Seasonal weather outlook

(Oct-Dec, 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 Oct 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.

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 (-1.68) 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. However, convective cloudiness remained generally near average over most of the region, except for below average cloudiness observed across the central and western Pacific. The lack of a coherent atmospheric El Niño pattern and near-average SSTs in the central Pacific indicate a continuation of ENSO-neutral.
- 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). (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Probability outlook: La Nina (1%), Neutral (38%) and El Nino (61 %) during Oct-Nov-Dec, 2014 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 (Oct-Dec, 2014)*

Synthesis of the latest model forecasts for Oct-Dec, 2014 (OND), 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 normal during October and November.   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. Above average precipitation is expected during last phase of predicted month (December).

II. Normal to slightly below normal precipitation is expected during October.

III. In October, below average precipitation is expected all over the country whereas slightly above average rainfall over southern parts (Sindh) of the county. Night temperatures are likely to be above normal (about 1°C) all over the country with higher value over eastern and central parts of the country.

IV.   Two rainy spells, one during 1st week and second on 3rd week , are expected during October

V.   Normal precipitation is expected over all the provinces except Kashmir. Normally, November is dry month all over the county.

VI.   Night temperature will be on higher side all over the country with higher values over central and eastern parts of the country.

VII.   No heavy or moderate rainy spells are expected during all over the country. Light rain is expected over isolated places of the country during the month.

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

IX.   Above normal precipitation is expected during December. Snowfall over Northern hilly areas may start during the month of December.

X.   Above normal precipitation is expected over Baluchistan and Sindh.

XI.   Expected Minimum temperature will be slightly below normal during December with higher values over North-western parts of the country.

2.2.   *Monthly Quantitative Weather Forecast*

	Oct, 2014		Nov, 2014		Dec, 2014		Oct-Dec, 2014	
	ave	exp	ave	exp	ave	exp	ave	exp
GB	9.6	Blw. Ave	10.0	Ave	16.3	Ave	35.8	Ave
KP	23.9	Ave	20.0	Ave	32.9	Ave	76.8	Ave
AJK	31.7	Ave	23.6	Blw. Ave	50.9	Ave	106.2	Ave
FATA	13.2	Ave	10.9	Abv. Ave	20.6	Abv. Ave	44.7	Abv. Ave
PUNJAB	8.4	Blw. Ave	4.2	Blw. Ave	12.0	Abv. Ave	24.6	Ave
BALUCHISTAN	3.7	Blw. Ave	3.2	Ave	14.8	Abv. Ave	21.6	Abv. Ave
SIND	4.5	Abv. Ave	1.6	Ave	5.0	Abv. Ave	11.2	Abv. Ave
Pakistan	7.8	Blw. Ave	5.7	Ave	14.9	Abv. Ave	28.3	Abv. Ave

Seasonal weather outlook (Oct-Dec, 2014)

