Seasonal weather outlook

(Nov, 2014-Jan, 2015)

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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 Nov 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 normal intensity. The area of jet stream may be squeezed during Oct over northern of Afghanistan. The strong winds showed tilting towards south trend when enter over Pakistan. Below than normal strength of higher winds trend over the region.

  Probability outlook: Normal to below intensity of jet stream is associated with normal to below normal precipitation in the region. In addition weather system enters in the country from north rather than from west during first two predicted months.

- A trough at 500 hPa is expected to be over northern parts of the country. Slightly above normal trend is expected over northern and eastern parts of the region.

  Probability outlook: Precipitation is likely to occur over upper parts of the country. Lower and central parts of the country may be dry during October.

- Surface temperatures are expected to be on higher side than normal over eastern parts of Pakistan and western states of India.

- North Atlantic Oscillation (NAO) is in negative phase (-1.27) 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 October 2014, above-average sea surface temperatures (SST) increased slightly across the eastern half of the equatorial Pacific. The weekly Niño indices were between +0.6°C (Niño-3.4 and Niño-1+2) and +0.9°C (Niño-3) at the end of the month. Subsurface heat content anomalies (averaged between 180º-100ºW) were largely unchanged even as a new downwelling Kelvin wave increased temperatures at depth in the central Pacific. The monthly equatorial low-level winds were near average, although anomalous westerlies continued to emerge on occasion. Upper-level winds were also mostly average across the Pacific. The Southern Oscillation Index continued to be negative, accompanied by mostly average rainfall near the Date Line and suppressed rainfall over Indonesia. Overall, several features across the tropical Pacific are characteristic of borderline El Niño conditions, but collectively, the combined atmosphere and oceanic state remains ENSO-neutral. Similar to last month, most models predict El Niño to develop during October-December 2014 and to continue into early 2015. However, the ongoing lack of clear atmosphere-ocean coupling and the latest NCEP CFSv2 model forecast have reduced confidence that El Niño will fully materialize (at least five overlapping consecutive 3-month values of the Niño-3.4 index at or greater than 0.5°C). If El Niño does emerge, the forecaster consensus favors a weak event. In summary, there is a 58% chance of El Niño during the Northern Hemisphere winter,

which is favored to last into the Northern Hemisphere spring 2015. (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Probability outlook: La Nina (0%), Neutral (42%) and El Nino (58 %) during Nov-Dec-Jan, 2015 season

- Arabian Sea Surface Temperatures are expected to be slightly below 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 below normal precipitation over the region.

3. *Seasonal Weather Outlook Summary (Nov, 2014-Jan, 2015)*

Synthesis of the latest model forecasts for Nov-Jan, 2015 (NDJ), current synoptic situation and regional weather expert's judgment indicates that slightly above normal precipitation is expected all over the country with above average during December and slightly above normal during January. Slightly above average night temperature is likely to occur during whole predicted period with higher values over eastern parts of the country.

2.1. Weather outlook

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

I. Average precipitation is expected over the country during November with below normal over Punjab, Sindh and Kashmir.

II. Average precipitation is expected over Punjab, Sindh, GB, KP and Baluchistan, Above average over FATA and below average over Kashmir during November.

III. A light to moderate spell of precipitation is expected over the country during least decade of November.

IV. Above normal precipitation with snow fall over the hills is expected during December.

V. Above normal precipitation will be occurred all over the country during December.

VI. Winter precipitation will be started from first week of December. Good precipitation is expected during first week of December.

VII. Heavy snowfall is expected over northern hilly region during December.

VIII. Average to slightly above average precipitation is expected all over the country during January. Above normal precipitation is expected over northern western parts of the country.

IX. Heavy spell of precipitation is expected over 1st week of January over the country.

X. Night temperature will be on higher side all over the country with higher values over central eastern parts of the country during November.

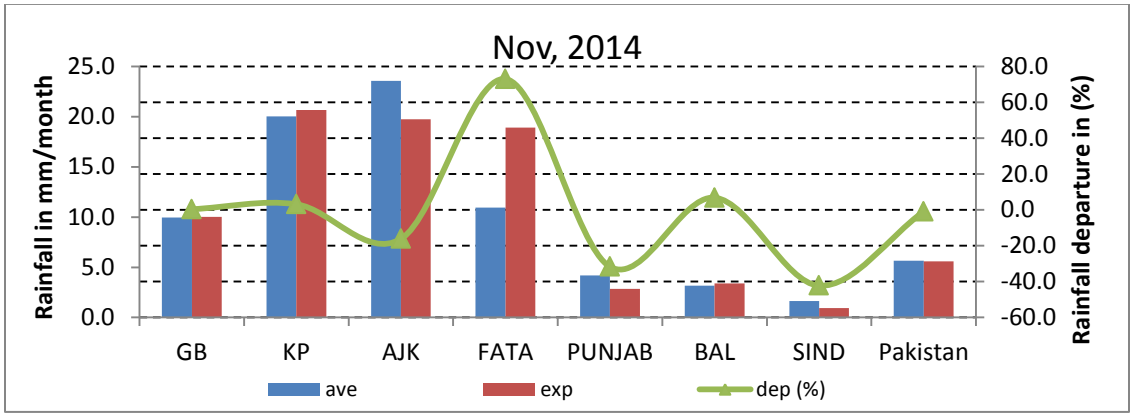
XI. Average night temperature is expected during December and January.

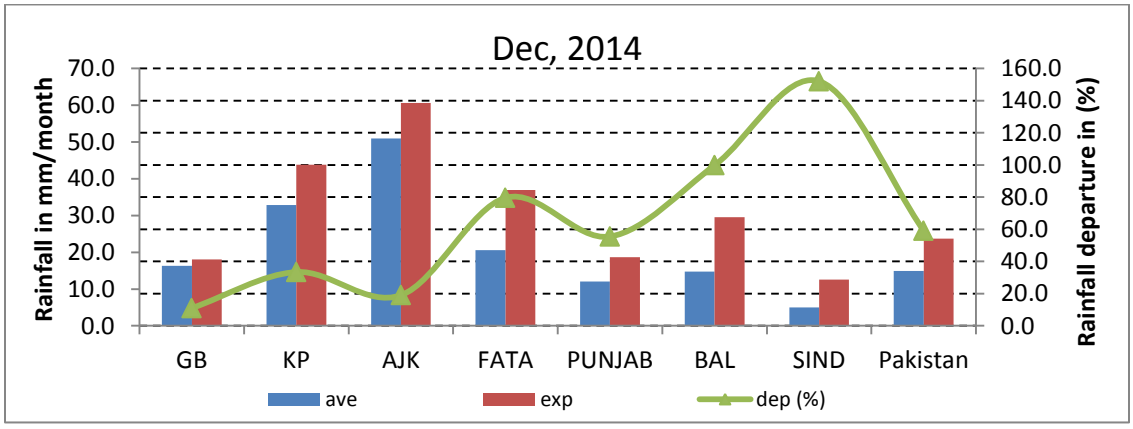
2.2. Monthly Quantitative Weather Forecast

