Seasonal weather outlook

(Sep-Nov, 2014)

Issued on Sep 06, 2014

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1. Introduction

A variety of methods including dynamical models, statistical methods, regional expert judgments and combination of them have been used to generate long-range weather forecast by the different climate prediction centers around the world. National Agromet Center (NAMC), Pakistan Meteorological Department adopts an ensemble approach to formulate its seasonal weather outlook for Pakistan (on experimental basis), taking into consideration available products from major climate prediction centres and different Global Climate Models (GCMs).

Regional weather (precipitation and temperature) outlook is predicted from different global climate models by using persisted sea surface temperature on 0000 Sep 01, 2014. Model's output then tuned by applying Regional Correction Factor (RCF). RCF has computed by comparison of Long Range Averages (LRA) with model's simulation for the period (2004-2012) on monthly basis. That might be somewhat different from actual weather because of time to time variation in Sea Surface Temperature (SST) during the season. Accuracy of Outlook seasonal weather mainly depend upon SST used in global climate models. Even with use of accurate SST, still is uncertainty in the climate forecast due to chaotic internal variability of the atmosphere.

Acknowledgement: *NAMC is gratefully acknowledges the International Research Institute (IRI) for climate and Society for providing access of dynamical prediction of Global Climate Model ECHAM4P5, developed and operated by European Center for Medium-Range Weather Forecasts model's simulations and hindcast data to support the formulation of seasonal weather outlook of Pakistan. Output maps have been prepared by using IRI climate software.*

2. Synoptic situation

- Location of jet stream (U wind at 200 hPa) is at normal position with higher than normal intensity. The region may prevail above than normal winds strength. The movement of higher strength winds may cover wider area than normal over the region.

Probability outlook: Above normal intensity of jet stream is associated with above normal precipitation in the region and it seems that weather systems will be focused towards northern parts of the country.

- A trough at 500 hPa is expected to be over upper and central parts of the country. As a result, weather system influenced by local weather phenomenon wills effects in these regions.

  Probability outlook: Precipitation is likely to occur over upper and central parts of the country due to local development.

- Surface temperatures are expected to be on higher side than normal over central parts of the country as compared with normal (1981-2010). However, northern and southern parts may prevail normal surface temperature.

- North Atlantic Oscillation (NAO) is in negative phase (-1.68) and in increasing trend. As a result normal track of western disturbances will persist. http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii.table

  Probability outlook: Above Normal precipitation over all parts of the country will be expected. The focus of weather tracks may be towards central of the country.

- During August 2014, above-average sea surface temperatures (SST) continued across much of the equatorial Pacific. Most of the Niño indices warmed during the month with values of +0.5°C in Niño-4, +0.4°C in Niño-3.4, +0.4°C in Niño-3, and +0.8°C in Niño-1+2. Subsurface heat content anomalies (averaged between 180º-100ºW) also increased during the month as above-average subsurface temperatures developed across the central and east-central equatorial Pacific. This warming is associated with the downwelling phase of an equatorial oceanic Kelvin wave triggered in July by low-level westerly wind anomalies. Westerly wind anomalies continued in the central and eastern part of the basin early in August, but weakened by the end of the month. Enhanced easterly upper-level wind anomalies have prevailed during much of the month, and the Southern Oscillation Index has been negative.

  Most of the models continue to predict El Niño to develop during September-November and to continue into early 2015. A majority of models and the multi-model averages favor a weak El Niño. At this time, the consensus of forecasters expects El Niño to emerge during September-October and to peak at weak strength during the late fall and early winter (3-month values of the Niño-3.4 index between 0.5°C and 0.9°C). The chance of El Niño is at

60-65% during the Northern Hemisphere fall and winter. (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Probability outlook: La Nina (0%), Neutral (57%) and El Nino (43 %) during May-Jun-Jul, 2014 season

- Arabian Sea Surface Temperatures are expected to be slightly above normal near western coastal belt of Pakistan.
- Caspian Sea surface temperatures expected to be slightly above normal over southern half and below normal over upper half.
- Mediterranean Sea surface temperatures are normal to slightly above normal.
- Bay of Bengal Sea Surface Temperatures are close to normal.

Probability outlook: Sea Surface Temperature trend is going towards normal leads to normal rainfall over the region.

3. *Seasonal Weather Outlook Summary (Sep-Nov, 2014)*

Synthesis of the latest model forecasts for Sep-Nov, 2014 (SON), current synoptic situation and regional weather expert's judgment indicates that normal precipitation is expected all over the country with above average during September and below normal during October and November. Above average day temperature is likely to occur during September and above average night temperature during October and November.

2.1. Weather outlook

"Average precipitation is expected during the season all over the country with slightly above normal temperature."

I. Above average rainfall is expected during last phase (September) of monsoon.

II. Above average rainfall may cause flash flooding over eastern and western rivers of the Pakistan.

III. In September, above average rainfall is expected all over the country with average over north eastern parts of the country. Day temperatures are likely to be above normal all over the country with higher value over eastern and central parts of the country.

IV. Monsoon current will be discontinued from mid of September and normal rainfall will occur in the rest of the month.

V. Above normal rainfall is expected over all the provinces except Kashmir.

VI. Day temperature will be on higher side all over the country with higher values over south eastern portion of Punjab and eastern parts of Sindh.

VII. Below normal rainfall is expected during October all over the country.

VIII. Slight rainy spell are expected over KP and FATA provinces during second decade of October.

IX. Night temperature will be on higher side during the month of October all over the country will higher values over central eastern portion.

X. The month of November will be dry month all over the country.

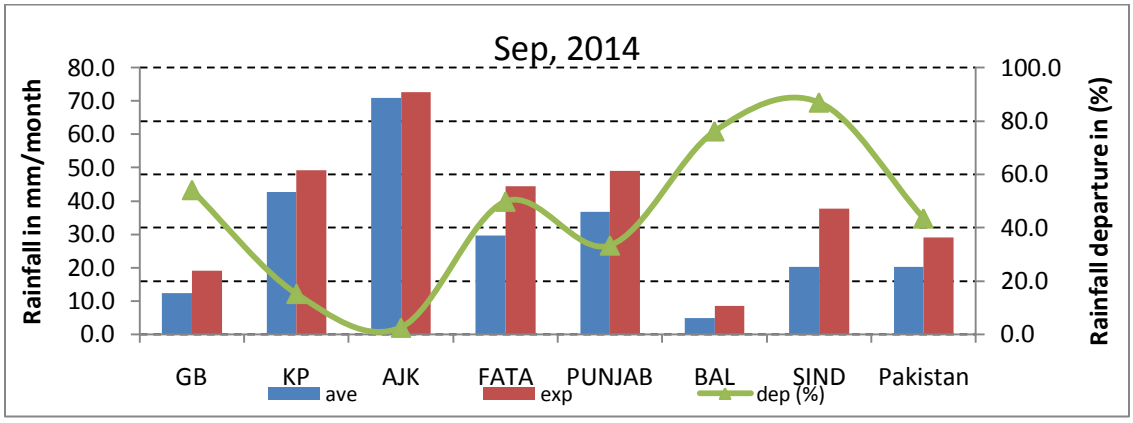
XI. Expected Maximum temperature will be slightly below normal during November.

