued: May 2019):** Above normal rainfall is likely over some of the west central and eastern parts of India. Below normal rainfall is likely over some parts of south peninsular and northeastern India.
3.	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Coupled Model	**JJA (Issued: May 2019):** Positive rainfall anomalies are predicted over most parts of south, northeast and east coast region of India. Negative rainfall anomalies are predicted over remaining areas like west central, northwest and north India.
4.	APEC Climate Center	MME 6 Models (AGCM & CGCM)	**June, July, August & September (Issued: May 2019):** Normal to below normal rainfall is likely over parts of northwest India. Below normal rainfall is likely over parts of south India. Above normal rainfall likely over some parts of the eastern India.
5.	Met Office, UK	Coupled Model	**JJA & JAS (Issued: May 2019):** Normal to below normal rainfall is likely over most parts of the country. However, above normal rainfall is likely over some of the northeastern parts of the country.
6.	WMO LRFMME	AGCM & CGCM	**JJA (Issued: May 2019):** Below normal rainfall is likely over most parts of the country. Climatological probabilities are likely for rest of the Country. **JJAS (Issued: May 2019):** Positive rainfall anomalies are predicted over some of the northeastern parts of the country. Indian region. Negative rainfall anomalies are predicted over most parts of the country.
7.	NMME	MME of 8 Models &	**JJA & JAS (Issued: May 2019):**

Observed Rainfall Pattern during JJAS 2019

The seasonal rainfall pattern was typically non El Nino type with below normal rainfall over NE India with normal rainfall over remaining region. This indicates absence of El Nino impact (except in the month of June).
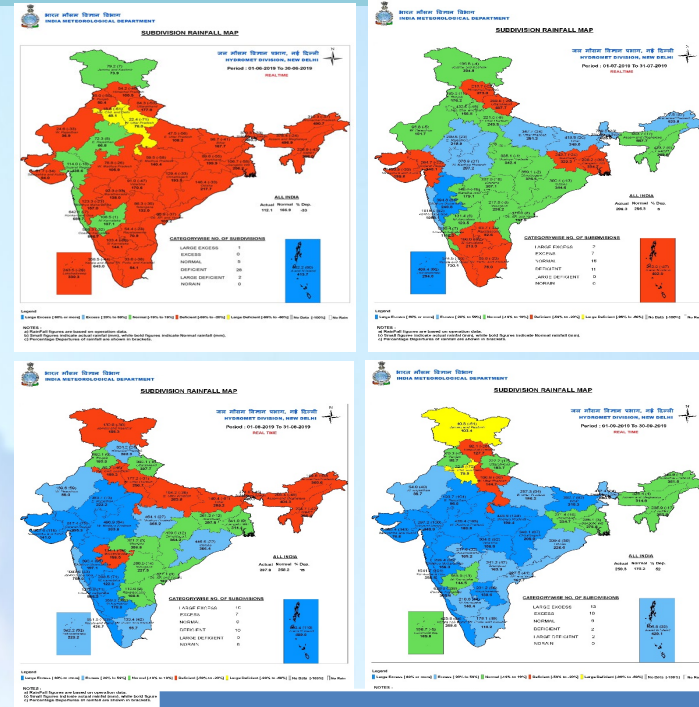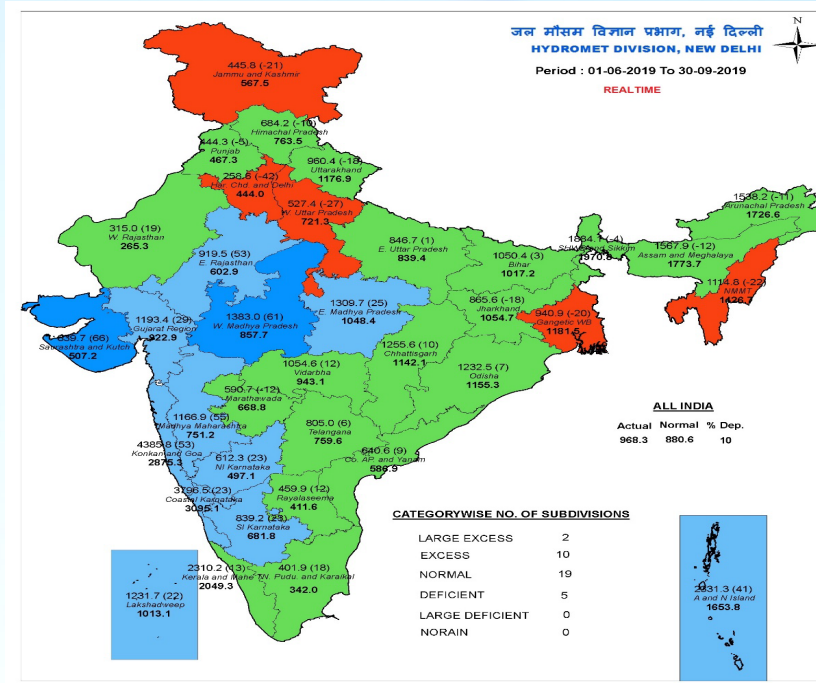
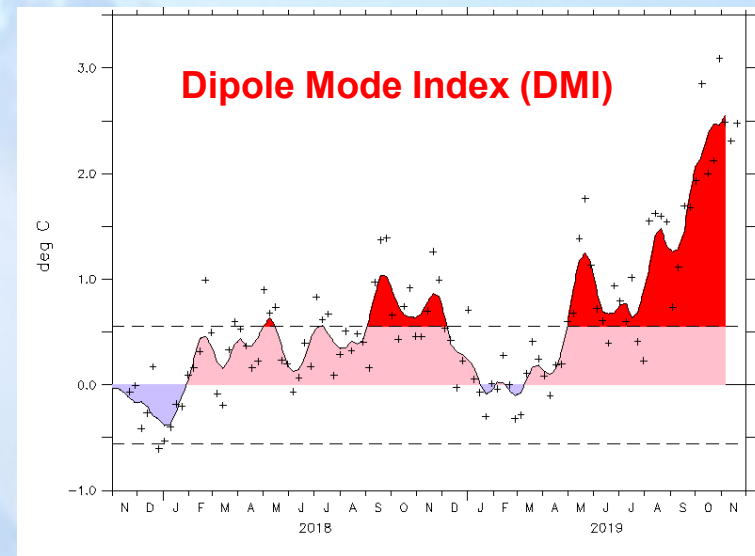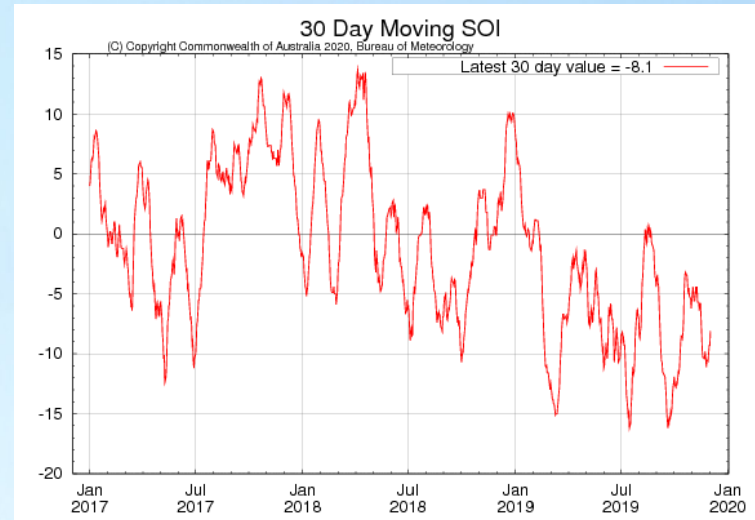| 2019 - Actual Rainfall(% of LPA)					
	JUN	JUL	AUG	SEP	JJAS
India	67	105	115	152	110
NWI	68	101	99	111	98
CI	69	109	139	107	129
NEI	63	111	62	114	88
SPI	70	89	156	149	116