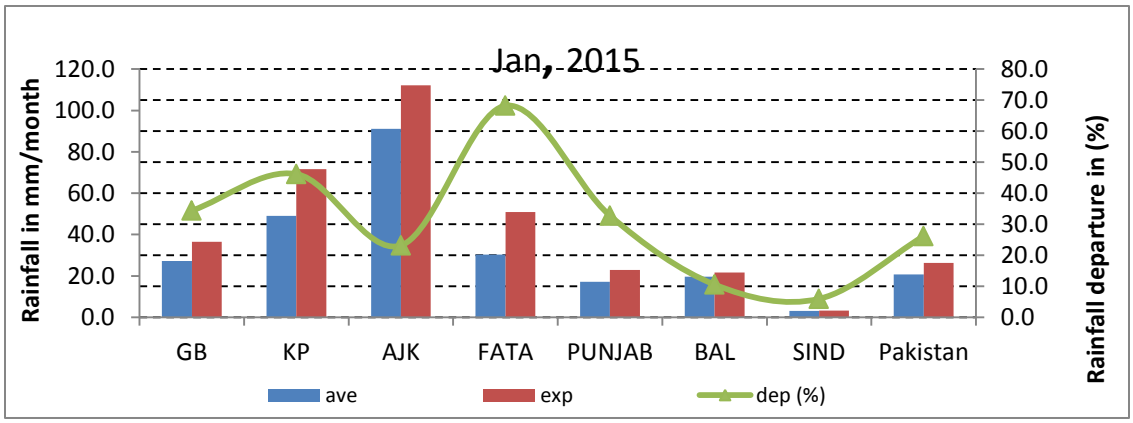
	Nov, 2014		Dec, 2014		Jan, 2015		Nov14-Jan, 2015	
	ave	exp	ave	exp	ave	exp	ave	exp
GB	10.0	Ave	16.3	Ave	27.2	Abv. Ave	53.4	Abv. Ave
KP	20.0	Ave	32.9	Abv. Ave	49.0	Abv. Ave	101.9	Abv. Ave
AJK	23.6	Blw. Ave	50.9	Abv. Ave	91.1	Abv. Ave	165.6	Abv. Ave
FATA	10.9	Abv. Ave	20.6	Abv. Ave	30.2	Abv. Ave	61.7	Abv. Ave
PUNJAB	4.2	Blw. Ave	12.0	Abv. Ave	17.2	Abv. Ave	33.4	Abv. Ave
BALUCHISTAN	3.2	Ave	14.8	Abv. Ave	19.5	Ave	37.5	Abv. Ave
SIND	1.6	Blw. Ave	5.0	Abv. Ave	3.0	Ave	9.7	Abv. Ave
Pakistan	5.7	Ave	14.9	Abv. Ave	20.8	Abv. Ave	41.3	Abv. Ave

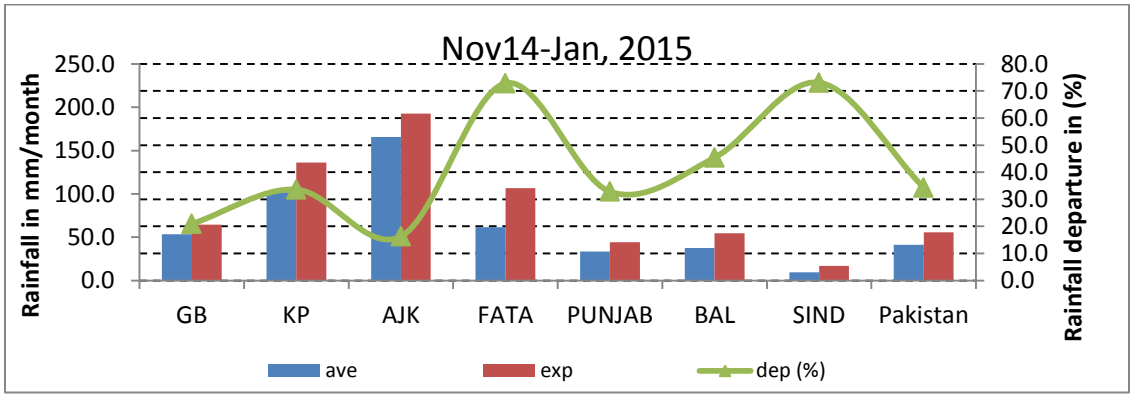
Ave.: *average (1981-2010),* ***Exp.****: Expected rainfall,* ***Below Average*** *(Blw. Ave) < -15 %,* ***Average*** *precipitation range (Ave) = -15 to +15 %,,* ***Above Average*** *(Abv.Ave) > +15 %*

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.