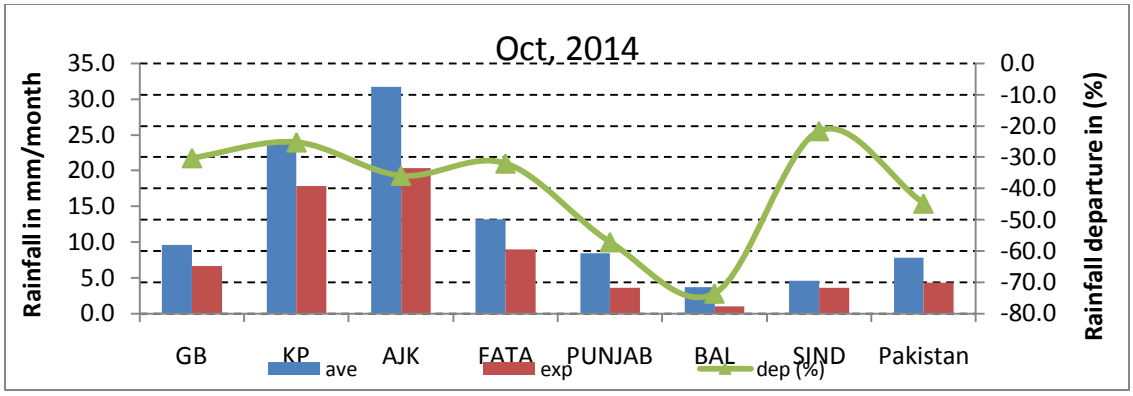
2.2. Monthly Quantitative Weather Forecast

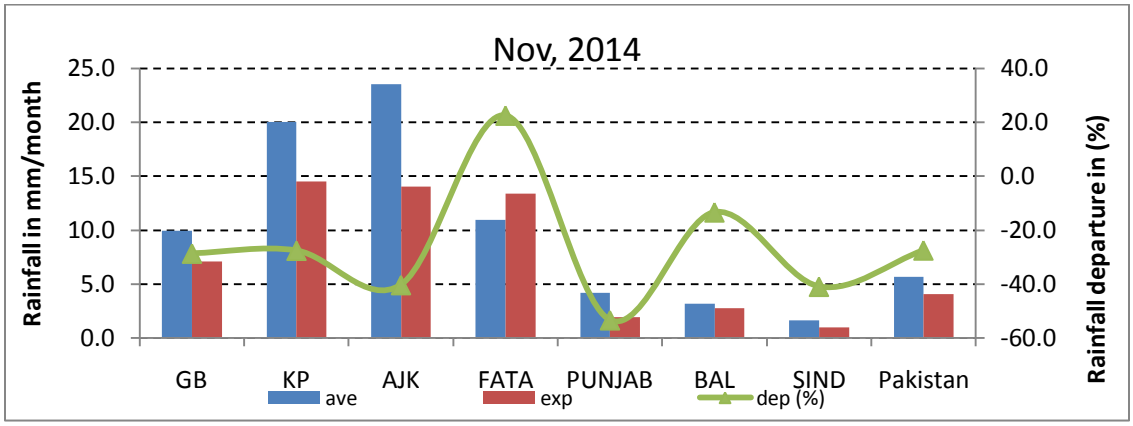
	Sep, 2014		Oct, 2014		Nov, 2014		Sep-Nov, 2014	
	ave	exp	ave	exp	ave	exp	ave	exp
GB	12.4	Abv. Ave	9.6	Blw. Ave	10.0	Blw. Ave	31.9	Ave
KP	42.7	Abv. Ave	23.9	Blw. Ave	20.0	Blw. Ave	86.7	Ave
AJK	70.9	Ave	31.7	Blw. Ave	23.6	Blw. Ave	126.2	Blw. Ave
FATA	29.7	Abv. Ave	13.2	Blw. Ave	10.9	Abv. Ave	53.9	Abv. Ave
PUNJAB	36.8	Abv. Ave	8.4	Blw. Ave	4.2	Blw. Ave	49.4	Ave
BALUCHISTAN	4.8	Abv. Ave	3.7	Blw. Ave	3.2	Ave	11.7	Ave
SIND	20.2	Abv. Ave	4.5	Blw. Ave	1.6	Blw. Ave	26.4	Abv. Ave
Pakistan	**20.3**	**Abv. Ave**	**7.8**	**Blw. Ave**	**5.7**	**Blw. Ave**	**33.7**	**Ave**

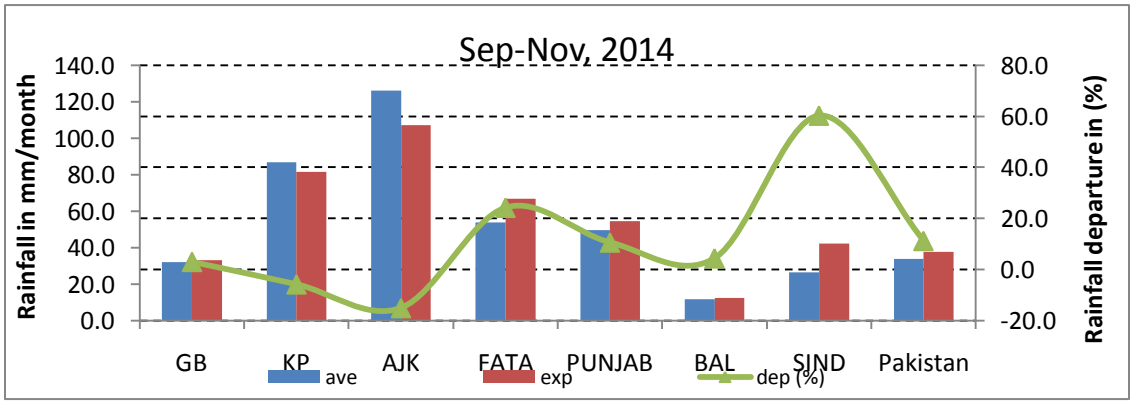
Ave.: *average (1981-2010),* ***Exp.:*** *Expected rainfall,* ***Below Average*** *(Blw. Ave) < -15 %,* ***Average*** *precipitation range (Ave) = -15 to +15 %,,* ***Above Average*** *(Abv.Ave) > +15 %*

Note: Average precipitation is computed by using Global Precipitation Climatology Centre (GPCC) gridded data by resolution (0.5x0.5^{o}) latitude by longitude. Ensembles of different climate models are used for computation of expected precipitation over the region.