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ENSO & IOD Conditions during 2019

Time series of SST anomalies (°C) in the Niño regions

SST Anomalies (NINO 4, NINO 3.4, NINO 3, NINO 1+2)
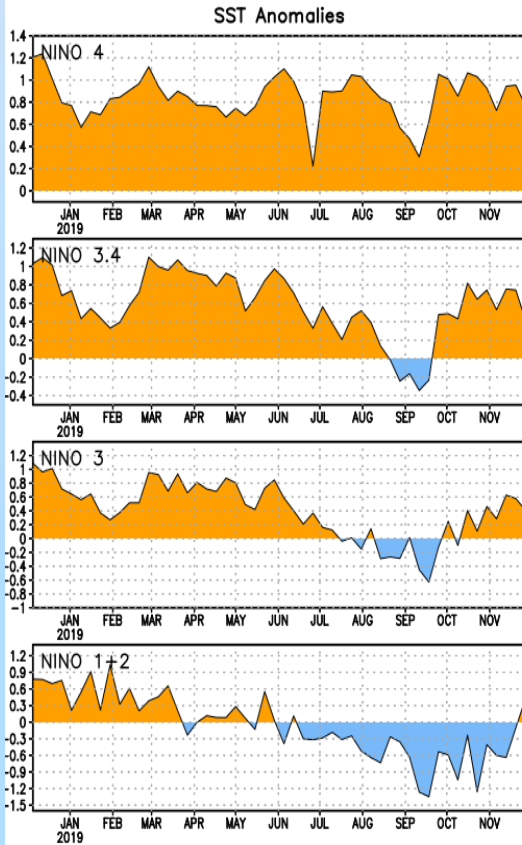
Weak El Nino Conditions prevailed over Equatorial Pacific during the first half of monsoon season.

Atmospheric conditions were also indicating El Nino in the first half of the monsoon season and ENSO Neutral condition in the second half.

Positive IOD conditions prevailed during the monsoon season (strong +ve in September month) over the Indian Ocean.

30 Day Moving SOI
(C) Copyright Commonwealth of Australia 2020, Bureau of Meteorology
Latest 30 day value = -8.1

Dipole Mode Index (DMI)