*Ave.: average (1981-2010), **Exp.**: Expected rainfall, **Below Average** (Blw. Ave) < -15 %, **Average** precipitation range (Ave) = -15 to +15 %,, **Above Average** (Abv.Ave) > +15 %*
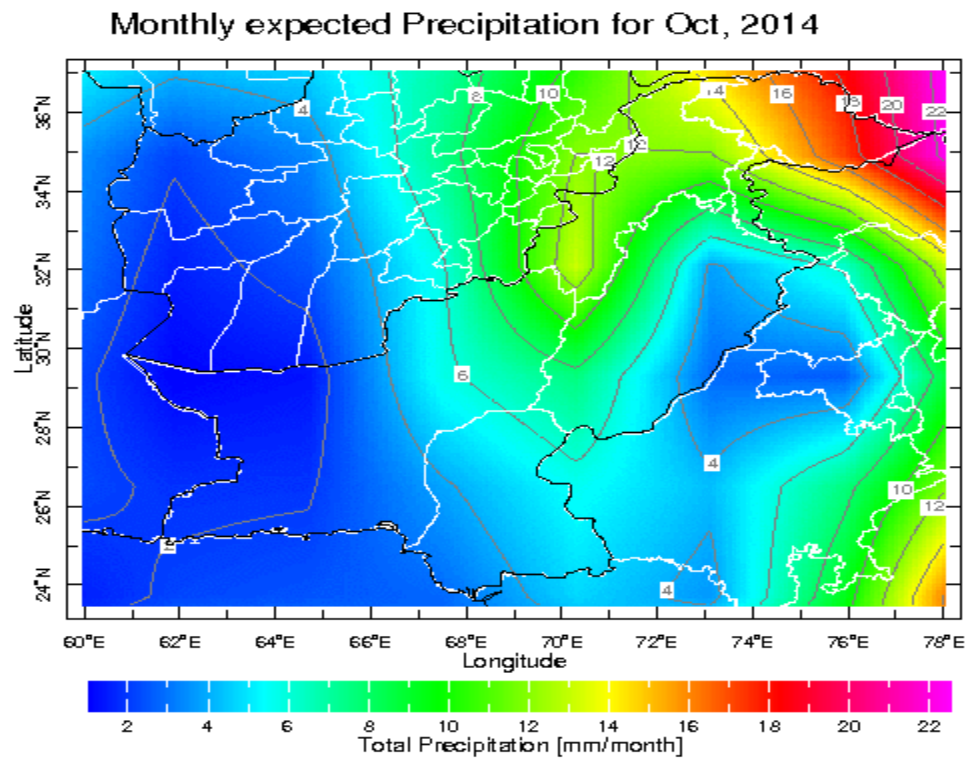
Note: Average precipitation is computed by using Global Precipitation Climatology Centre (GPCC) gridded data by resolution (0.5x0.5^o) latitude by longitude. Ensembles of different climate models are used for computation of expected precipitation over the region.
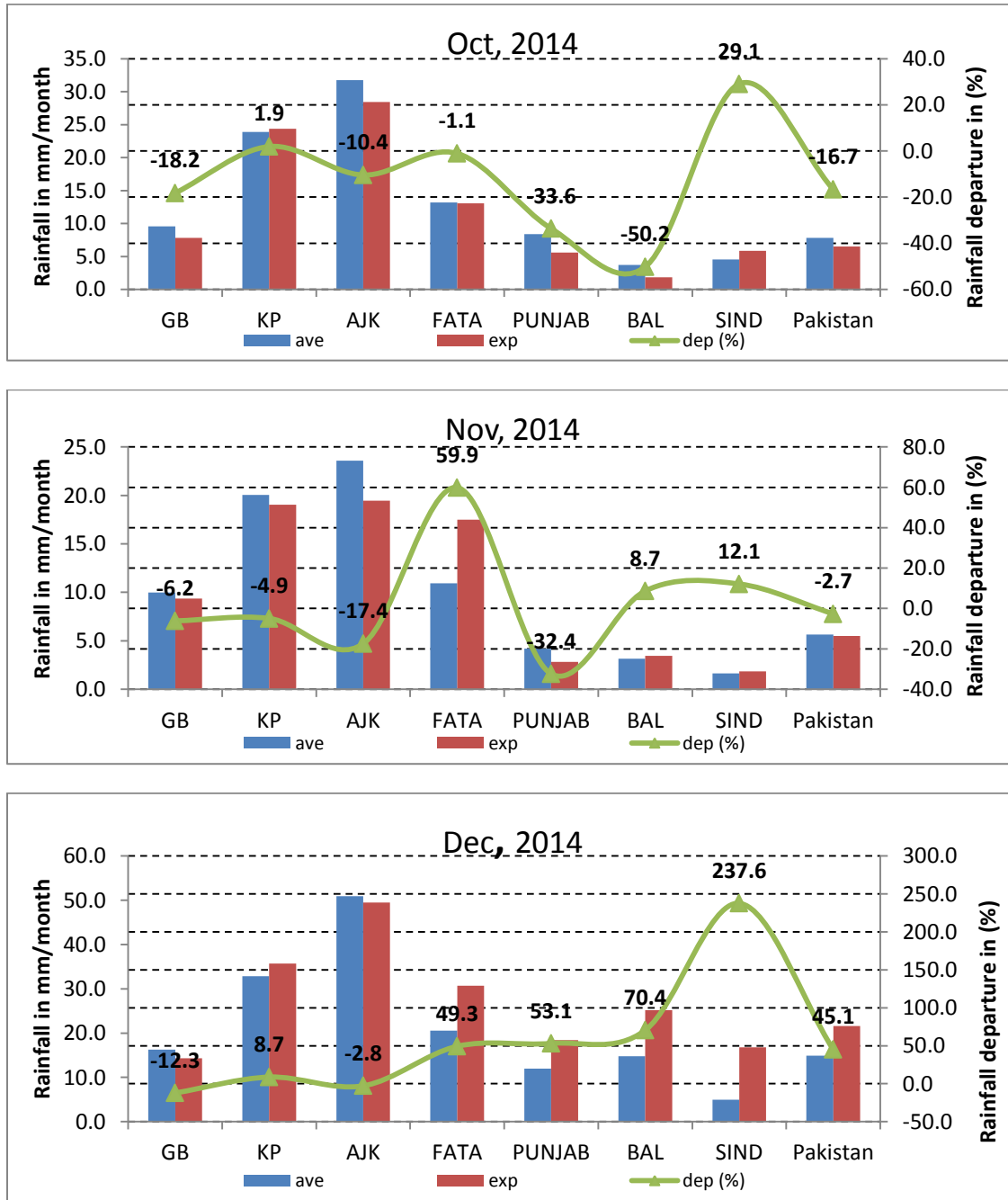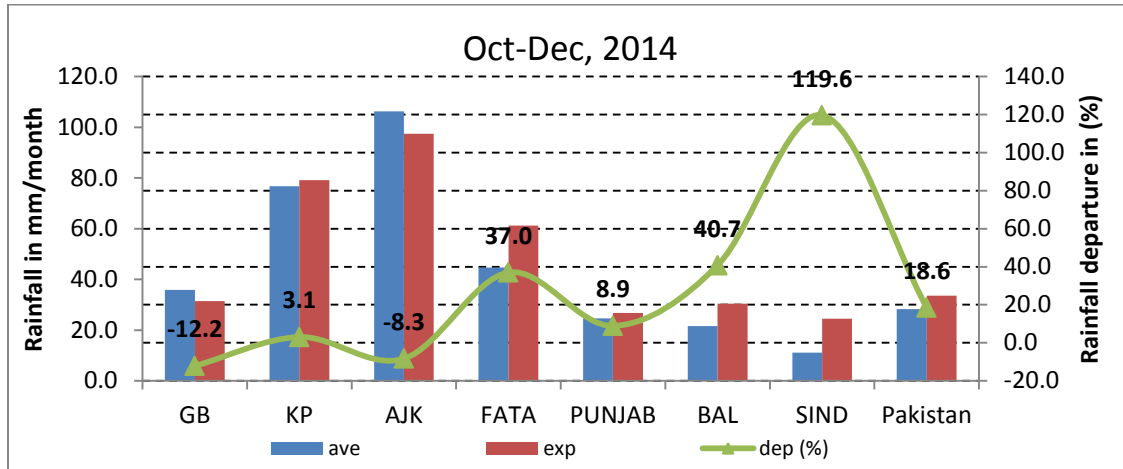
Oct-Dec, 2014