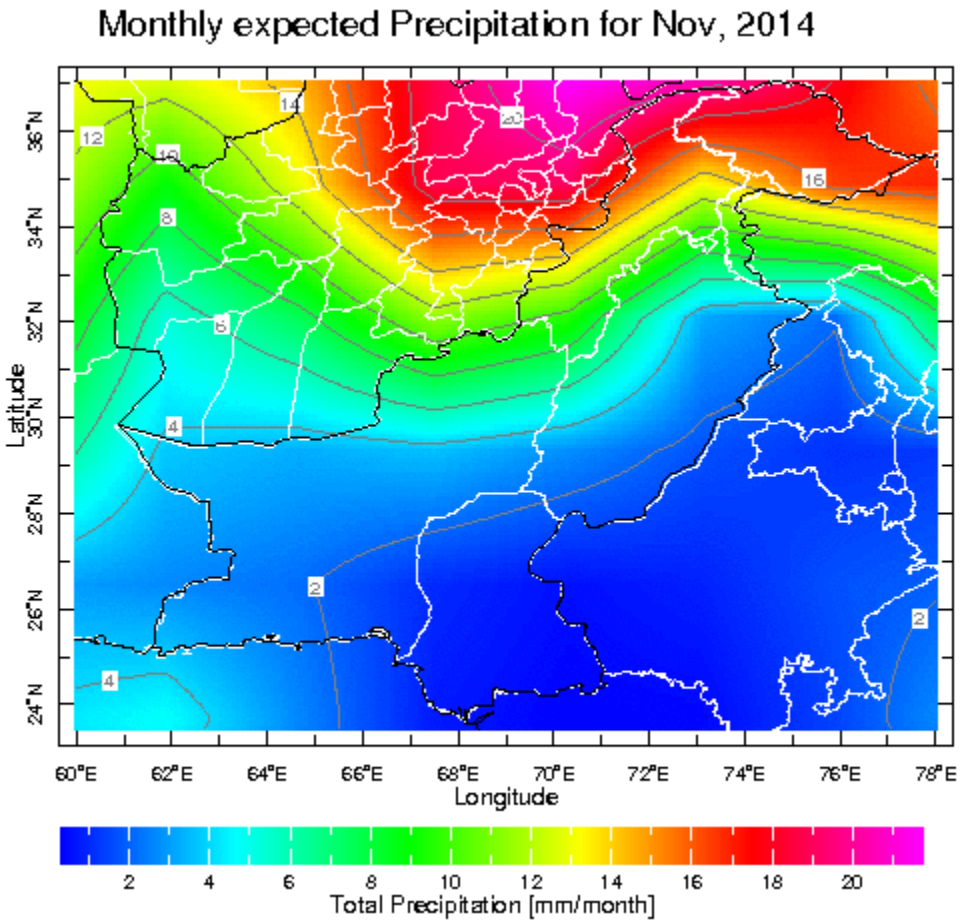




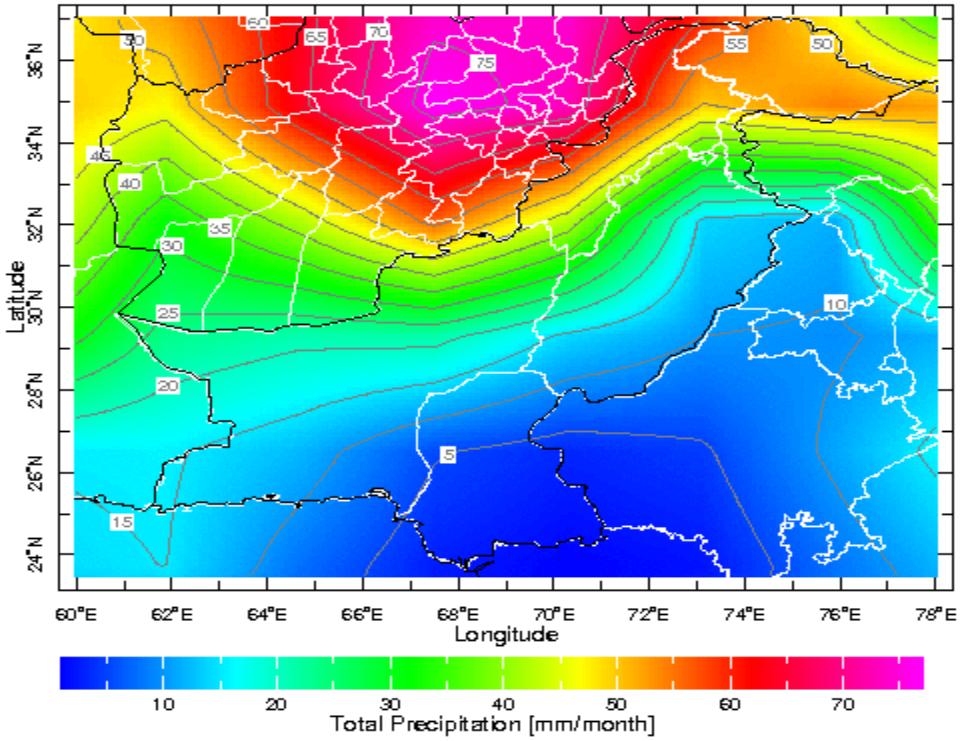




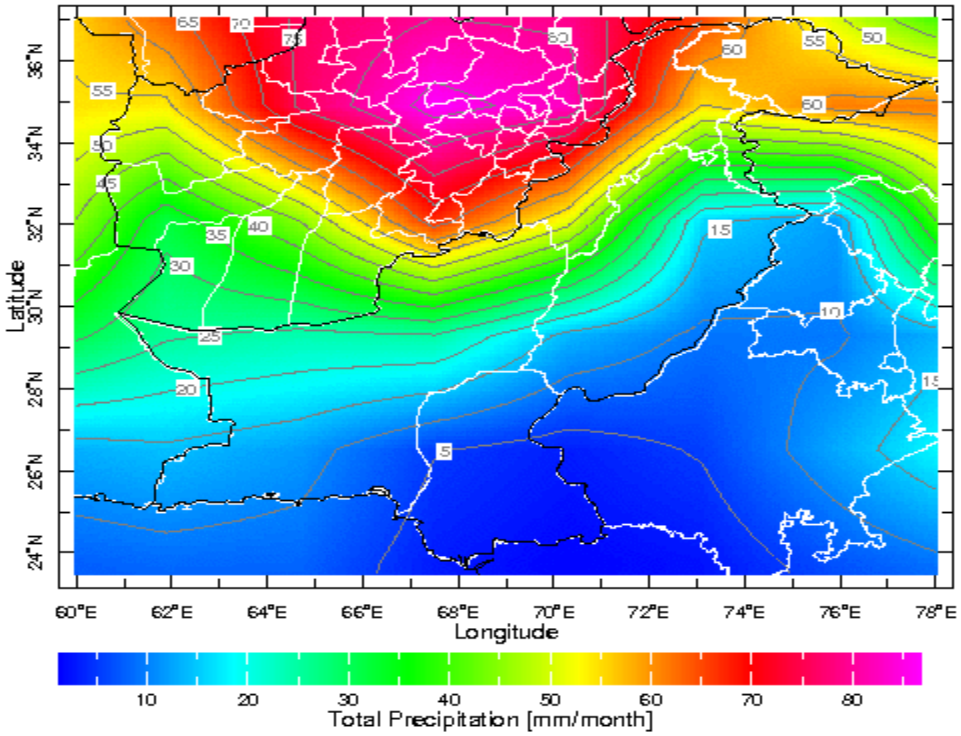
3. *Spatial distribution of expected rainfall during coming season (GCM-ECHAM)*