MJO and West Pacific Storms

MJO Index JJAS 2019
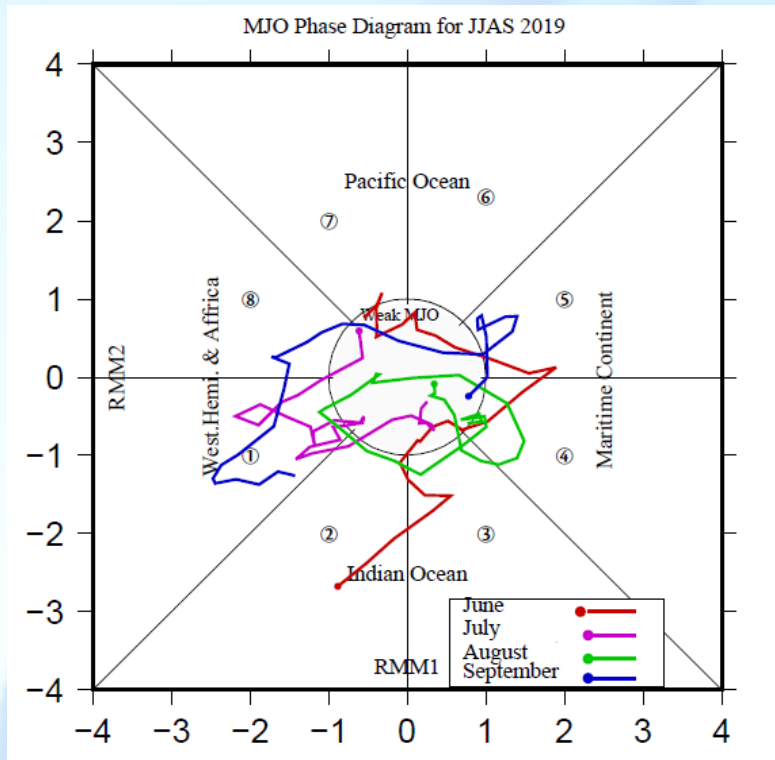
West Pacific Storm Tracks
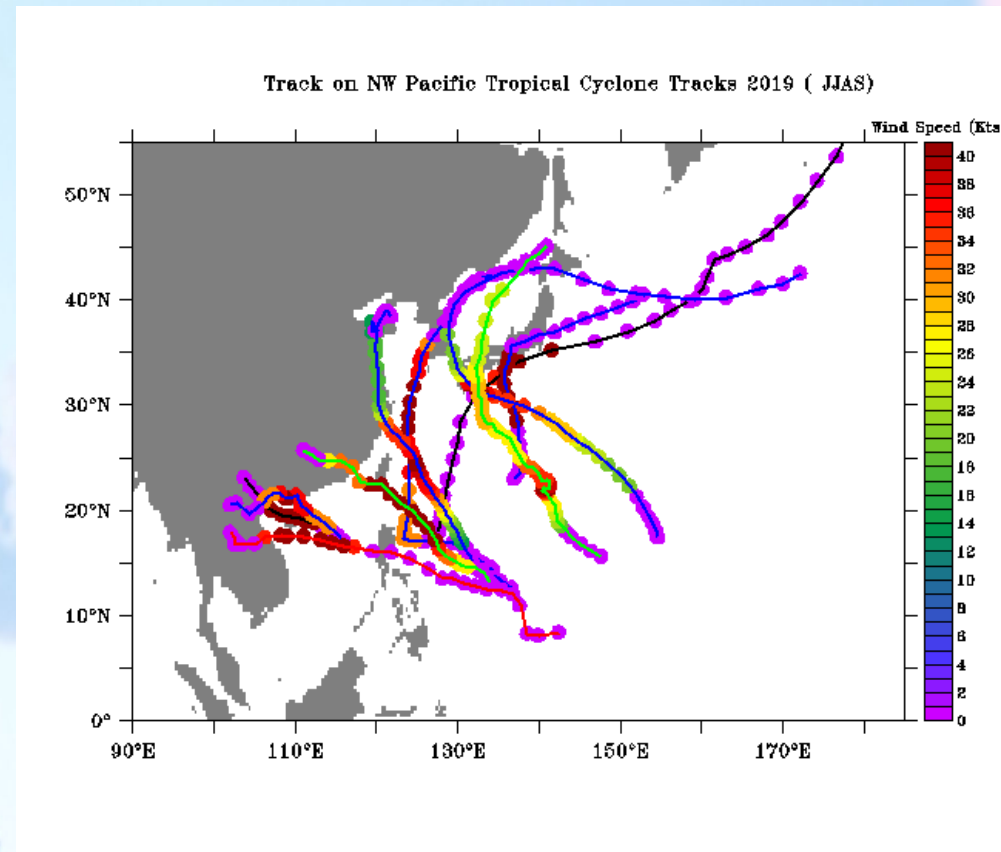
MJO activity was absent over Indian Ocean during most part of the season except beginning of Monsoon season.

Below Normal Typhoon activity over west Pacific

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Verification of SASCOF-14 forecast
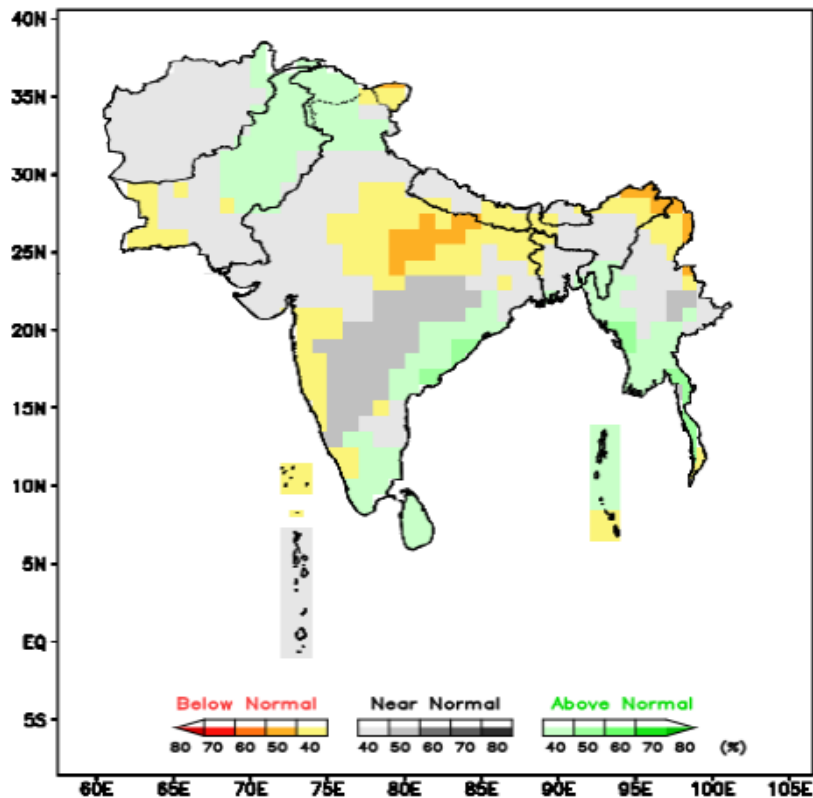
Consensus outlook for 2019 Southwest Monsoon Rainfall over South Asia
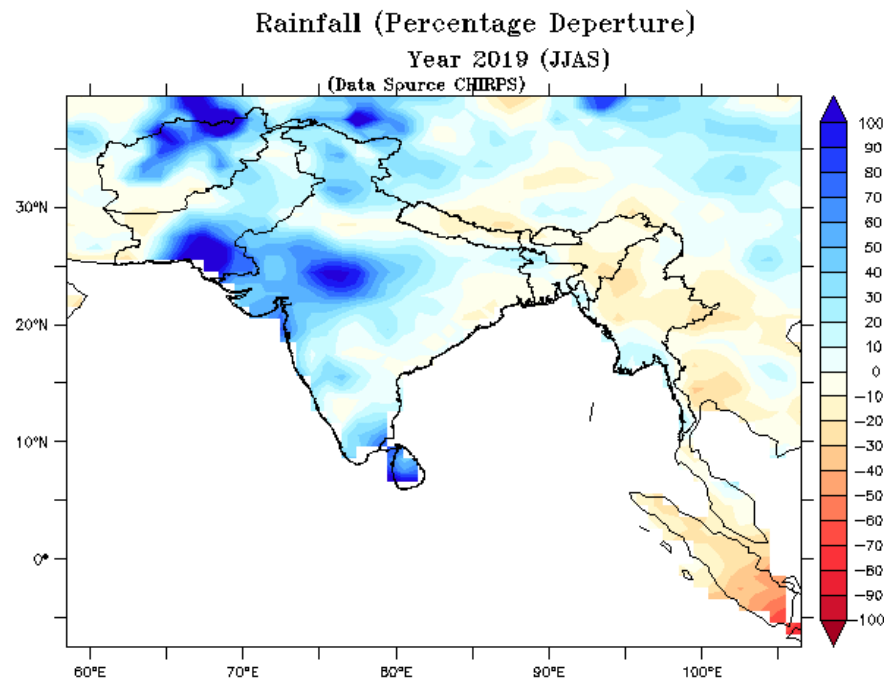
Normal rainfall is most likely during the 2019 southwest monsoon season (June – September) over most parts of South Asia. However, above normal rainfall is likely over some northern parts of the region, eastern coastal areas of Peninsular India, Sri Lanka, southern parts of Myanmar, and most parts of Andaman Nicobar Islands. Below-normal rainfall is likely over some areas of southern Pakistan, some areas along the west coast of Peninsular India, northern parts of central India and some areas of northeastern part of the region. Remaining areas are likely to experience normal rainfall.