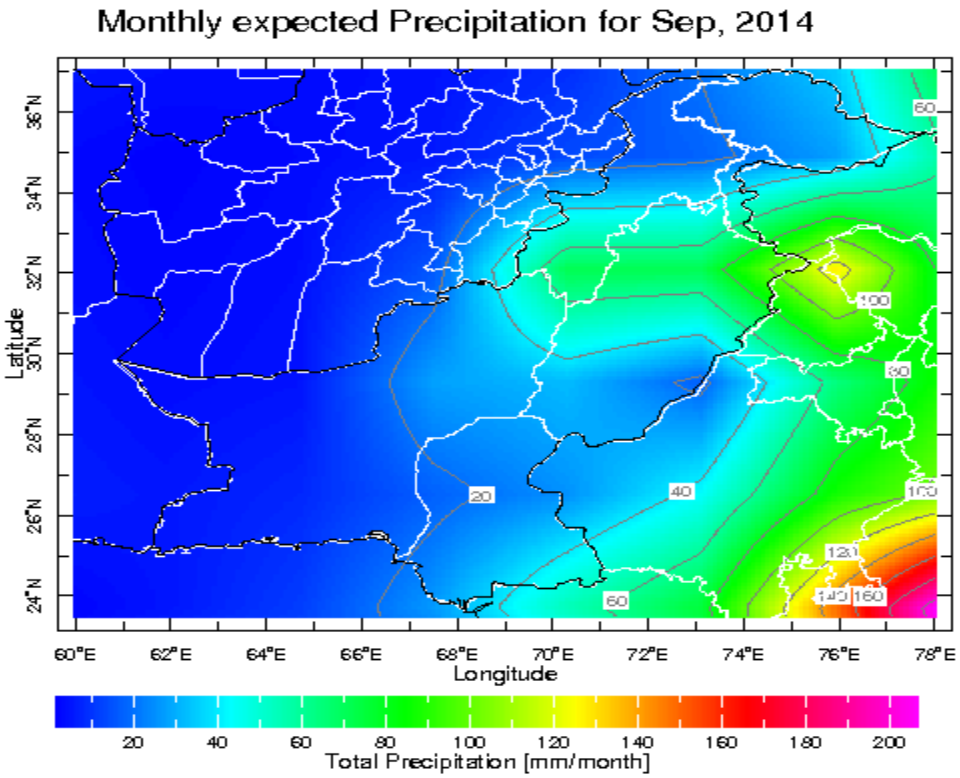

Sep, 2014
Rainfall in mm/month
Rainfall departure in (%)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
100.0
80.0
60.0
40.0
20.0
0.0
GB
KP
AJK
FATA
PUNJAB
BAL
SIND
Pakistan
ave
exp
dep (%)

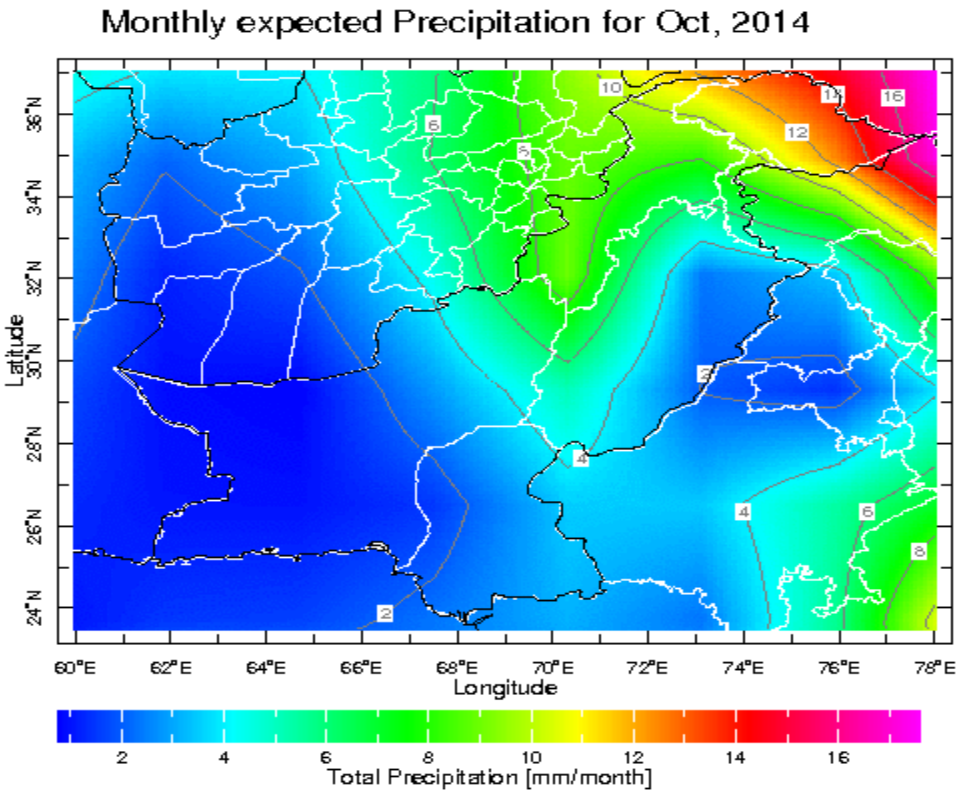

Oct, 2014
Rainfall in mm/month
Rainfall departure in (%)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
GB
KP
AJK
FATA
PUNJAB
BAL
SIND
Pakistan
ave
exp
dep (%)

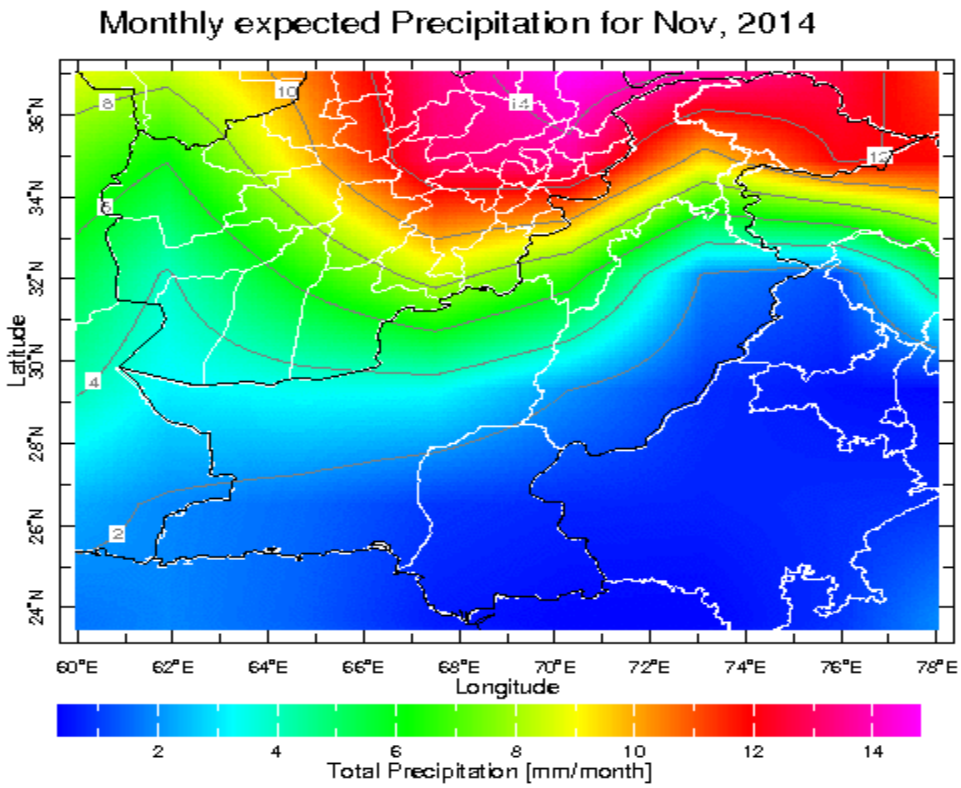

Nov, 2014
Rainfall in mm/month
Rainfall departure in (%)
25.0
20.0
15.0
10.0
5.0
0.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
GB
KP
AJK
FATA
PUNJAB
BAL
SIND
Pakistan
ave
exp
dep (%)