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

Monthly expected Precipitation for Oct, 2014

Monthly expected Precipitation for Nov, 2014
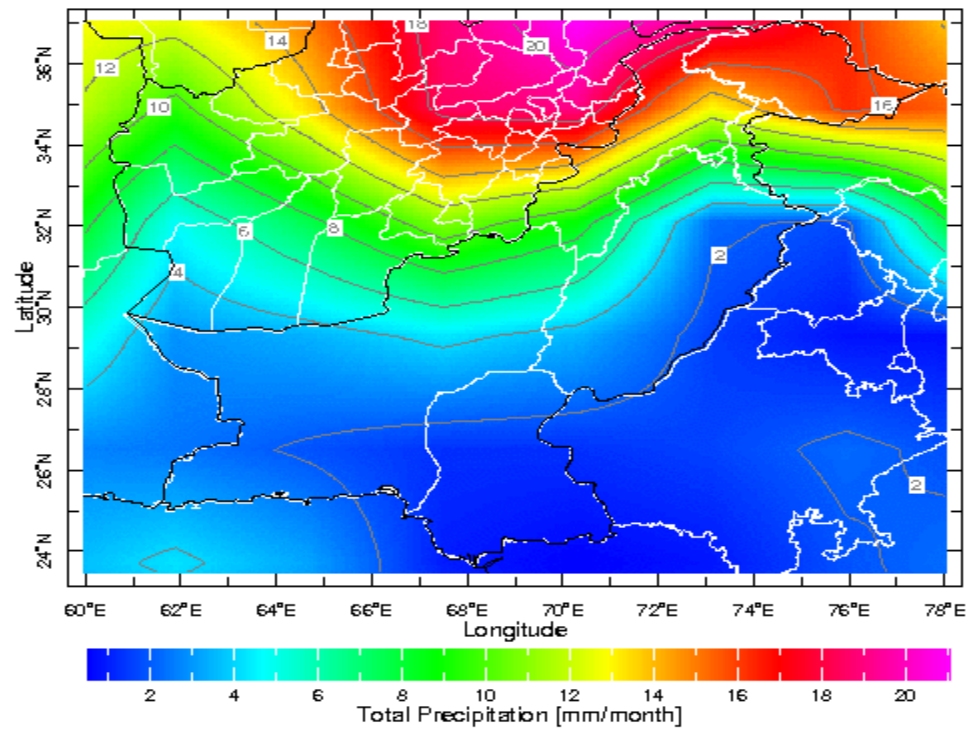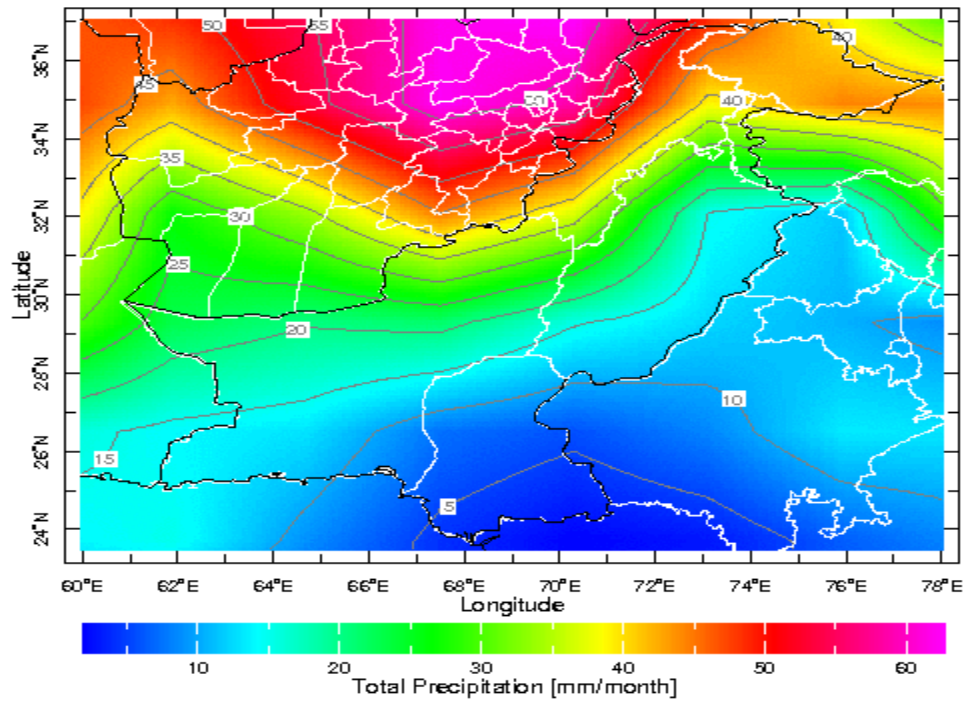
Monthly expected Precipitation for Dec, 2014

Seasonal Precipitation Outlook (Oct-Dec,2014)
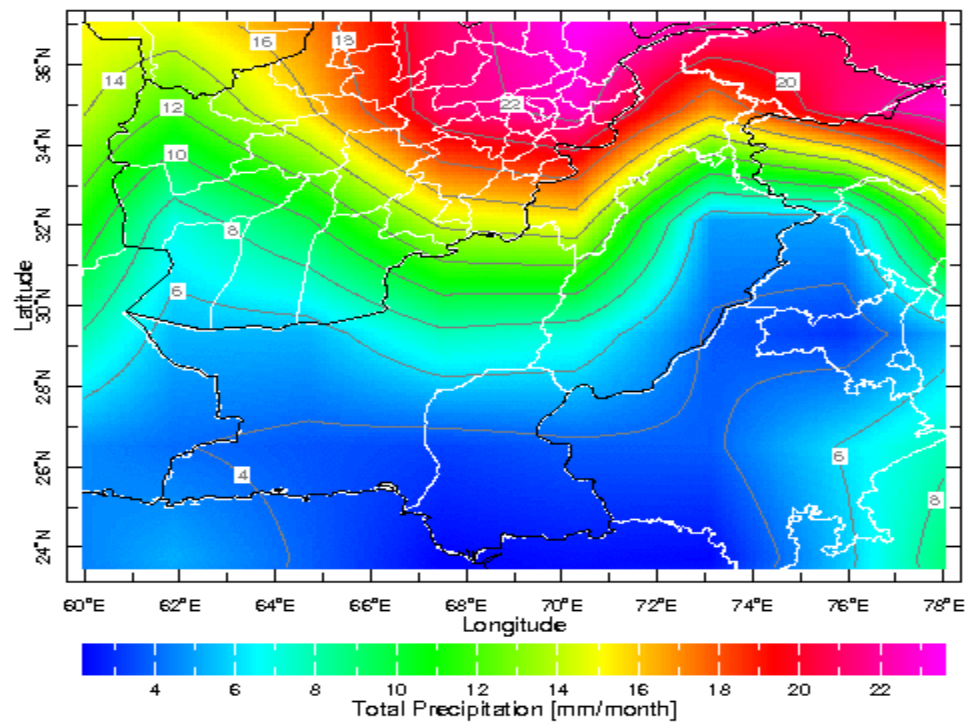
4. *Expected daily rainfall*