Summary

- After 1994 (110% of LPA), rainfall received in 2019 (110 % of LPA) is the highest season rainfall received by the country as a whole
- El Niño conditions prevailed over the tropical Equatorial Pacific during the beginning of monsoon. But turned into ENSO Neutral conditions in the second half of the season.
- Positive Indian Ocean Dipole (IOD) with strong Positive IOD in the second part of the Season prevailed over Indian Ocean.
- June rainfall was deficient (67% of LPA) due to the negative impact of the prevailing El Niño and delayed onset of monsoon over Kerala
- After 1931, this is the first time, the seasonal rainfall is more than LPA even after the June rainfall deficiency was more than 30% of LPA.
- Due to weakening of the El Nino conditions and emergence of the positive IOD during July, rainfall activity increased significantly
- East and Northeast India received only 88% of LPA.

- The seasonal forecast issued by IMD was within the forecast limit up to 25th September 2019, the last week rainfall was 181% of LPA makes all India rainfall to above normal category.
- Overall, the impact of synoptic scales systems on the monsoon performance was very significant this year resulting in increased uncertainty in the predictability of monsoon at extended and seasonal scales

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Ministry of Earth Sciences
Government of India

El Niño/La Niña
Indian Ocean Dipole
Update (15th October 2016)

1. Current Sea Surface Temperature (SST) Conditions over Pacific & Indian Oceans

During September 2016, cool SSTs anomalies persisted along much of the equator in the eastern and central Pacific crossing the date line, while positive SST anomalies were observed over north and south of this band. Cool SST anomalies (since August 2016) were observed over North Pacific Ocean off the west coast of North America, which was warmer as observed in July month. Cool SST anomalies persisted in the subtropical north and south Pacific. SST anomaly difference from August to September (Fig.1b) shows there was SST cooling of up to -1°C over the small patches along the equator in the eastern and central Pacific and a smaller region in east pacific showing warming of SSTs. Slight increase in SST positive anomaly over some pockets of east Pacific Ocean was observed as compared to August month, where cooling was observed over the entire equatorial Pacific Ocean.

During September 2016, cool SST anomalies were observed over most parts of Arabian Sea, equatorial Indian Ocean and south subtropical Indian Ocean (Fig.1a) and warm anomalies is observed over Bay of Bengal and over maritime continents in the east equatorial Indian Ocean. The positive anomalies which were observed over the maritime continents in August continue to exist. During September, cooling of SST was observed over the entire Indian Ocean while warm SSTs persisted over maritime continents in east equatorial India Ocean (Fig.1b).

1.1. El Niño Southern Oscillation (ENSO) conditions over the Pacific Ocean

The monthly time series of Niño3.4 SST anomalies for the last 12 months (Fig.2a) suggest that the El Niño conditions which started since April 2015 after peaking during December 2015 have continued to weaken to neutral conditions in summer 2016. In association with the decay, cool subsurface anomalies were observed in the western Pacific crossing the date line towards east (Fig.2b).

1.2. Indian Ocean Dipole (IOD) Conditions over Indian Ocean

Warm subsurface (Fig. 2d) anomalies were observed in the eastern Equatorial Indian Ocean. Cool subsurface anomalies which were seen over a region centred at 50°E at thermocline level (approximately about 100m depth) in September. The subsurface dipole strength is stronger in September compared to August. The September Dipole Mode index (DMI) suggests negative IOD conditions currently present in the Indian Ocean (Fig. 2c).

2. ENSO & IOD Forecast

The SST forecast were prepared using the ESSO-IMD-IITM high resolution Coupled Forecast System (AGCM T382L64; 38 km and OGCM 25km in tropics) based on 2016 September initial conditions. The initial conditions for the model runs were obtained from ESSO-INCOIS and ESSO-NCMRWF analysis. Probability density function (PDF) correction, based on hindcasts for the period 1982-2008 was applied over the forecasts of Niño3.4 index (Fig.4a) and DMI (Fig.4b).

The forecasted 3-month season averaged SST anomalies (Fig.3) indicate cooler SST anomalies in the central equatorial Pacific Ocean in OND season, which persisted till DJF with reduced intensity. Warming of SST conditions is observed in either side of this narrow band till JFM season. There is neutral El Niño condition currently prevailing in Pacific Ocean which is likely to remain the same for the forecasted seasons (Fig.4a). In the central Indian Ocean, cool SST anomalies are observed in OND season and are likely to remain near normal in the later forecasted seasons (Fig.3). The IOD conditions over Indian Ocean are likely to remain negative in OND season (Fig.4b) and remain neutral in the later forecasted seasons.