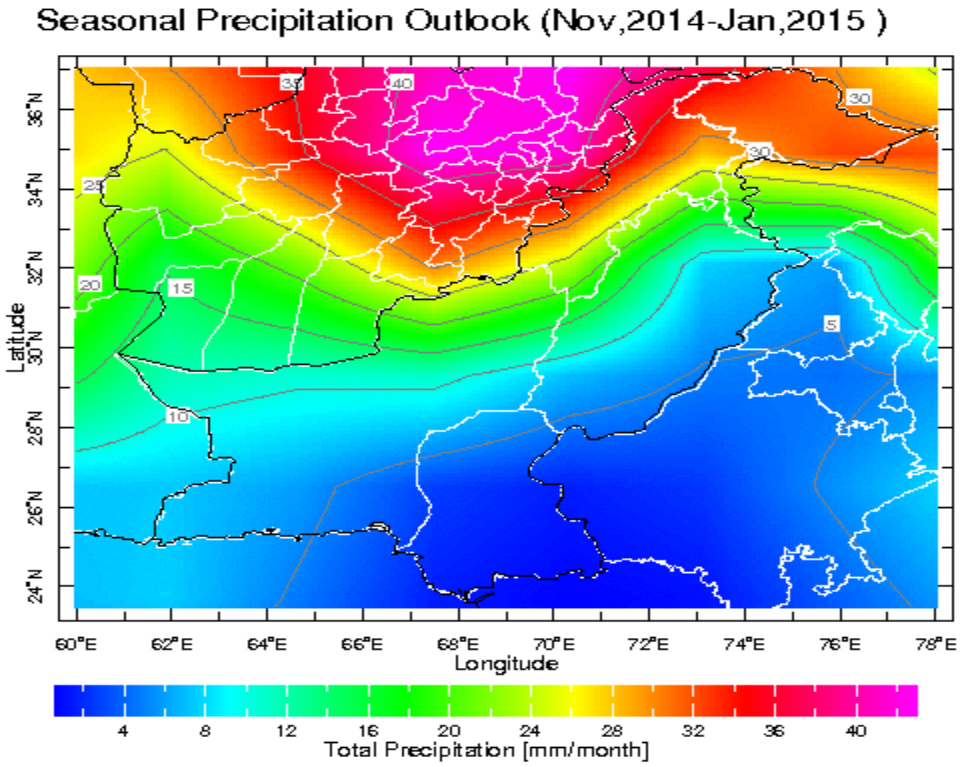


Monthly expected Precipitation for Dec, 2014

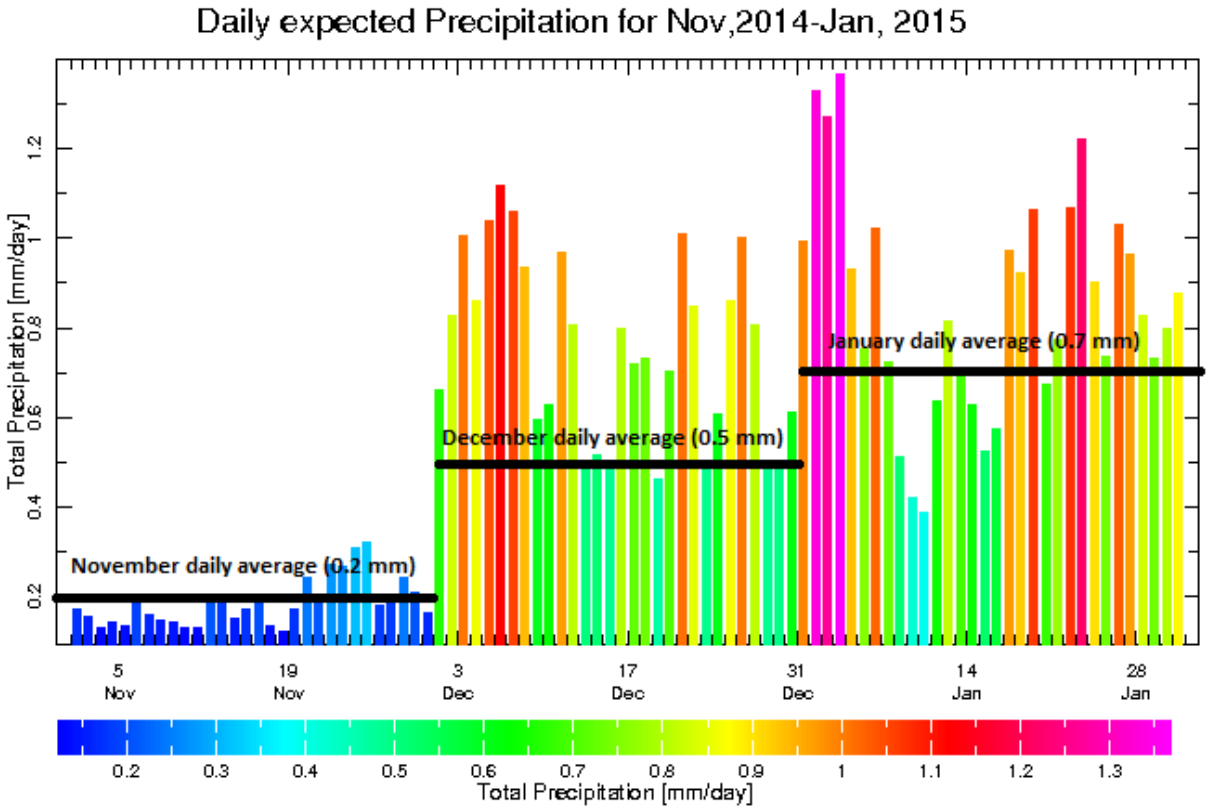


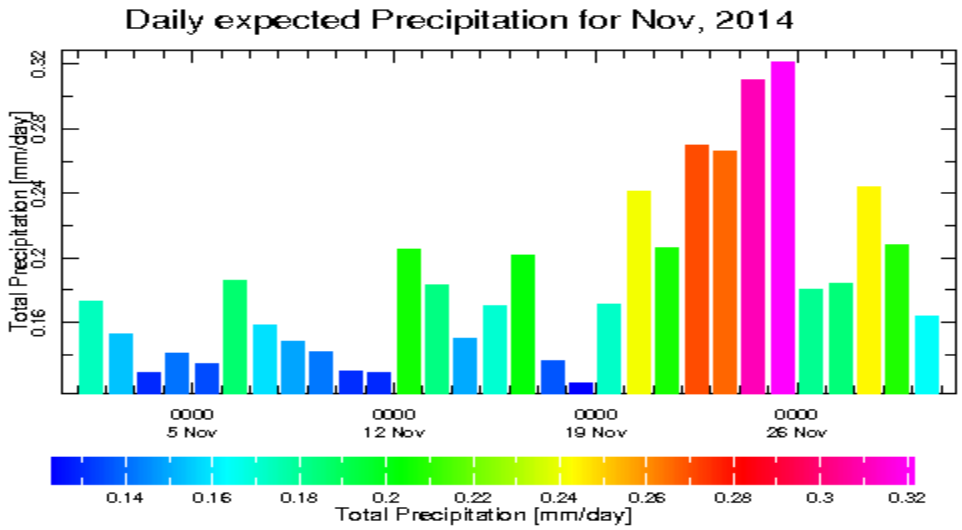
Monthly expected Precipitation for Jan, 2015