Daily expected Precipitation for Oct-Dec, 2014
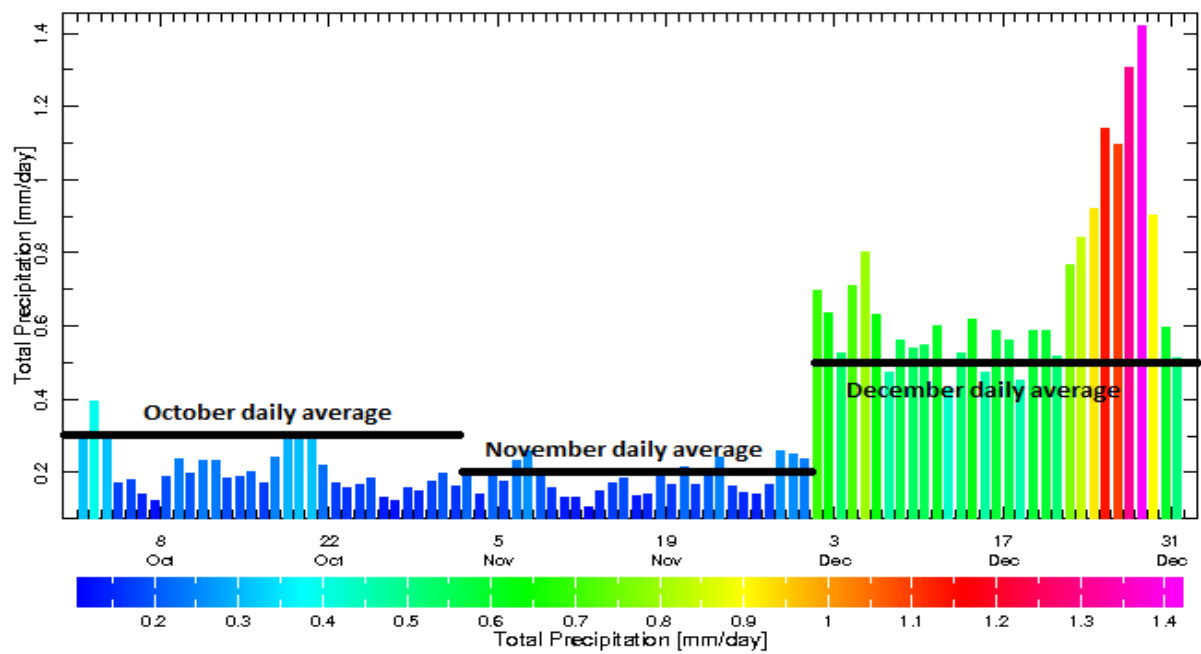
Daily expected Precipitation for Oct, 2014
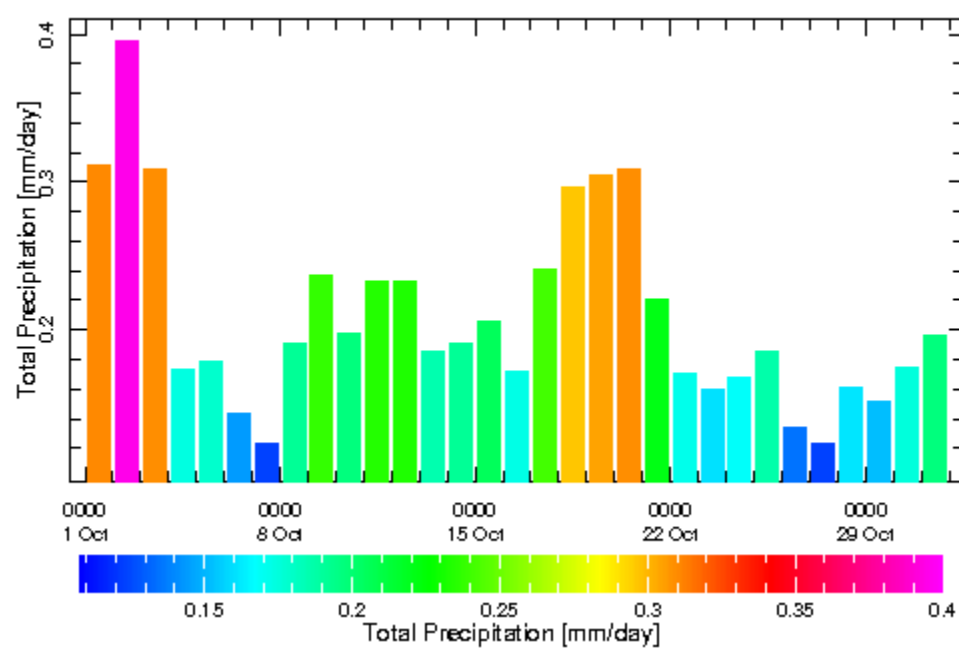
Daily expected Precipitation for Nov, 2014
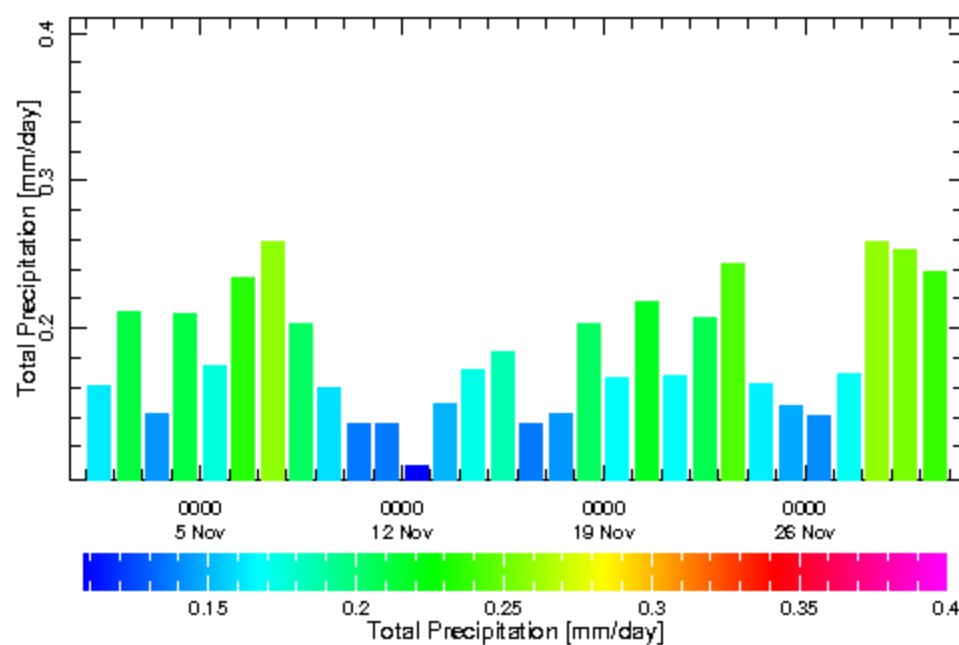
Daily expected Precipitation for Dec, 2014
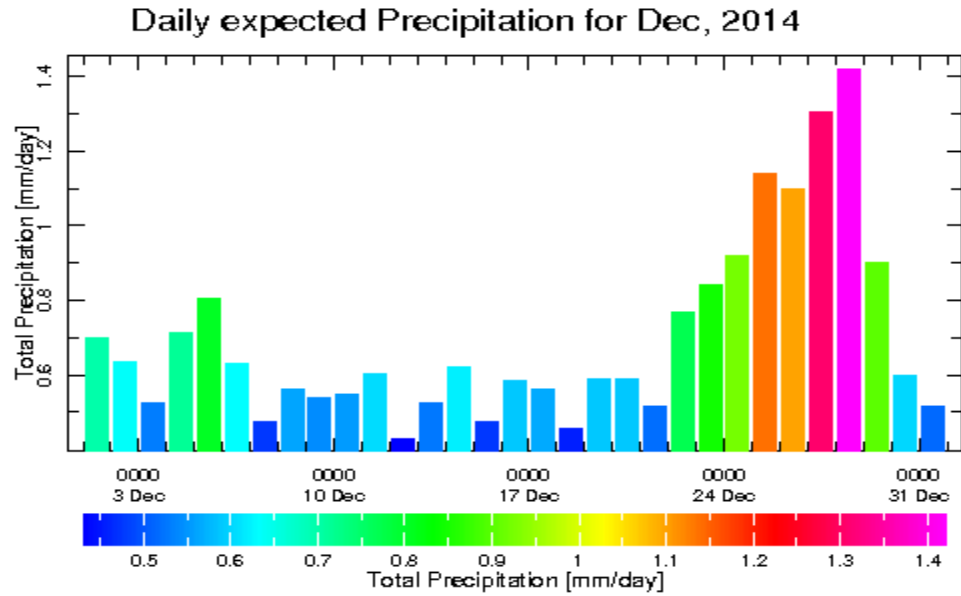
Note: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