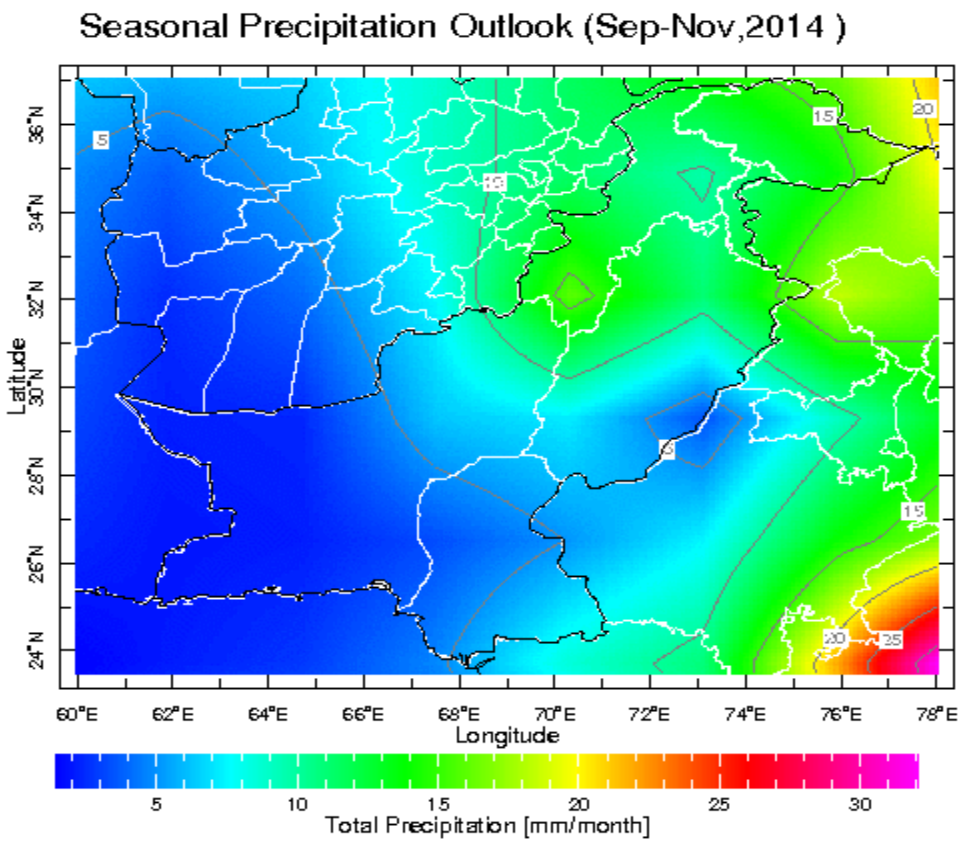

Sep-Nov, 2014
Rainfall in mm/month
Rainfall departure in (%)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
80.0
60.0
40.0
20.0
0.0
-20.0
GB
KP
AJK
FATA
PUNJAB
BAL
SIND
Pakistan
ave
exp
dep (%)