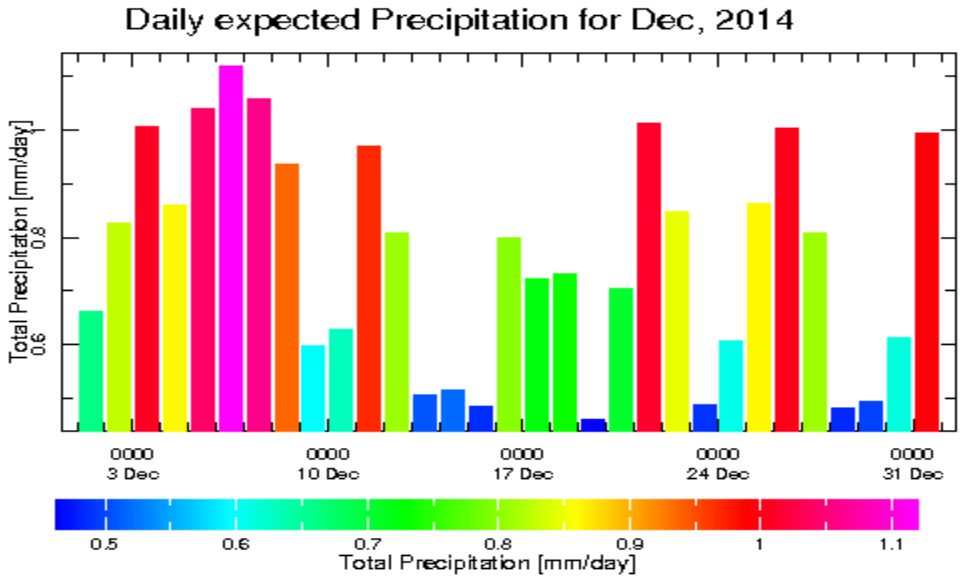


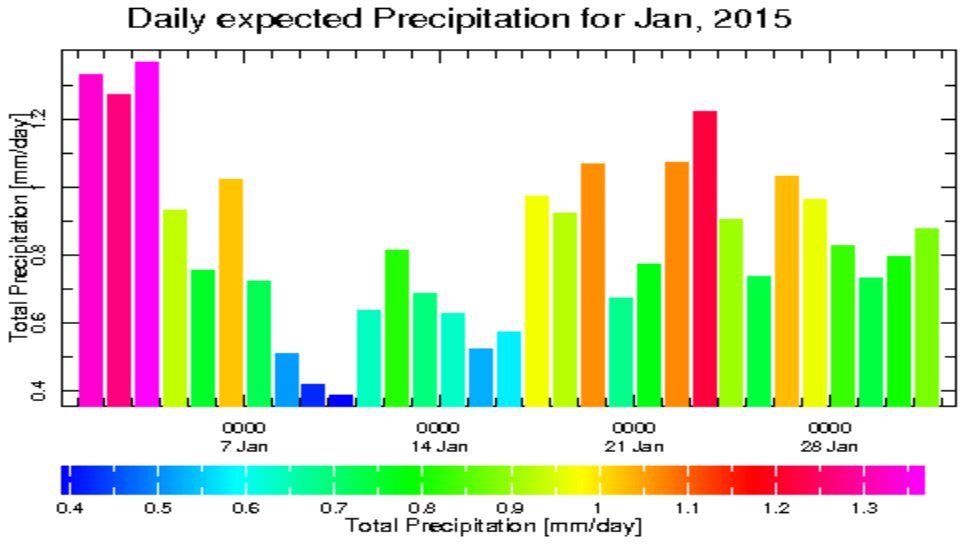


4. *Expected daily rainfall*



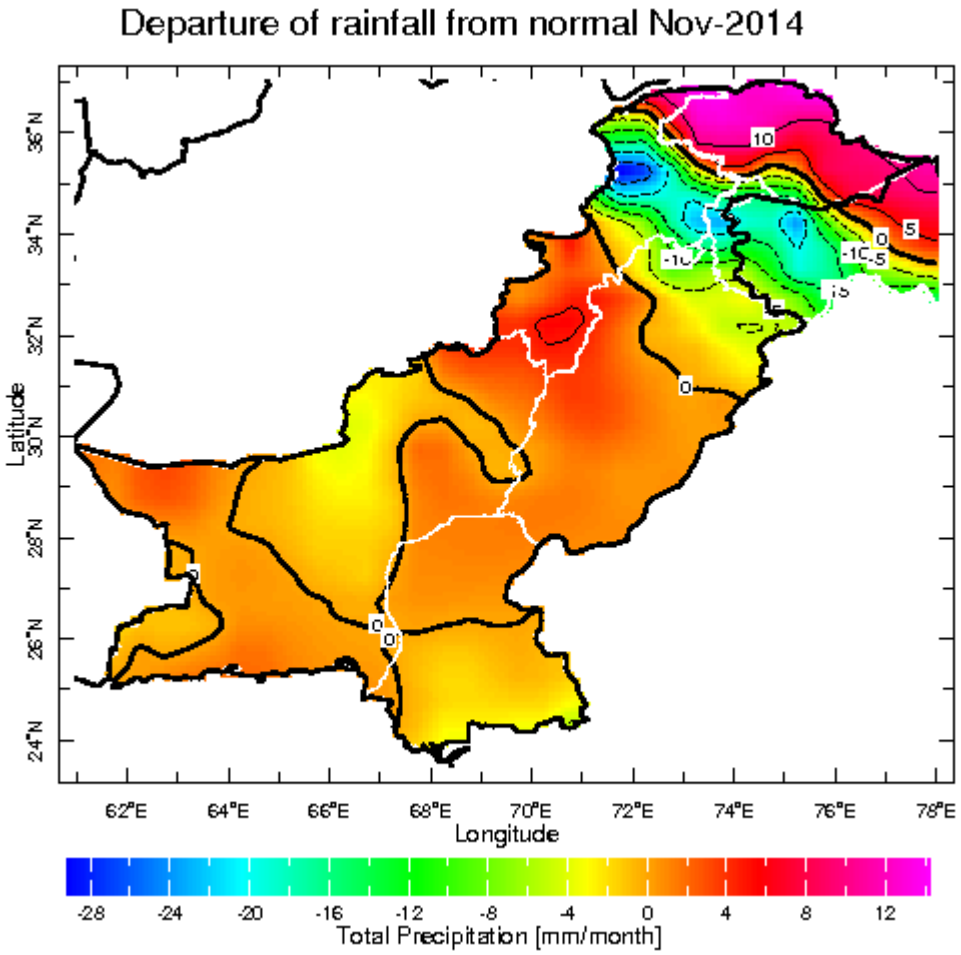

Daily expected Precipitation for Nov, 2014
Total Precipitation [mm/day]
0.16
0.2
0.24
0.28
0.32
0000
5 Nov
0000
12 Nov
0000
19 Nov
0000
26 Nov
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
Total Precipitation [mm/day]


Daily expected Precipitation for Dec, 2014
Total Precipitation [mm/day]
0.6
0.8
1
0000
3 Dec
0000
10 Dec
0000
17 Dec
0000
24 Dec
0000
31 Dec
0.5
0.6
0.7
0.8
0.9
1
1.1
Total Precipitation [mm/day]

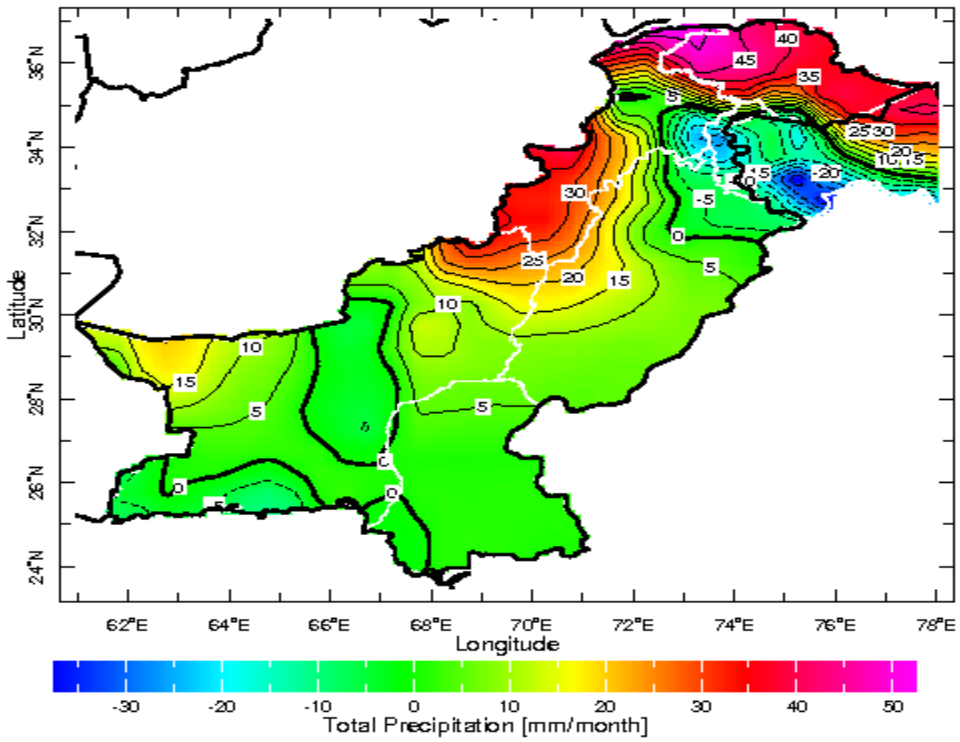

Daily expected Precipitation for Jan, 2015
Total Precipitation [mm/day]
0.4
0.6
0.8
1
1.2
0000
7 Jan
0000
14 Jan
0000
21 Jan
0000
28 Jan
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
Total Precipitation [mm/day]

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.