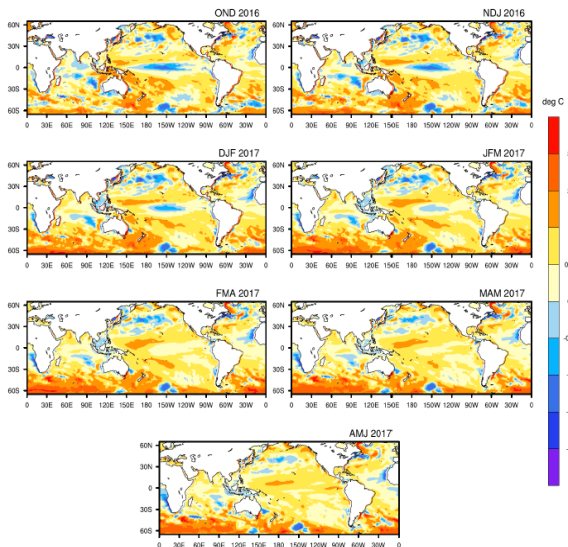**IITM CFSv2 SST Anomaly Forecast : September 2016 IC**

Fig.3: Forecasted Seasonal mean SST anomalies for 3 monthly seasons, (a) October through December (OND), (b) November through January (NDJ), (c) December through February (DJF) (d) January through March (JFM), (e) February through April (FMA), (f) March through May (MAM) and (g) April through June (AMJ).
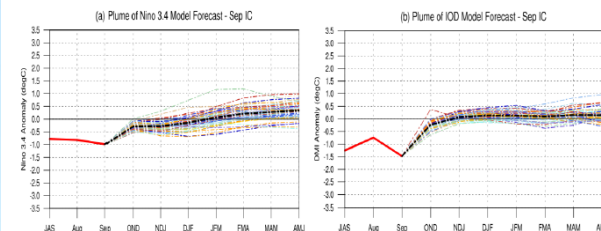
Fig.4: Plume of (a) Niño 3.4 SST anomalies, (b) Indian Ocean Dipole Mode Index forecasted by high resolution CFSv2. The forecasts were PDF corrected for bias and variance. The solid red line is the observed SST anomaly (INCOIS-GODAS) and dashed black line is the ensemble SST anomaly forecast mean of 47 members (CFSv2). The individual ensemble member forecasts are shown in light dotted lines of different colours.

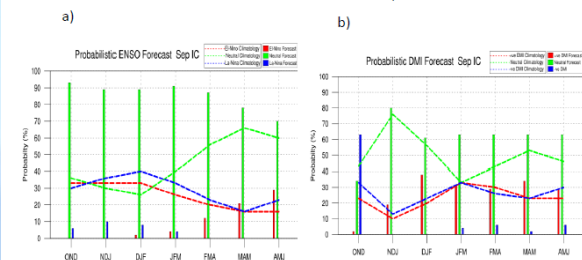**Probability Forecast for Niño 3.4 and Dipole Mode Index**

Fig.5: Probability forecast along with climatological probability of (a) Niño 3.4 and (b) Indian Ocean Dipole Mode Index from high resolution CFSv2. Data source for Climatology probabilities: NOAA Extended Reconstructed SST V3b. Criteria used for Probabilistic ENSO Forecast: ≤ -0.5 La Niña, >0.5 to <-0.5 neutral, ≥ 0.5 El Niño. Criteria used for Probabilistic DMI Forecast: ≤ -0.2 negative DMI, >0.2 to <-0.2 neutral, ≥ 0.2 positive DMI.

The probability forecast suggests that there is highest probability for ENSO neutral conditions for the season OND and later seasons, which gradually reduces to about 70% in the AMJ forecasted seasons. The probability for neutral ENSO condition remain significantly above the climatological probability throughout the forecast range, which indicate high confidence for the forecast of neutral ENSO condition. The probability for a La-Niña condition is very small and not at all significant, while there is a slight probability for the revival of another episode of El-Niño in the coming pre-monsoon season (AMJ), which is further subjected to the limitations of the spring barrier of ENSO predictability.

The DMI probability forecast for OND season indicates high probability (63%) for negative IOD mode conditions but reduces sharply during NDJ and remain not significant based on climatological probability. Neutral DMI forecast probability indicates increase from OND season to NDJ season and thereafter a slight decrease from DJF season and continue to remain constant and significant till AMJ season.

Seasonal Climate Outlook for South Asia

Ministry of Earth Sciences
Earth System Science Organization

India Meteorological Department
WMO Regional Climate Centre
(Demonstration Phase)
Pune, India

SEASONAL CLIMATE OUTLOOK FOR SOUTH ASIA

(September to December 2016)

Issued in September 2016

- During August 2016, neutral El Niño conditions prevailed over equatorial Pacific Ocean with sea surface temperatures along the equatorial Pacific being cool. The latest coupled model forecast suggests moderate warming will start from January 2017.

- The 2016 spatial pattern of the SON precipitation forecast indicates above normal precipitation over most parts of Central India, whole of Bangladesh, Bhutan, eastern Nepal and Myanmar. The OND precipitation is likely to be similar as that of SON season but with less intensity.

- The country averaged monthly precipitation is likely to be below normal for Afghanistan and Pakistan and normal to above normal for rest of the South Asian countries for the month September, October, November and December .

- The 2016 SON mean temperatures are likely to be normal over all the South Asian countries except for extreme northern parts of India. The OND mean temperatures shows similar pattern as that of SON with increase in the intensity of the anomalies.