3. Spatial distribution of expected rainfall during coming season (GCM-ECHAM)

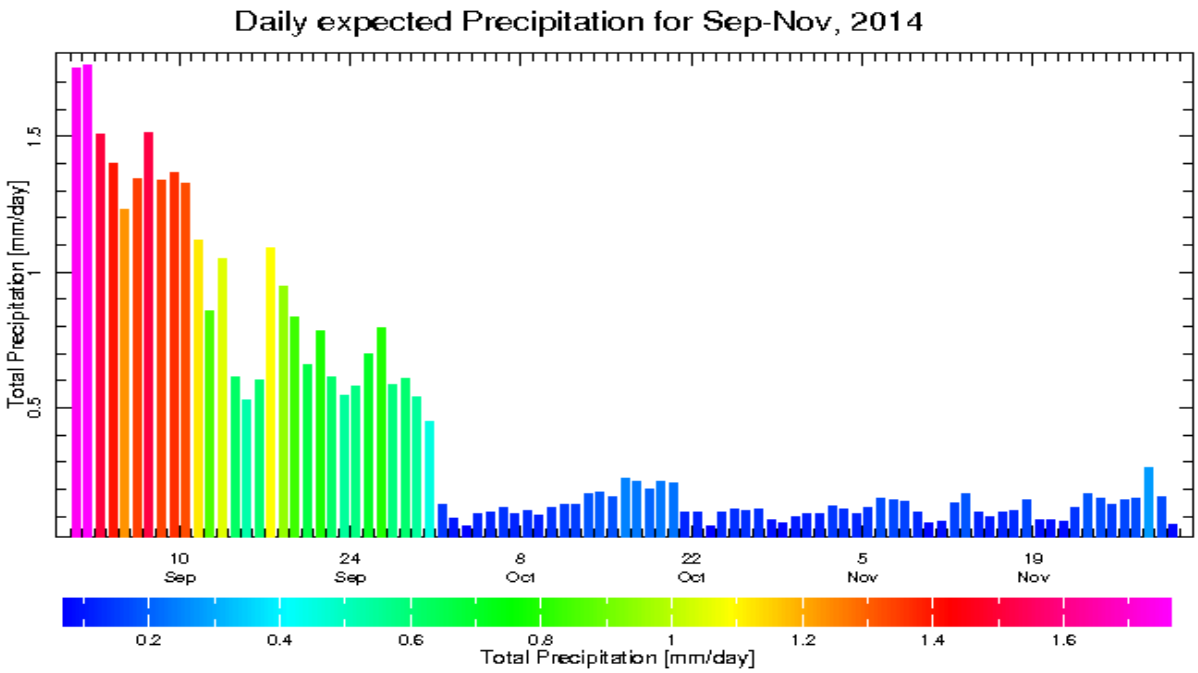


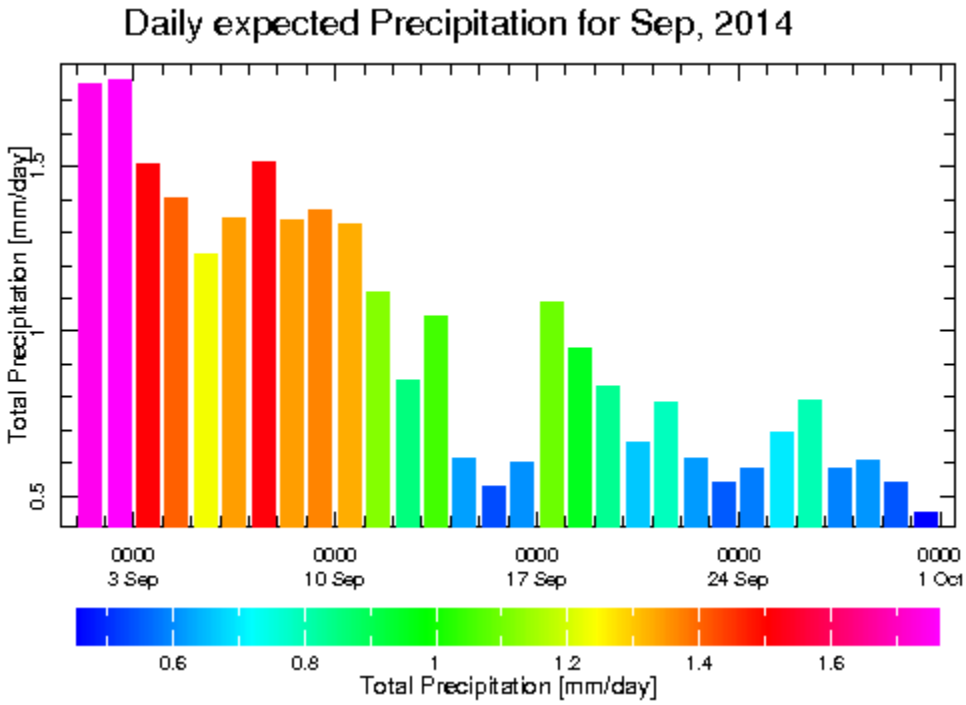


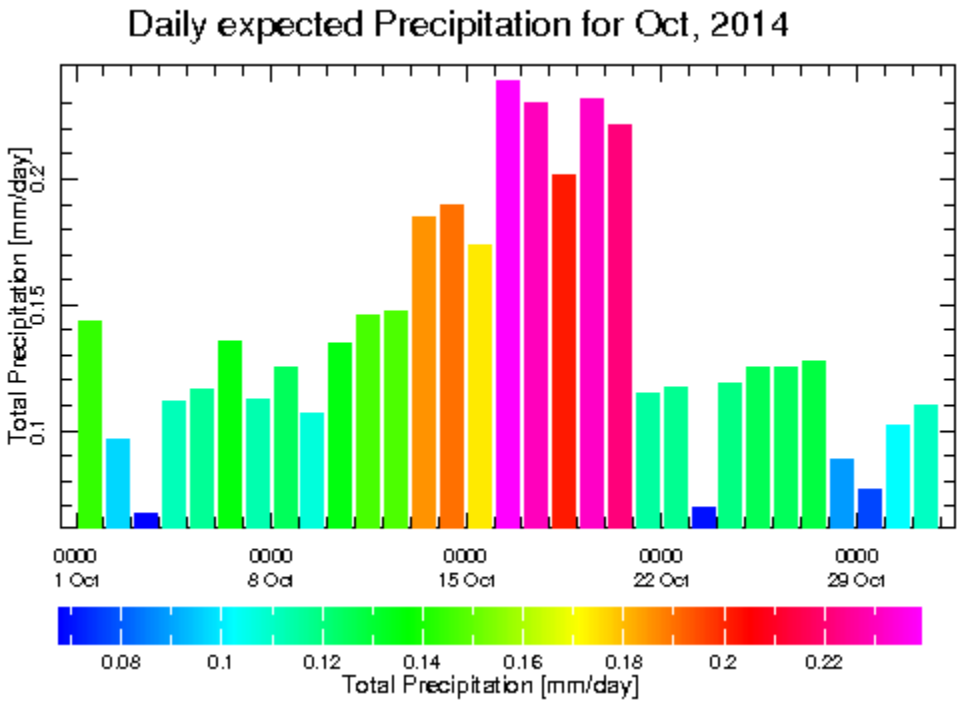

Monthly expected Precipitation for Nov, 2014
Latitude
36°N
34°N
32°N
30°N
28°N
26°N
24°N
60°E
62°E
64°E
66°E
68°E
70°E
72°E
74°E
76°E
78°E
Longitude
2
4
6
8
10
12
14
Total Precipitation [mm/month]

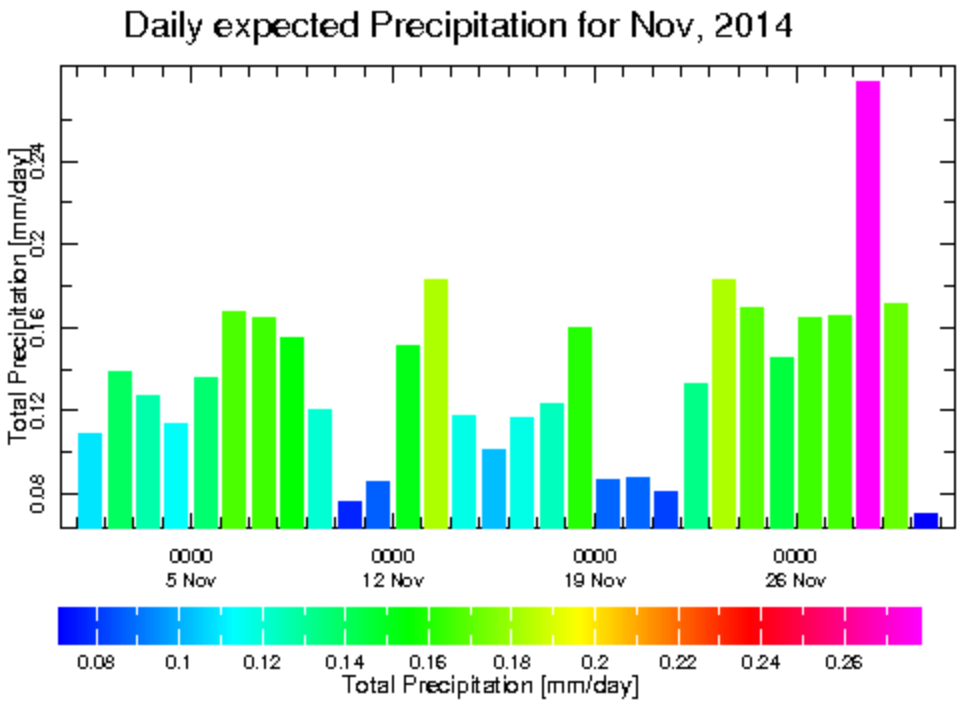

Seasonal Precipitation Outlook (Sep-Nov,2014)
Latitude
36°N
34°N
32°N
30°N
28°N
26°N
24°N
60°E
62°E
64°E
66°E
68°E
70°E
72°E
74°E
76°E
78°E
Longitude
5
10
15
20
25
30
Total Precipitation [mm/month]