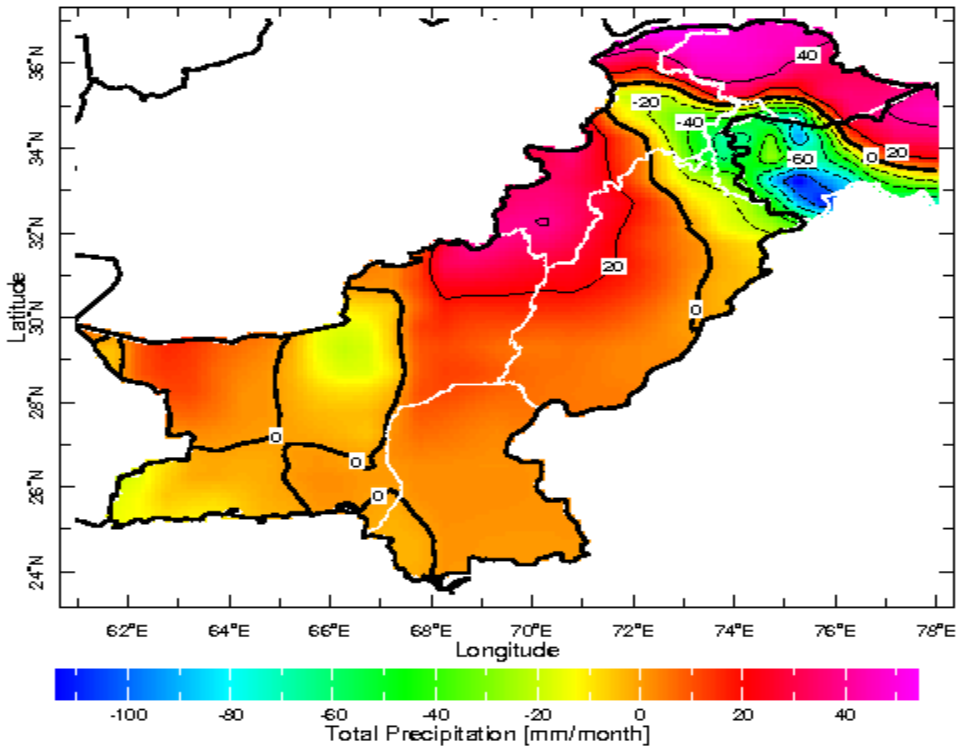
5. Monthly departure from normal (precipitation) during coming season