5. Monthly departure from normal (precipitation) during coming season
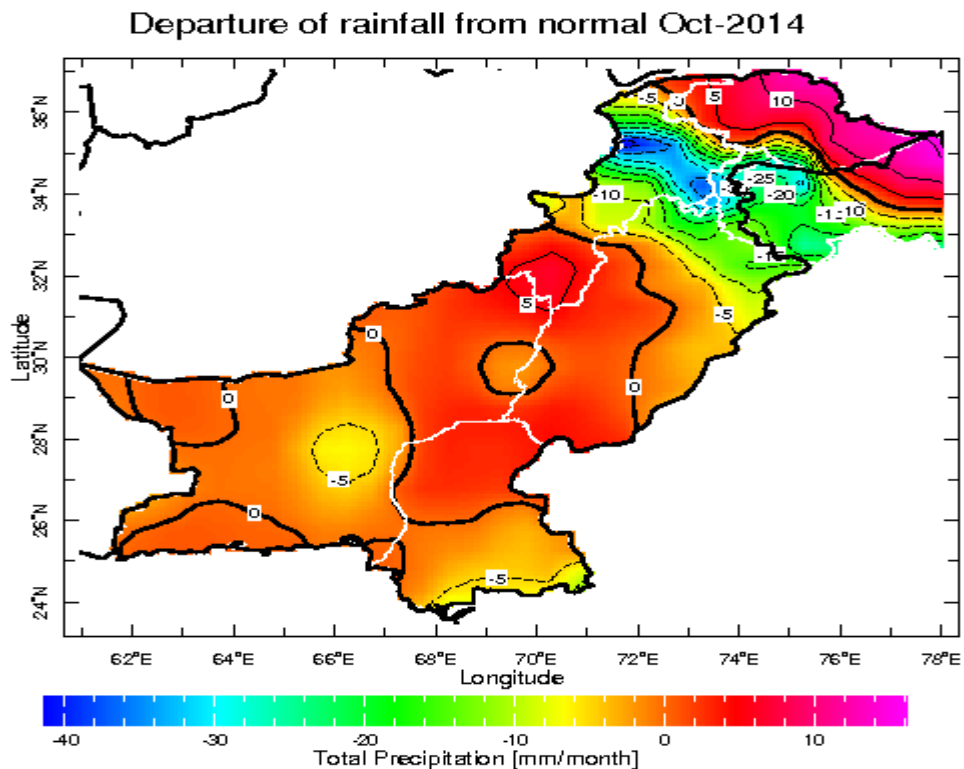
Departure of rainfall from normal Oct-2014

Departure of rainfall from normal Nov-2014

Total Precipitation [mm/month]
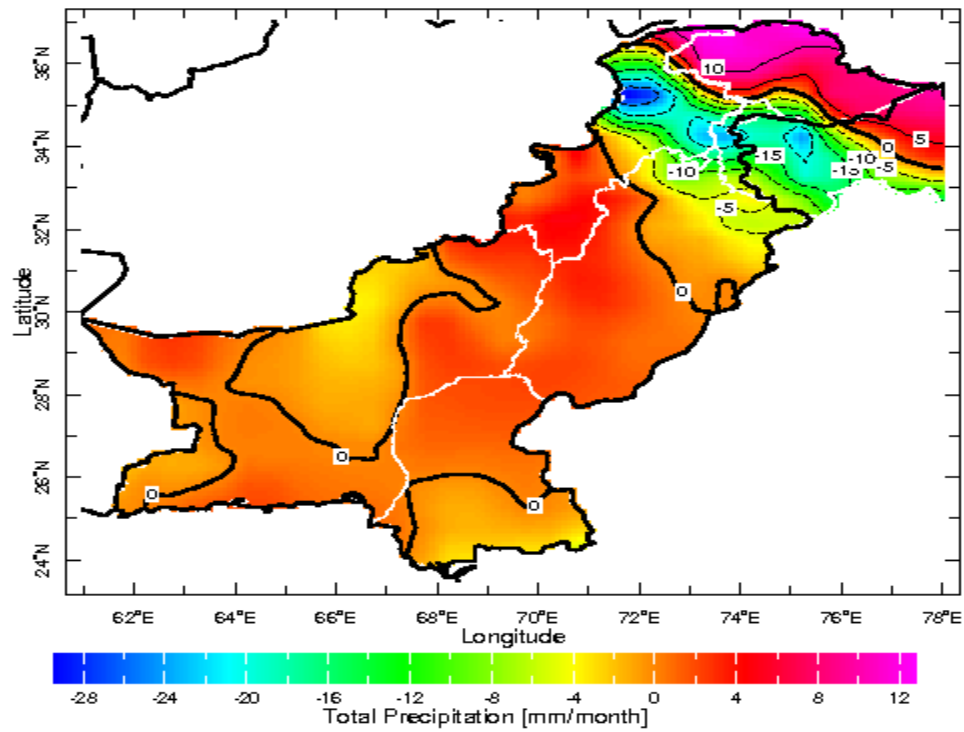
Departure of rainfall from normal Dec-2014