4. Expected daily rainfall



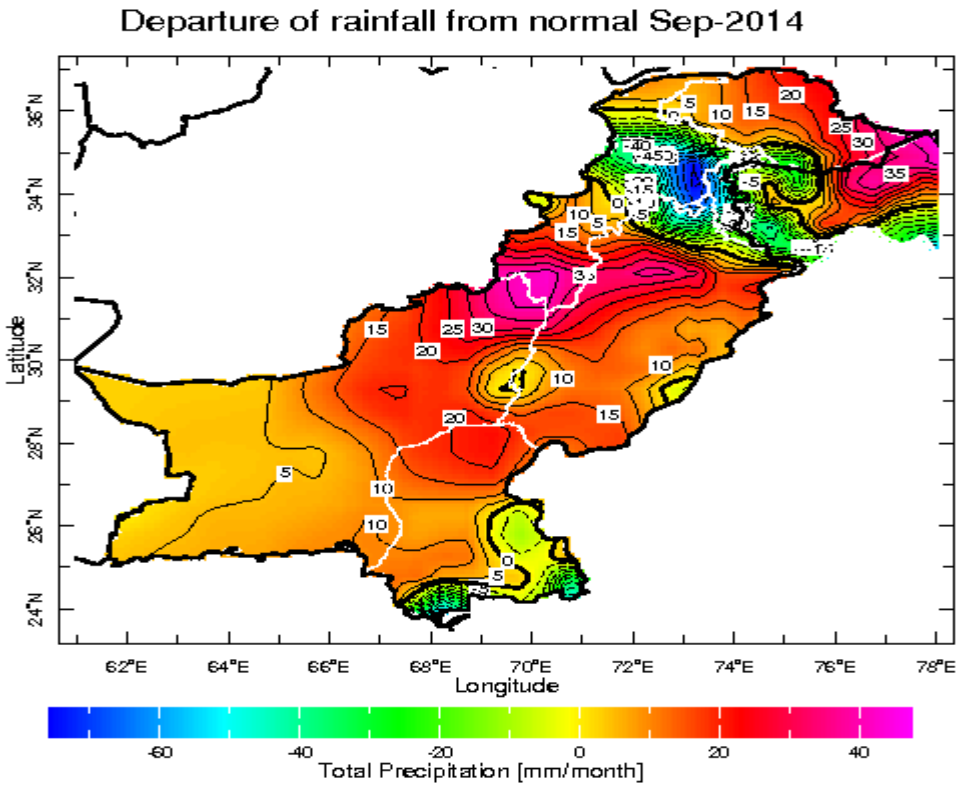


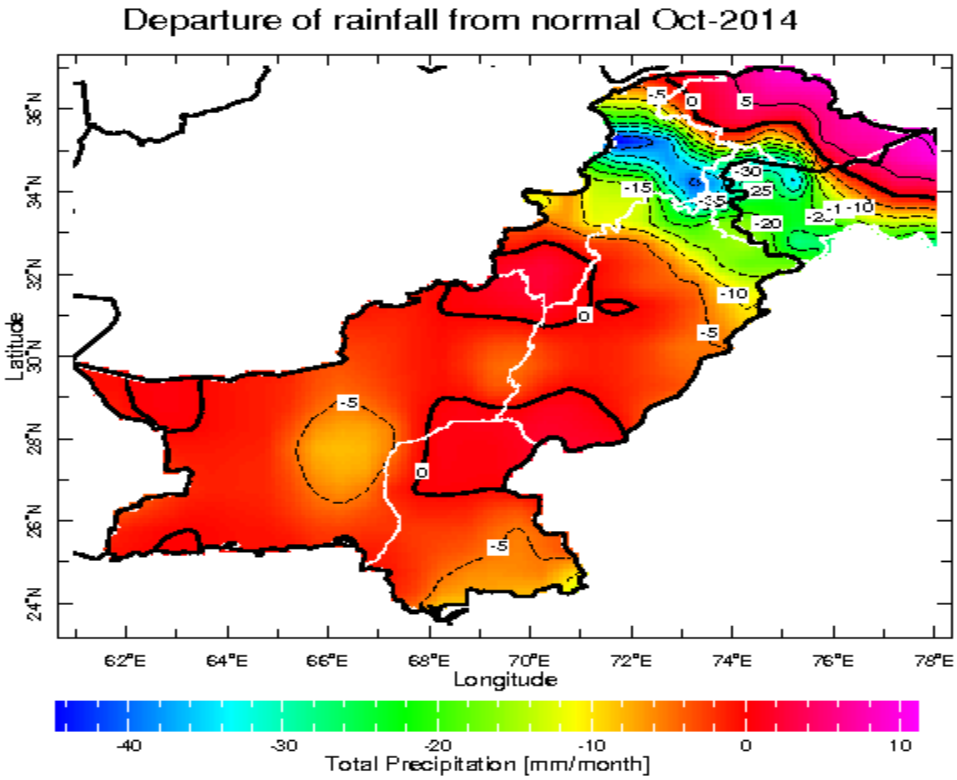




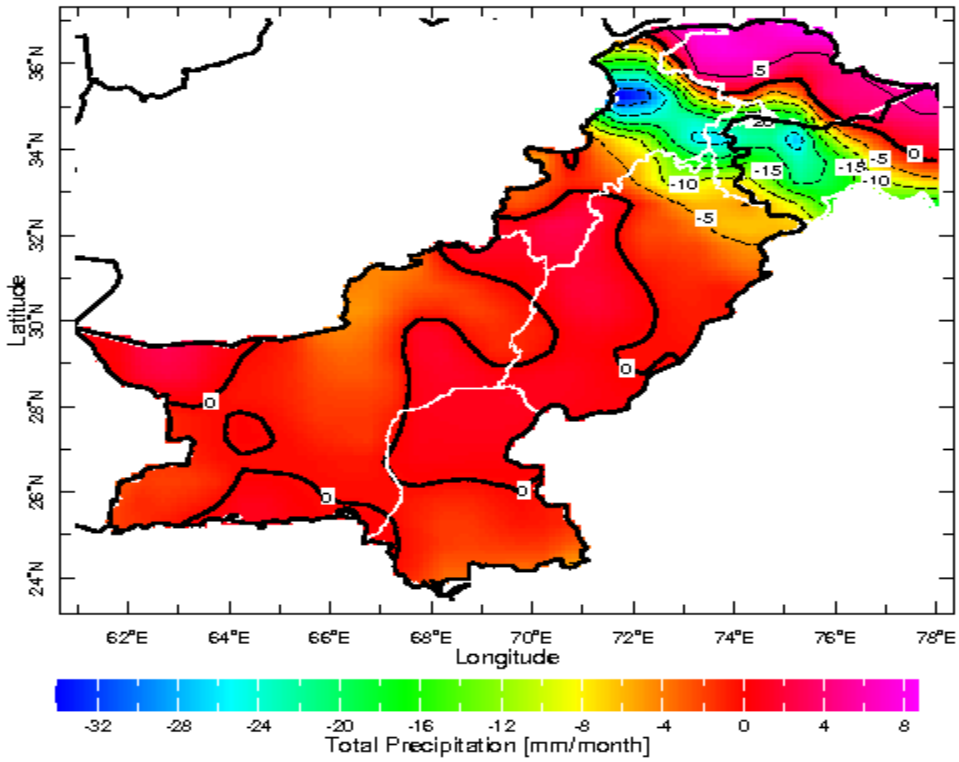
Note: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