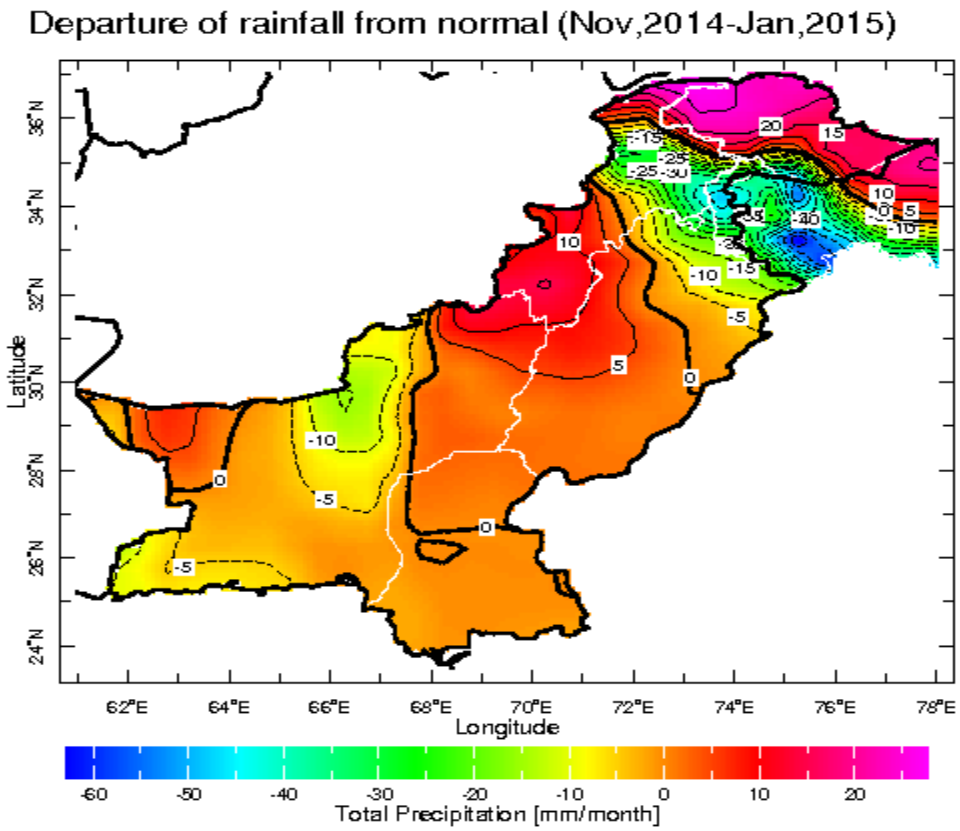


Departure of rainfall from normal Dec-2014

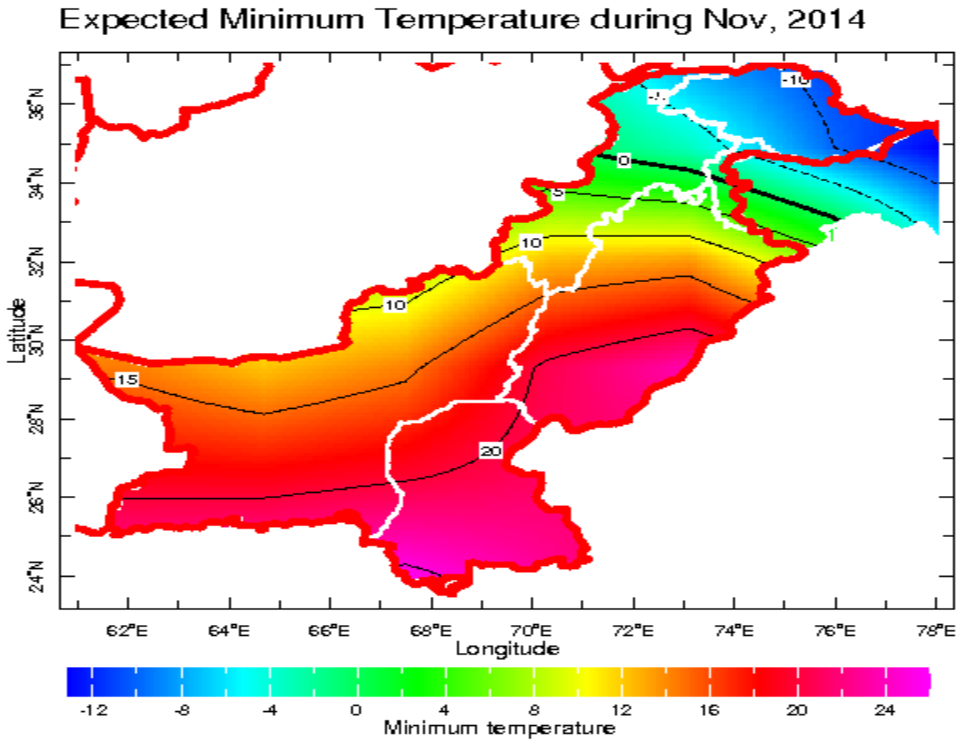


Departure of rainfall from normal Jan-2015

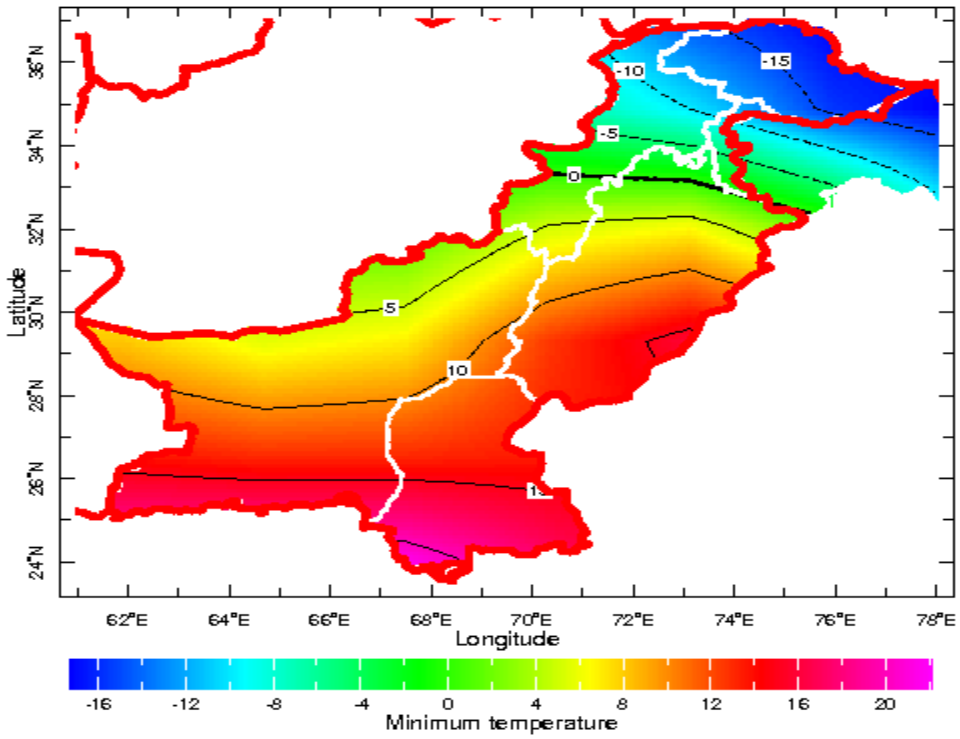




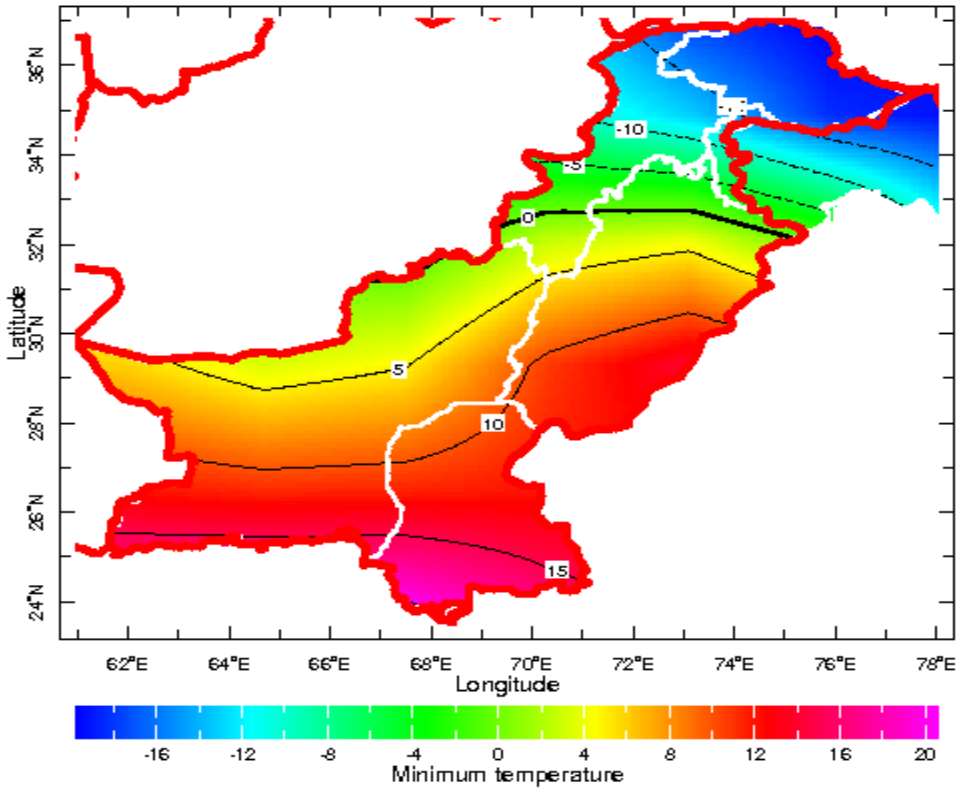
6. *Spatial distribution of expected minimum temperature*