- The country averaged monthly mean temperature is likely to be above normal for all South Asian countries for all months (September, October, November and December).
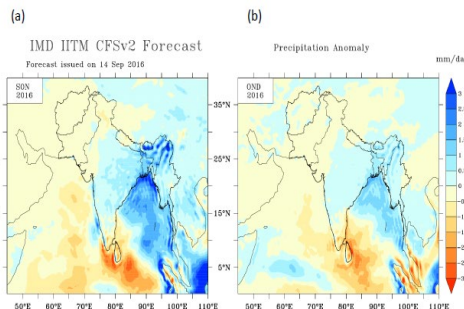
Fig.5: Seasonal forecasts of precipitation anomalies (mm/day) for (a) SON and (b) OND (right) based on Initial conditions of August 2016.
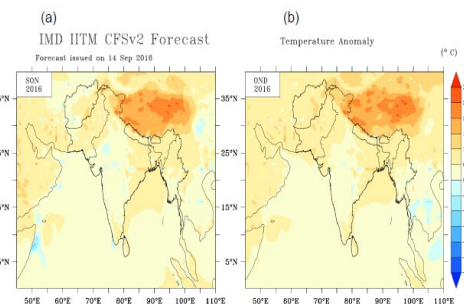
Fig. 6: Seasonal mean temperature anomalies (°C) for (a) SON and (b) OND (right) based on Initial conditions of August 2016.
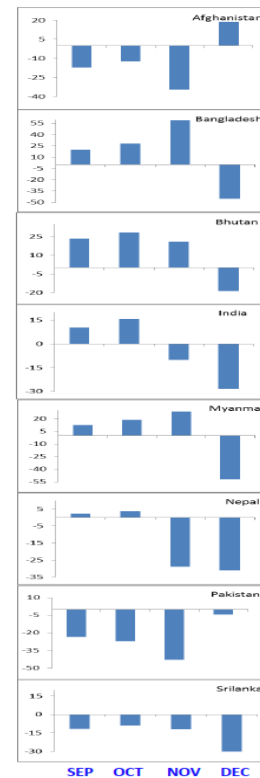
Fig.7: Monthly country averaged rainfall forecast expressed as percentage departures (%) during September to December, 2016 (Normal % departure range 10≥0≥-10).
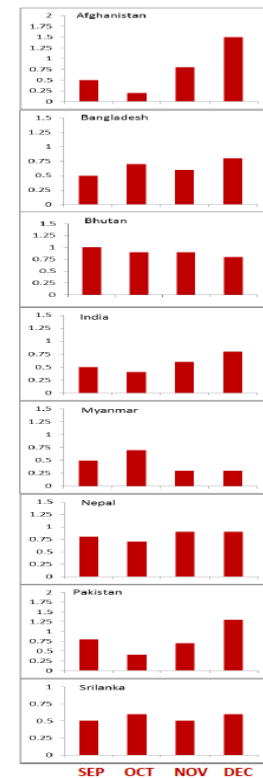
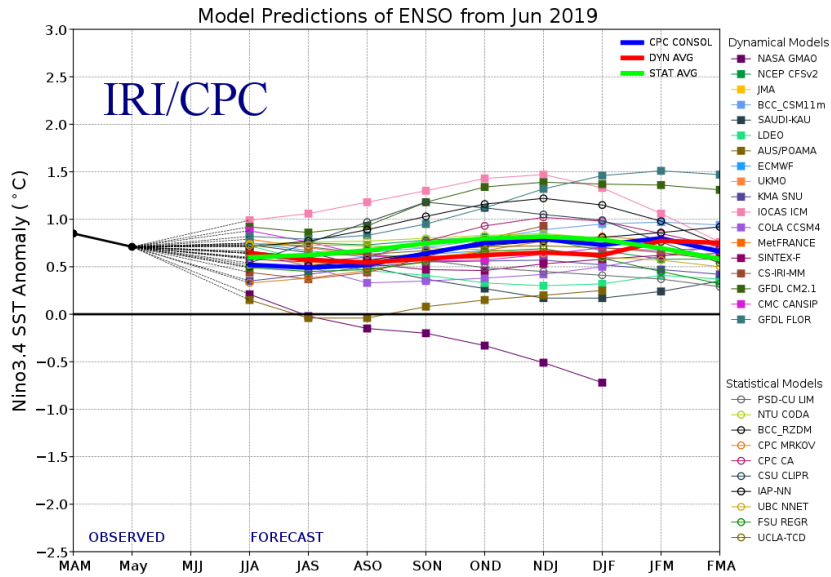**Fig.8:** Monthly country averaged temperature anomaly (°C) forecast during September to December, 2016 (Normal anomaly range 0.25≥0≥-0.25)

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INDIA METEOROLOGICAL DEPARTMENT

Latest Model Forecast for ENSO Conditions over Pacific

Model Predictions of ENSO from Jun 2019

Mid–June 2019 IRI/CPC Model–Based Probabilistic ENSO Forecasts
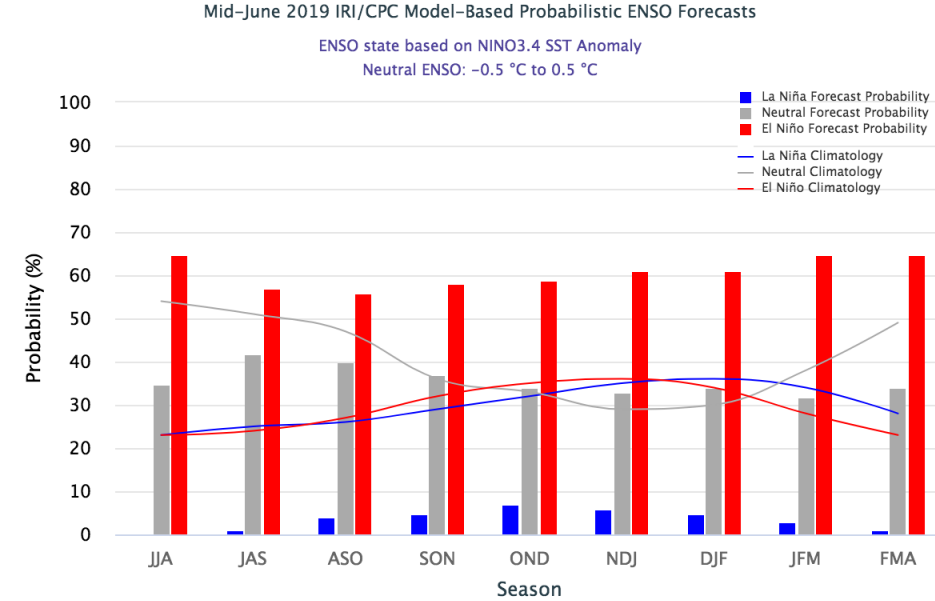
Currently tropical Pacific reflected Weak El Niño conditions. The official CPC/IRI outlook suggests El Niño is favored to continue with chances nearing 50% in Northern Hemisphere fall and winter.
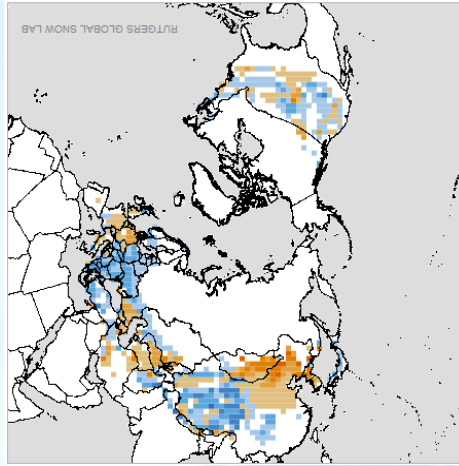
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26-Dec-19