5. *Monthly departure from normal (precipitation) during coming season*

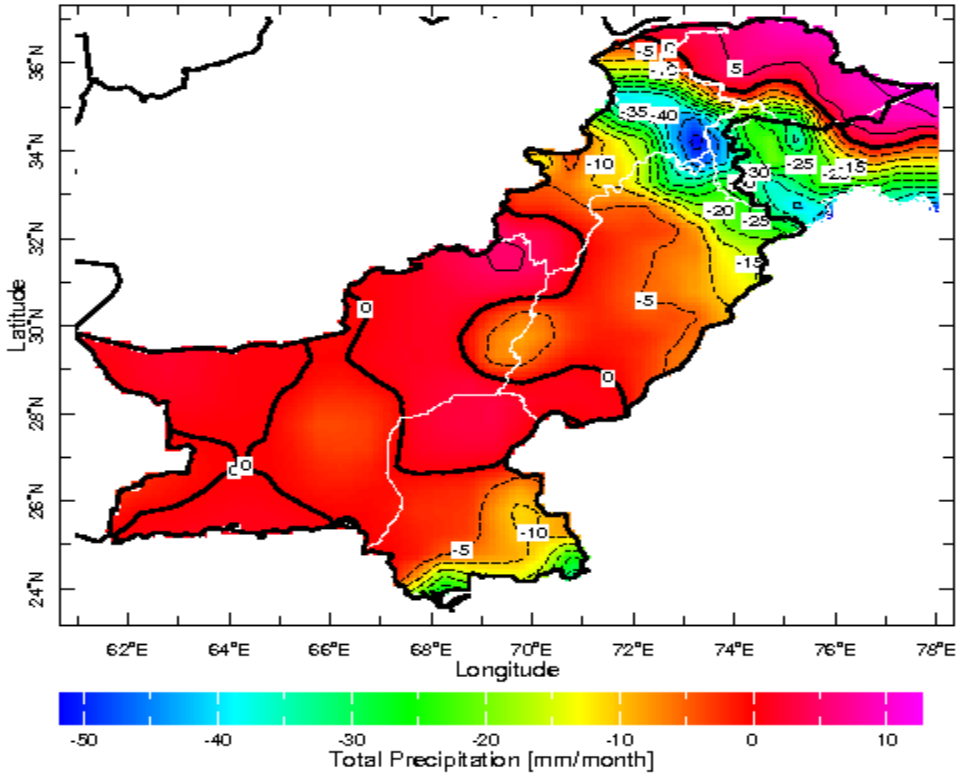




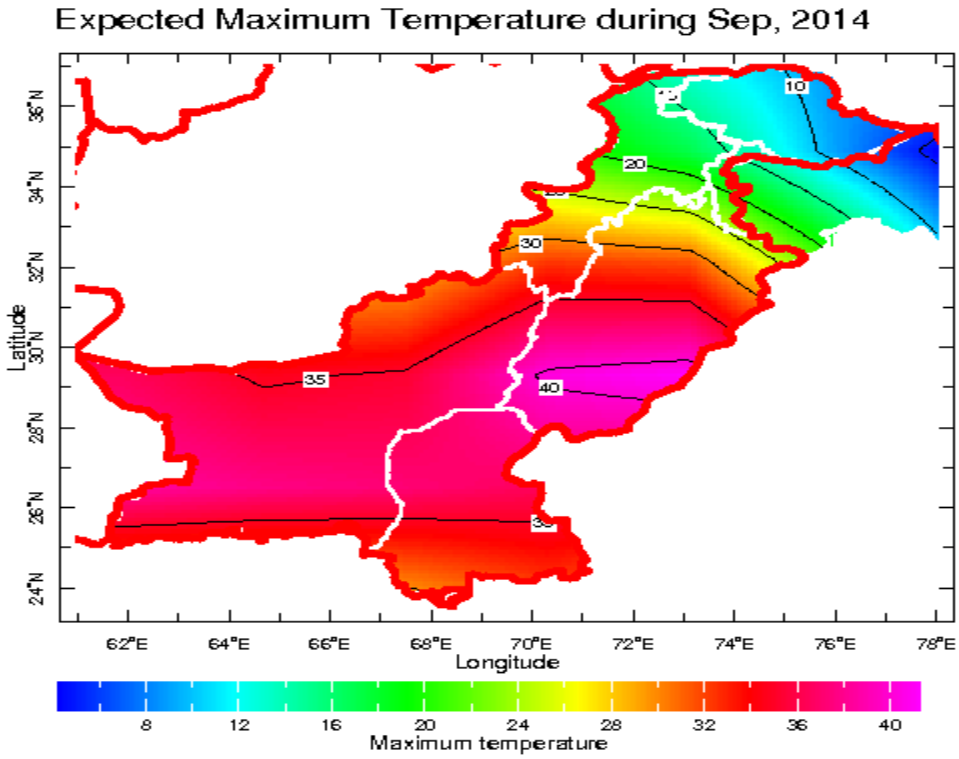
Departure of rainfall from normal Nov-2014

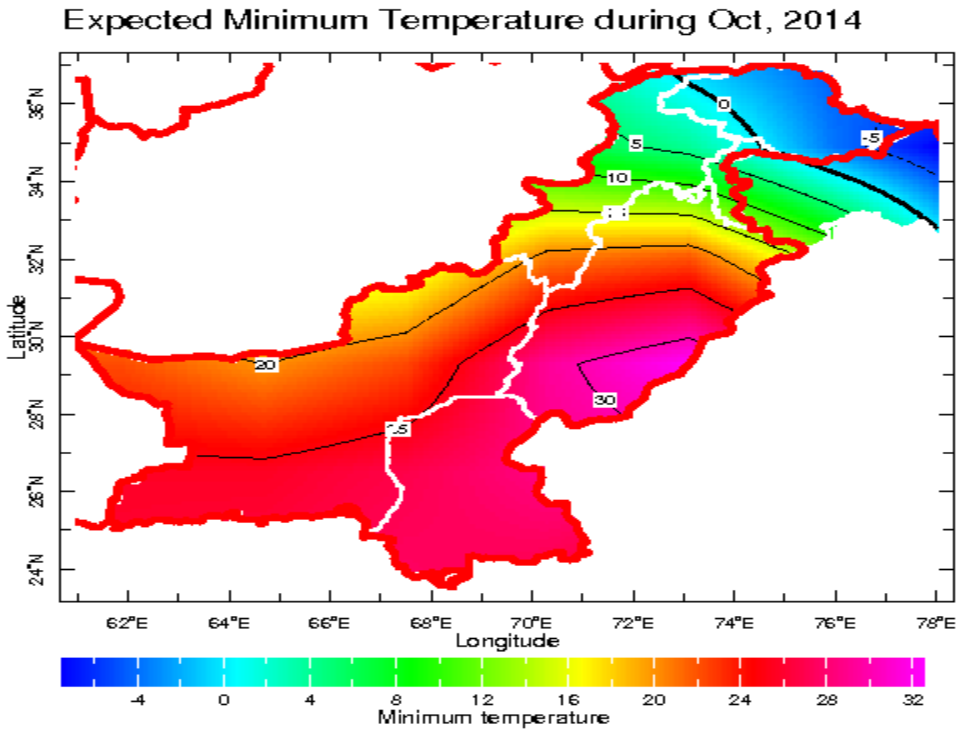


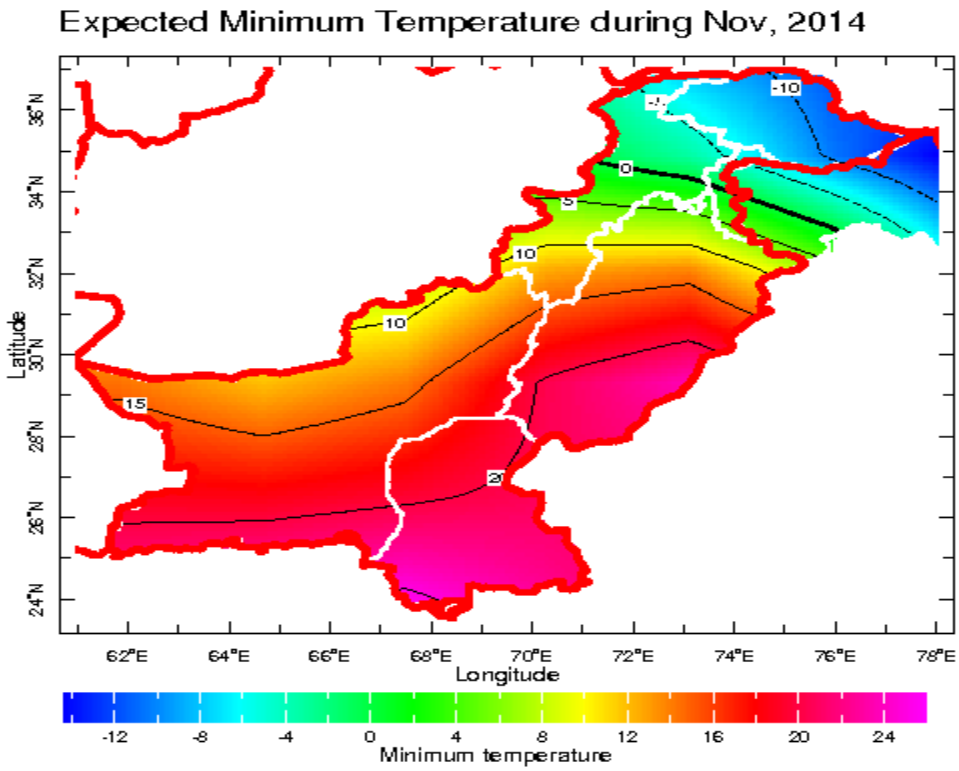
Departure of rainfall from normal (Sep-Nov,2014)