Total Precipitation [mm/month]
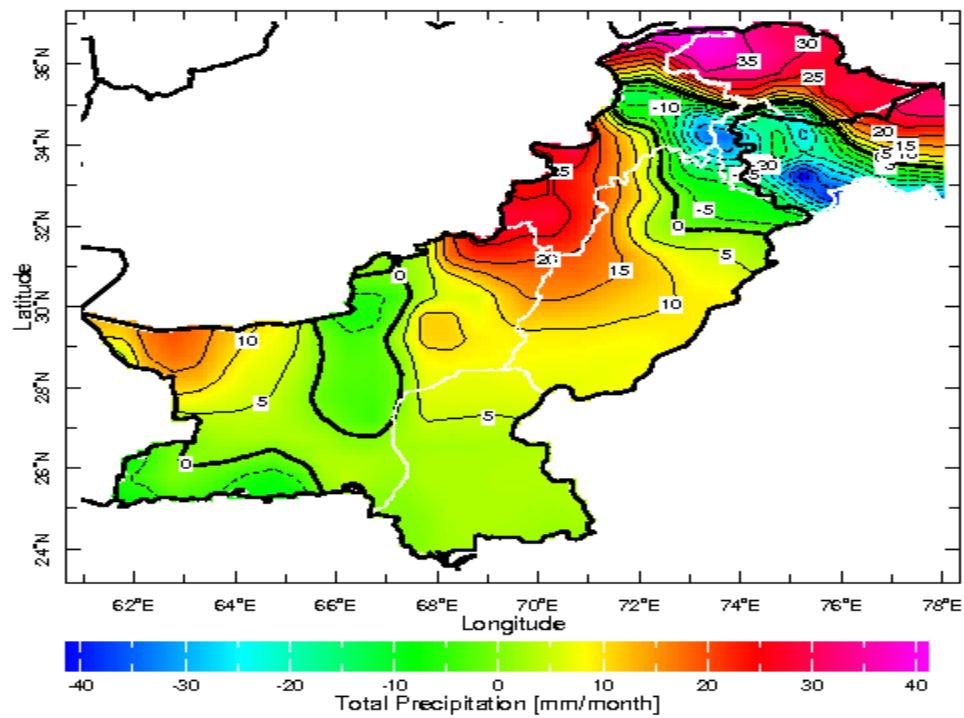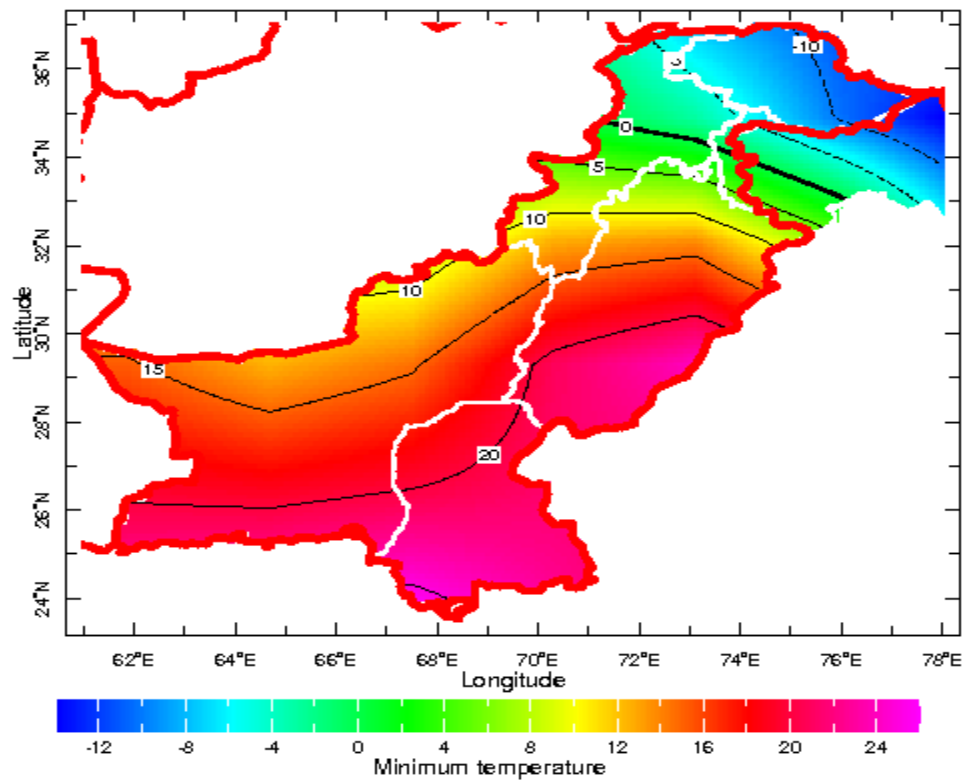
Departure of rainfall from normal (Sep-Nov,2014)
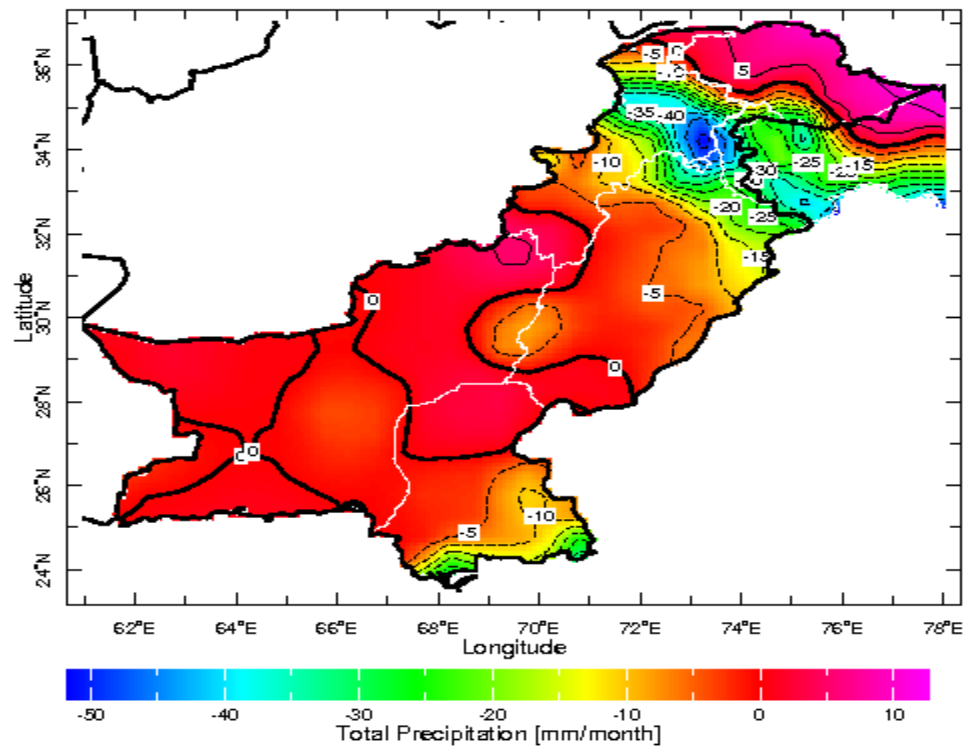
6. Spatial distribution of expected minimum temperature during (Oct and Dec.)
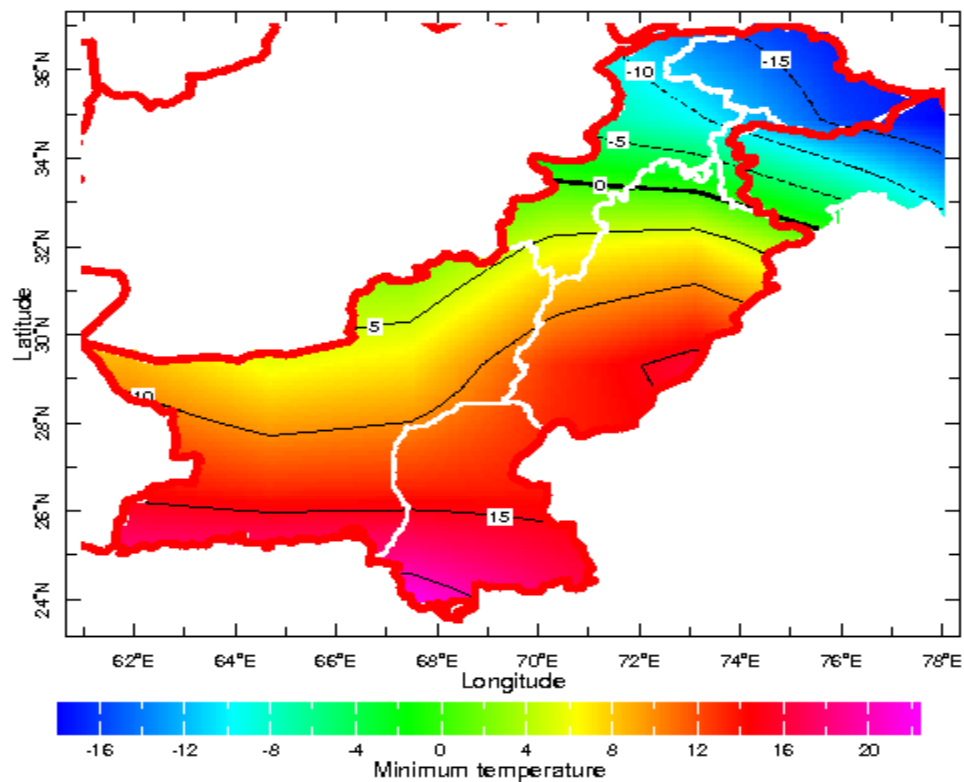
Expected Minimum Temperature during Oct, 2014
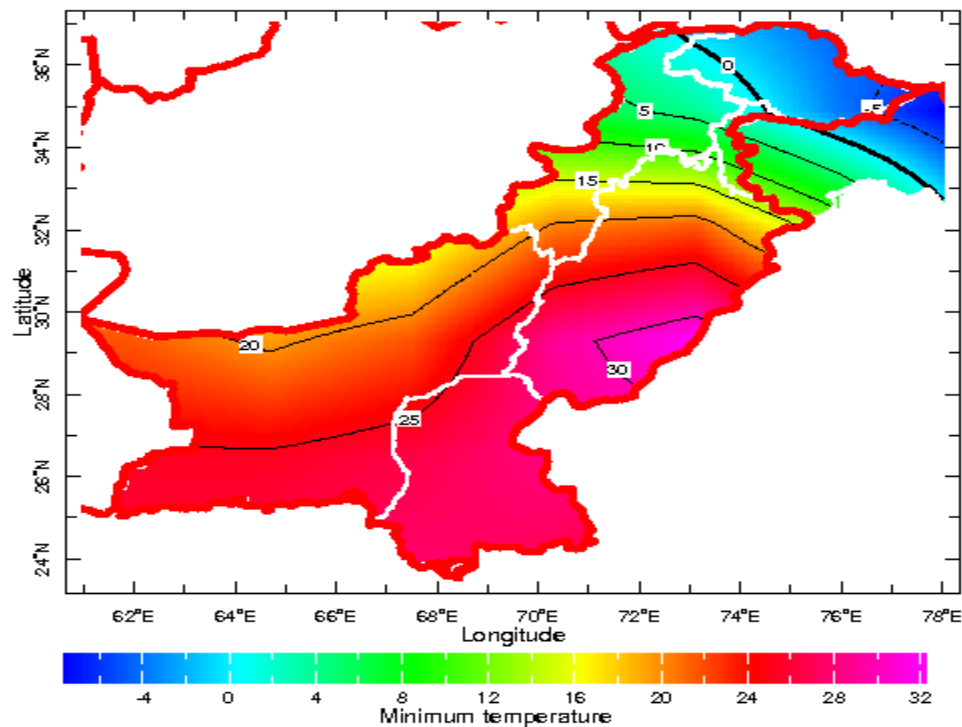
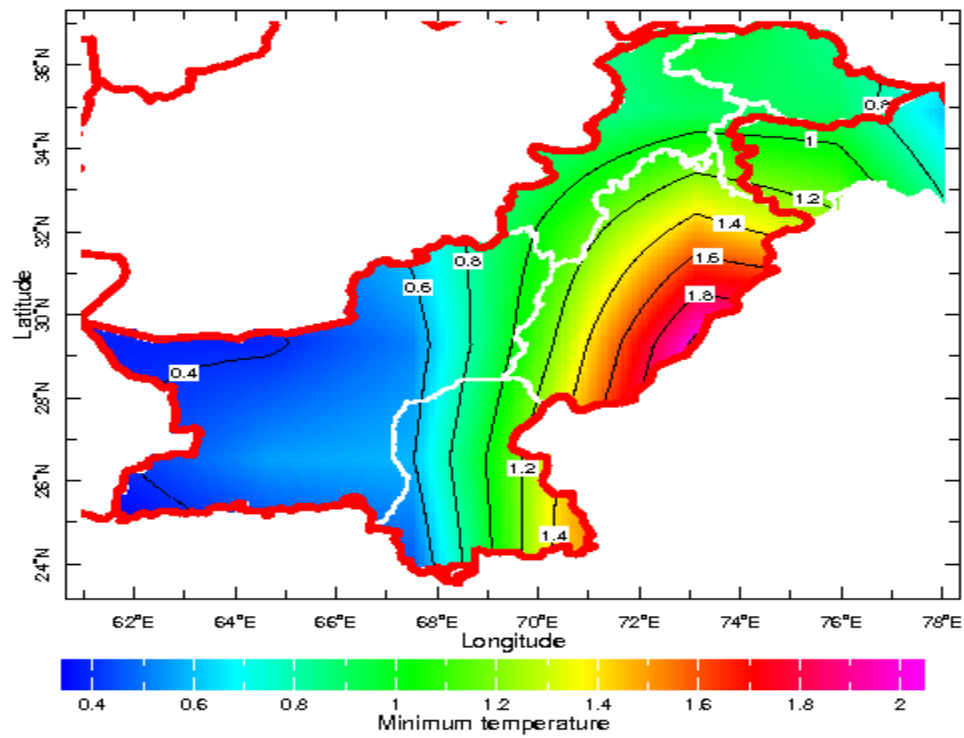Expected Minimum Temperature during Nov, 2014