Monthly Snow Cover Area - 2019
Departure from normal

December 2018
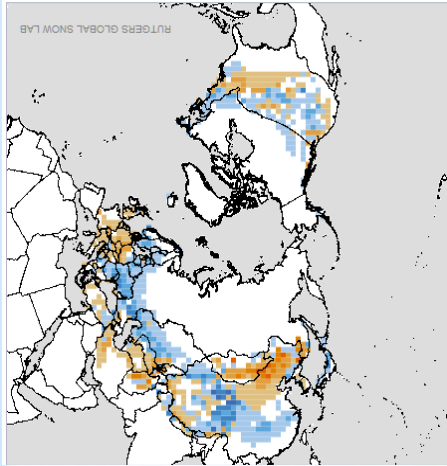
January 2019

February 2019
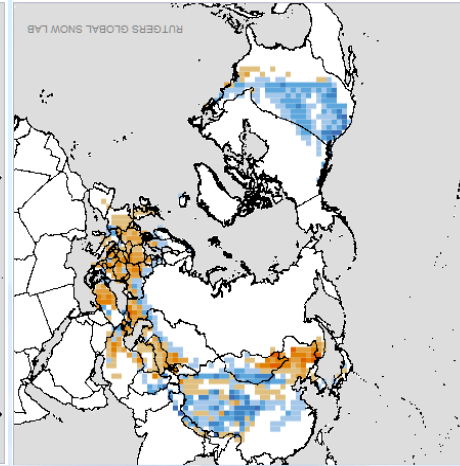
March 2019
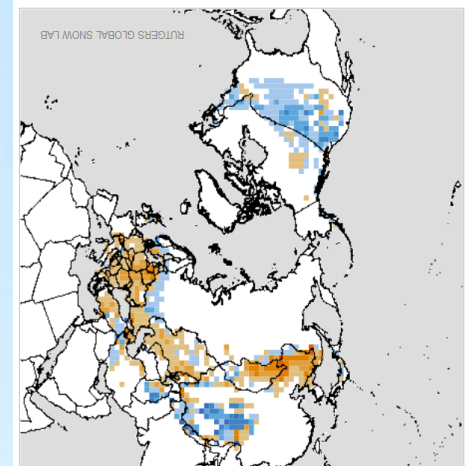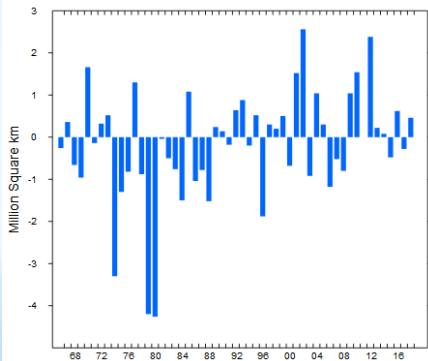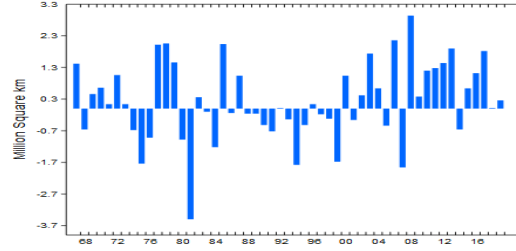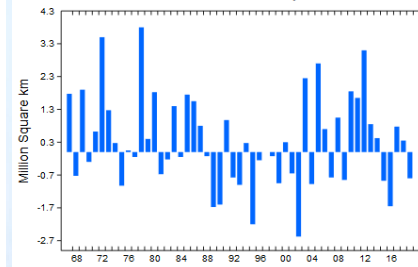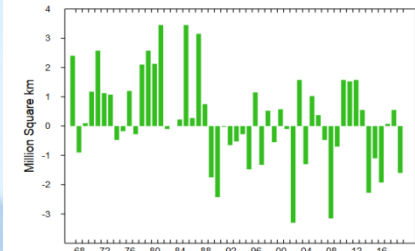
Data source:
RUTGERS UNIVERSITY

❖The snow-covered area over NH as well as Eurasia was normal during Dec 2018, Jan & Feb 2019. Over Eurasia, below normal snow cover area was observed during March 2019. N**H snow cover during winter and spring has a general negative relationship with the subsequent Asian summer monsoon.**
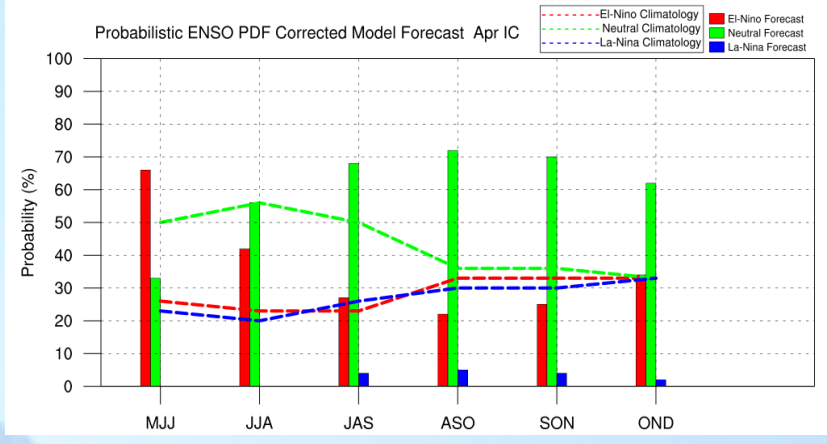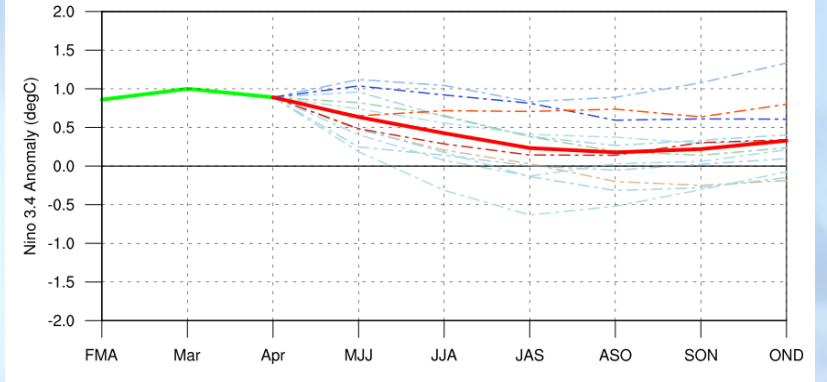
ENSO Forecast - MMCFS:

MMCFS SST Anomaly Forecast : Apr 2019 IC

Plume of Nino 3.4 PDF Corrected Model Forecast

Probabilistic ENSO PDF Corrected Model Forecast Apr IC
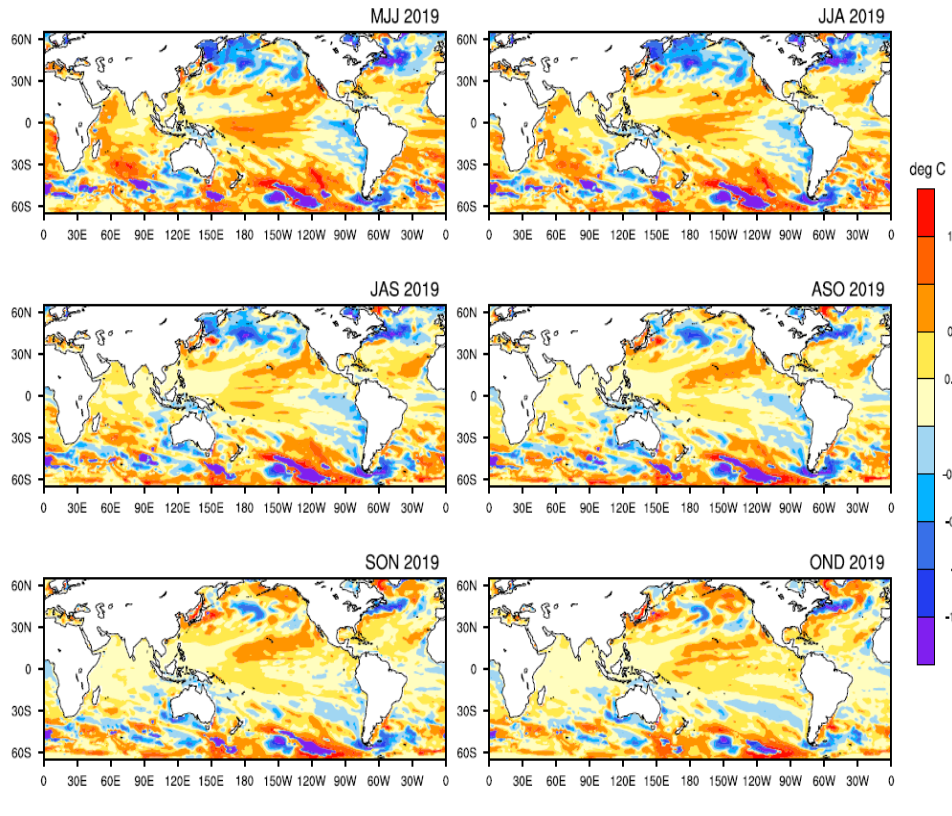
(a) Plume of Nino 3.4 PDF Corrected Model Forecast - Apr IC

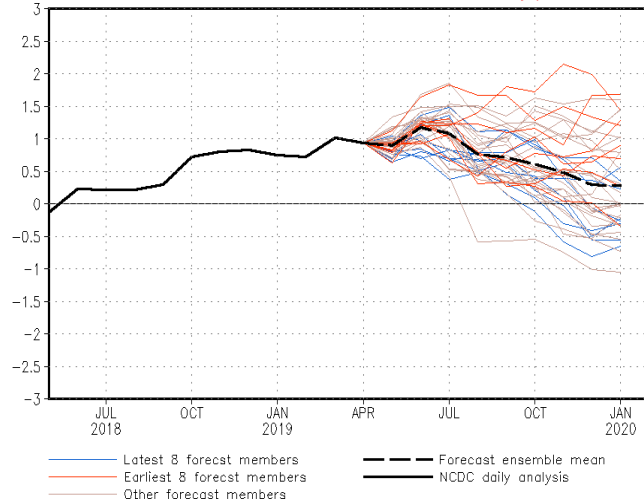Prevailing weak El Niño conditions are likely to continue during the early part of the monsoon season

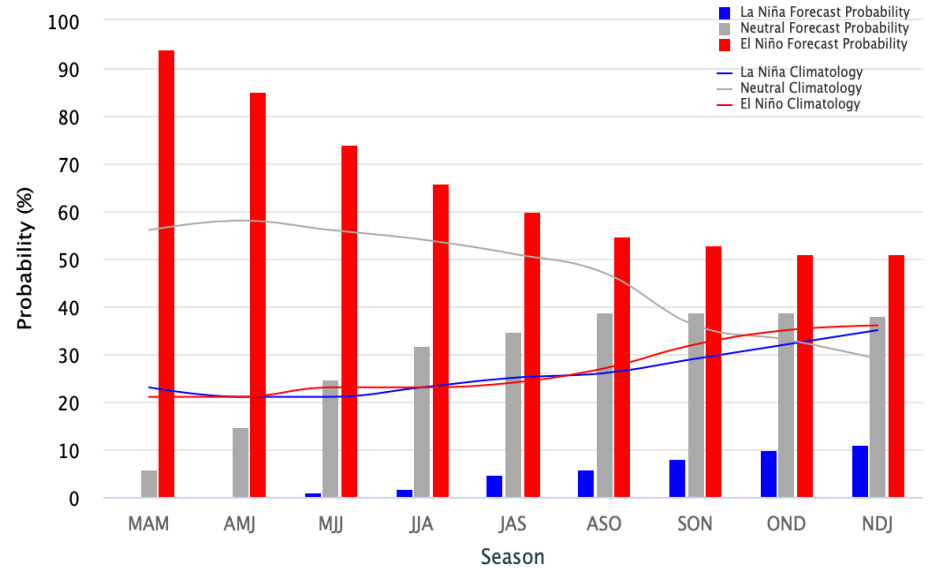# Latest Model Forecast for ENSO Conditions over Pacific: IRI

Currently tropical Pacific reflect weak El Niño conditions. The official CPC/IRI outlook suggests at least weak El Niño conditions to continue through monsoon season. About 60% probability of weak El Nino conditions prevail during the SW monsoon season.