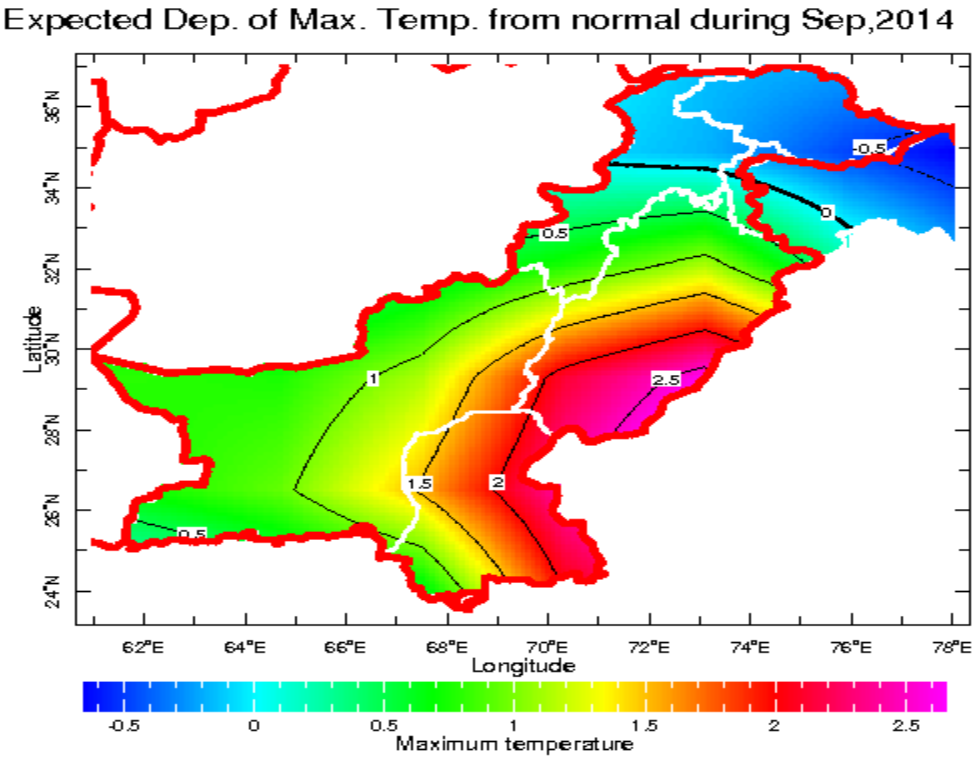
6. Spatial distribution of expected maximum temperature (Sept.) and minimum temperature during (Oct and Nov.)

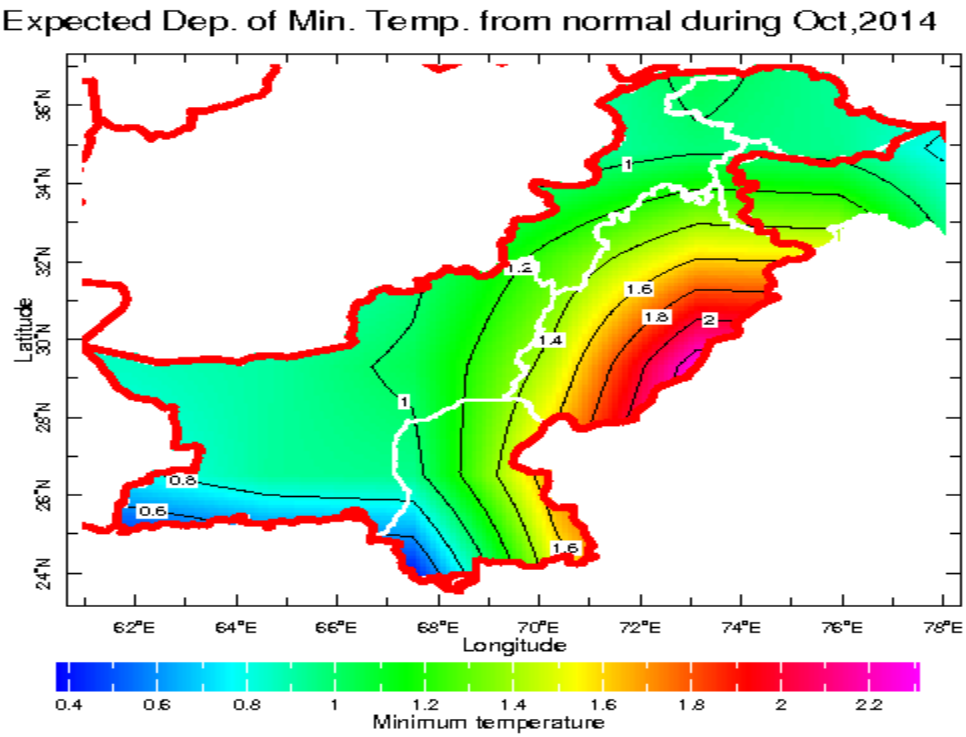


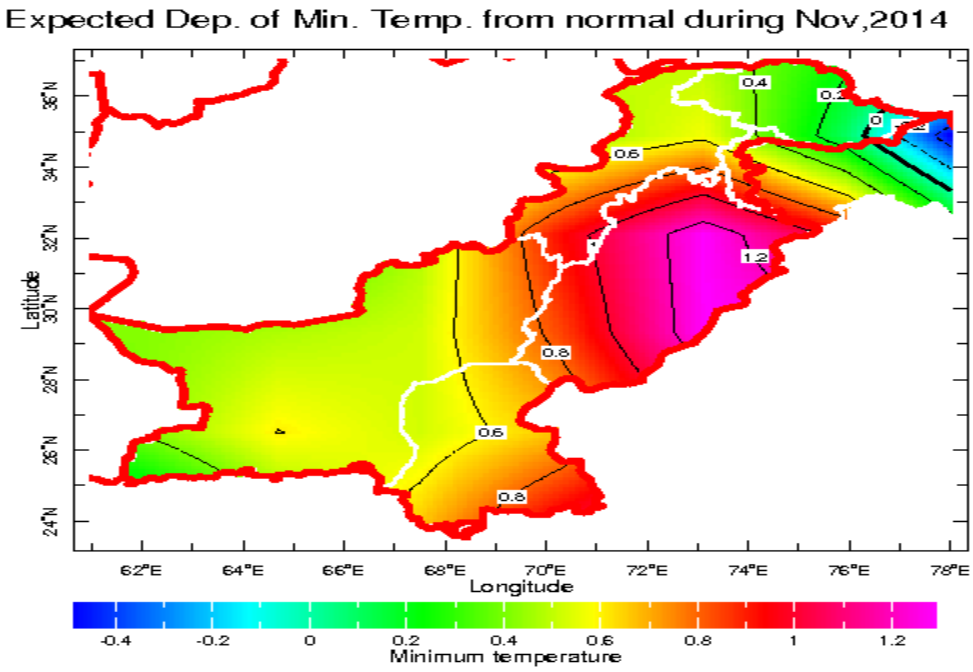




7. ***Departure of expected maximum temperature from normal (Sept.) and minimum temperature from normal (Oct and Nov.)***







Note: Research wing of NAMC is regularly monitoring variation in synopitc situation of the globe and using different global climate models regional weather prediction data for prepration of this weather outlook. Seasonal weather outlook issues 10th of every month with three months in advance weather outlook. Lastest seasonal weather summay can be download from NAMC web site mentioned below: http://namc.pmd.gov.pk/