Expected Minimum Temperature during Dec, 2014
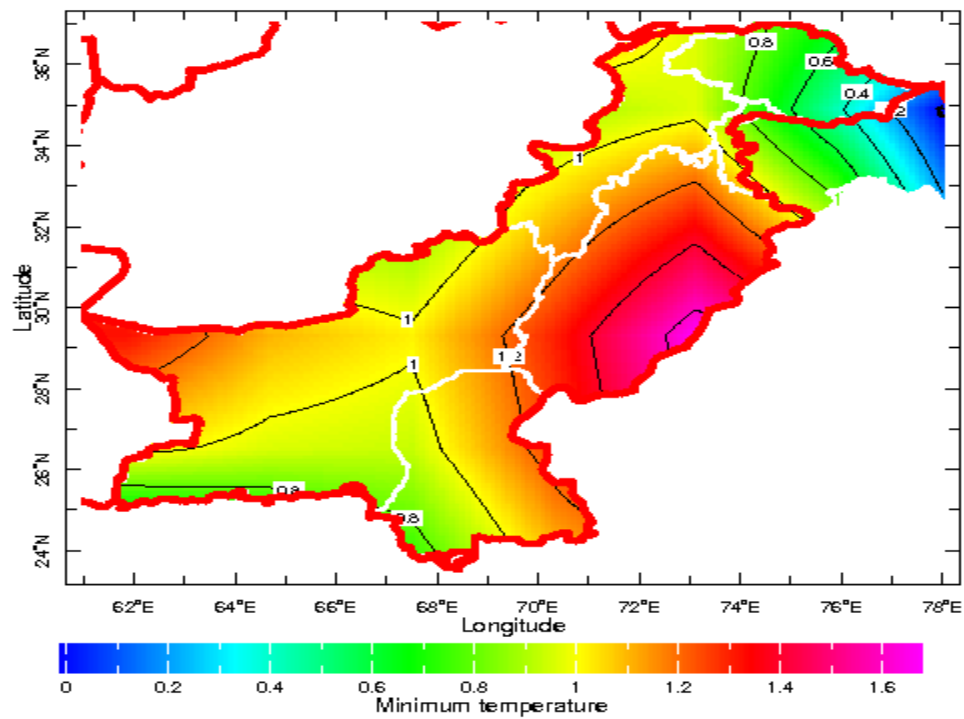
7. *Departure of expected minimum temperature from normal (Oct and Dec.)*