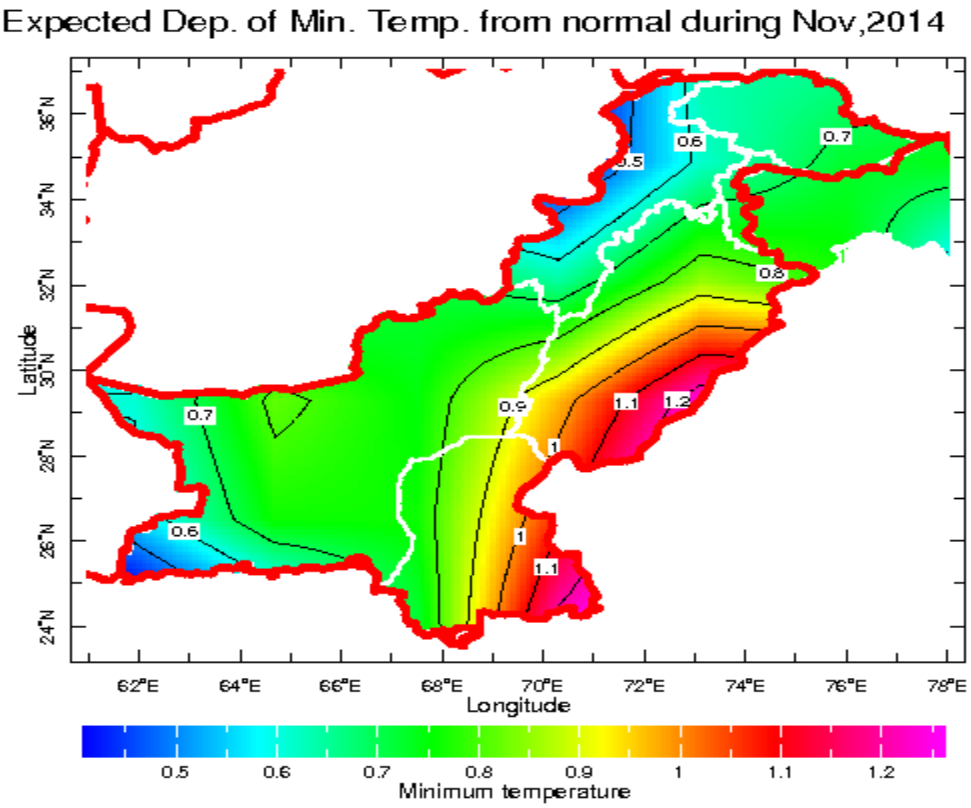
Expected Minimum Temperature during Dec, 2014

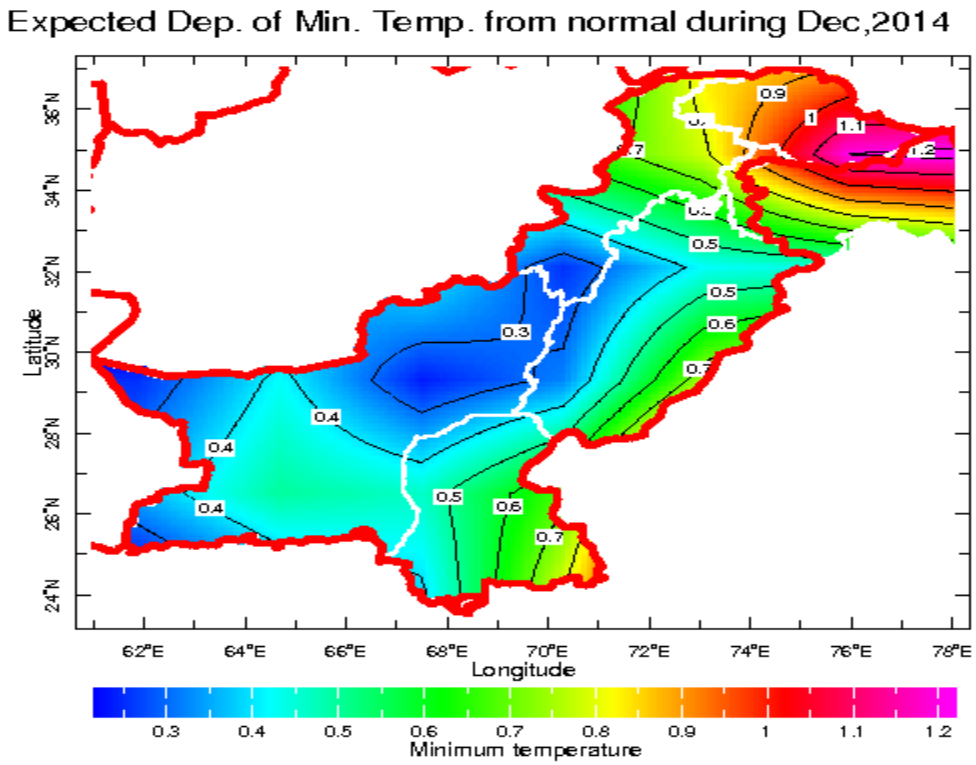


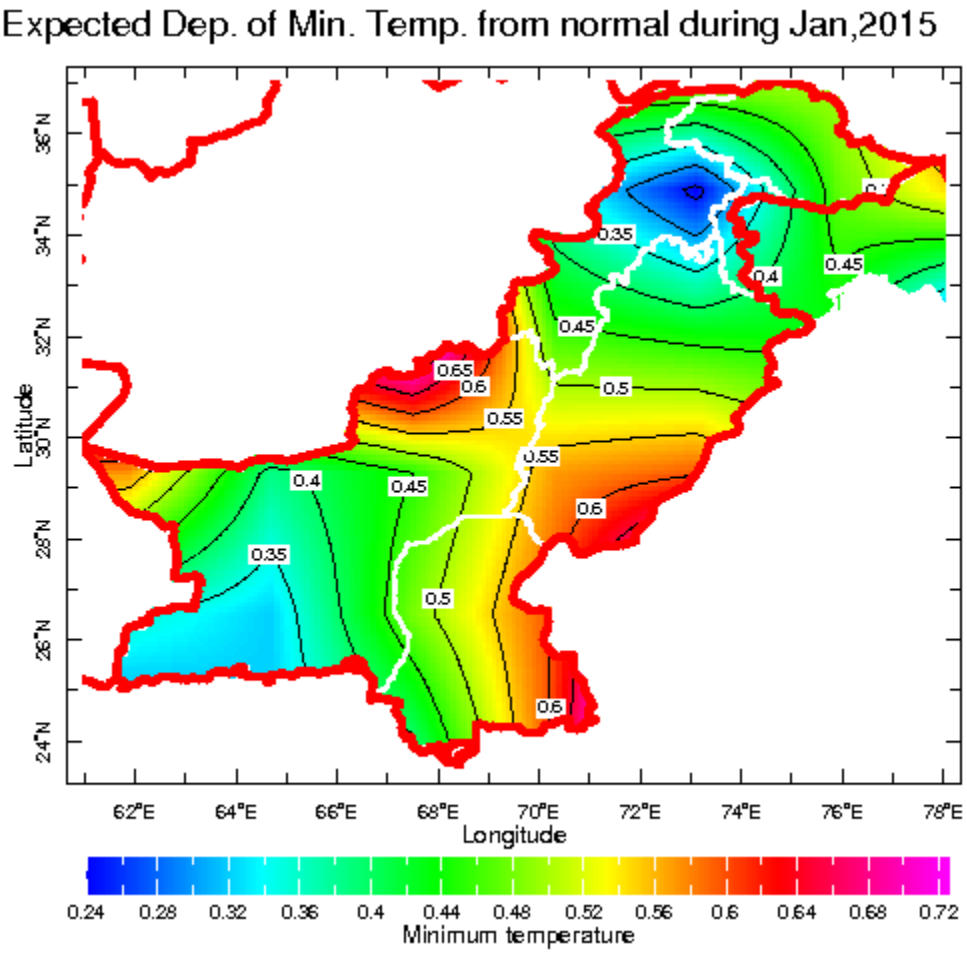
Expected Minimum Temperature during Jan, 2015



7. *Departure of expected minimum temperature from normal*







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/