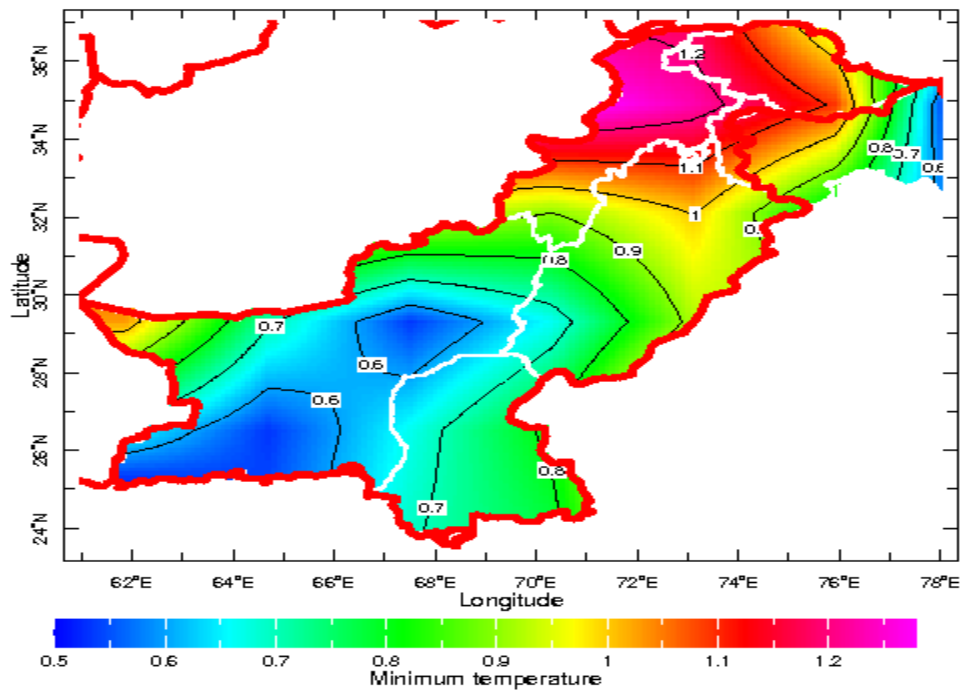Expected Dep. of Min. Temp. from normal during Oct,2014

Expected Dep. of Min. Temp. from normal during Nov,2014

Expected Dep. of Min. Temp. from normal during Dec,2014

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/