Seasonal weather outlook

(Nov, 2013-Jan, 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 Nov 01, 2013. 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 slightly southward from the normal with higher intensity over the west. Intensity of jet stream will be slightly above normal during November, significantly above normal during December and below normal during January.

Probability outlook: Above normal intensity is associated with above normal precipitation in the region and vice versa.

- A ridge at 500 hPa will dominate over the western parts of the region. A narrow trough over Afghanistan and surrounding will be boosted up western disturbances during early season.

Probability outlook: Presence of trough over Afghanistan plays its role and causes rain over northern parts of the country during early and late predicted season.

- Area of high surface temperature expands during November from normal (1982-2010) over central parts of the country. Day temperature will be on higher side during November over central parts of the country

- North Atlantic Oscillation (NAO) is in negative phase (-1.28) and may cause to shift western disturbances towards south during coming months. Data source:

  http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/nao.shtml

Probability outlook: Normal to above normal precipitation over the country. The focus of weather tracks may be towards central and southern side.

- Most of the set of dynamical and statistical model predictions issued during late September and early October 2013 predict neutral ENSO conditions through the rest of 2013 and into early 2014, with a warming tendency during northern spring and summer 2014. Development of weak El Nino conditions appears possible by the middle of 2014. In the most recent week, the SST anomaly in the Nino3.4 region was -0.3C. Data source: http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

Probability outlook: La Nina (6%), Neutral (93%) and El Nino (1 %) during Nov-Dec-Jan, 2014 season

- Arabian Sea Surface Temperatures are expected to be normal near the coast of Pakistan and slightly below normal over far from coast.
- Caspian Sea surface temperatures expected to be normal.
- Mediterranean Sea surface temperatures are normal to slightly above normal.
- Bay of Bengal Sea Surface Temperatures are normal.

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

3. *Seasonal Weather Outlook Summary (Nov, 2013-Jan-2014)*

Synthesis of the latest model forecasts for Nov, 2013-Jan, 2014 (NDJ), current synoptic situation and regional weather expert's judgment indicates that above normal rainfall is expected all over the country with significant normal during December, slightly above normal during November and above normal during January. The slightly above normal temperature is likely to occur in central parts of the country during November, normal during December and below normal during January. Neutral-ENSO condition is expected to persist throughout the predicted period.

3.1.   *Weather outlook*

"Above normal precipitation is expected during the season all over the country with more snowfall over the northern region during December."

I.   Above average (+ 25 %) precipitation is expected during predicted season 2013.

II.   Predicted season (NDJ) is likely to be cold and wet.

III.   In November, two to three spells of precipitation with moderate to higher intensity will occur over northern and central parts of the country.

IV.   Density of fog will be less during upcoming winter months

V.   Area of fog will be less with shallow density.

VI.   Dry weather will be expected over Sindh during November.

VII.   Early and last decade of December will be wet with higher intensity of precipitation over plan areas as well hilly areas of the country.

VIII.   Western weather currents will mostly effective from December.

IX.   Above normal rain is expected over GB region during predicted period.

X.   Below normal rains are expected over AJK province during predicted period.

XI.   The focus of monsoonal weather systems during December will be towards central and Upper Punjab, KP and Kashmir.

XII.   Well intense snowfall spells over northern glaciers are expected during December.

XIII.   Expected Minimum temperature will be slightly above normal all over the country during November whereas December and January will be expected colder month than normal over the country.

XIV.   Temperature will drop significantly over Northeast Balochistan and southern KP during December

3.2. Monthly Quantitative Weather Forecast

	Nov, 2013		Dec, 2013		Jan, 2014		Nov,2013-Jan, 2014	
	Ave	Exp	Ave	Exp	Ave	Exp	Ave	Exp
GB	10.0	Abv. Ave	16.3	Abv. Ave	27.2	Abv. Ave	53.4	Abv. Ave
KP	20.0	Blw. Ave	32.9	Abv. Ave	49.0	Abv. Ave	101.9	Abv. Ave
AJK	23.6	Blw. Ave	50.9	Ave	91.1	Blw. Ave	165.6	Blw. Ave
FATA	10.9	Abv. Ave	20.6	Abv. Ave	30.2	Abv. Ave	61.7	Abv. Ave
PUNJAB	4.2	Abv. Ave	12.0	Abv. Ave	17.2	Abv. Ave	33.4	Abv. Ave
BALUCHISTAN	3.2	Abv. Ave	14.8	Abv. Ave	19.5	Abv. Ave	37.5	Abv. Ave
SIND	1.6	Ave	5.0	Ave	3.0	Abv. Ave	9.7	Abv. Ave
Pakistan	5.7	Abv. Ave	14.9	Abv. Ave	20.8	Abv. Ave	41.3	Abv. Ave

- *Ave. : average (1981-2010)*

- *Exp. : Expected rainfall*

- *Below Average (Blw. Ave) < -10 %,*

- *Average precipitation range (Ave) = -10 to +10 %,*

- *Above Average (Abv.Ave) > +10 %*

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

4. Spatial distribution of expected rainfall during coming season (GCM-ECHAM)
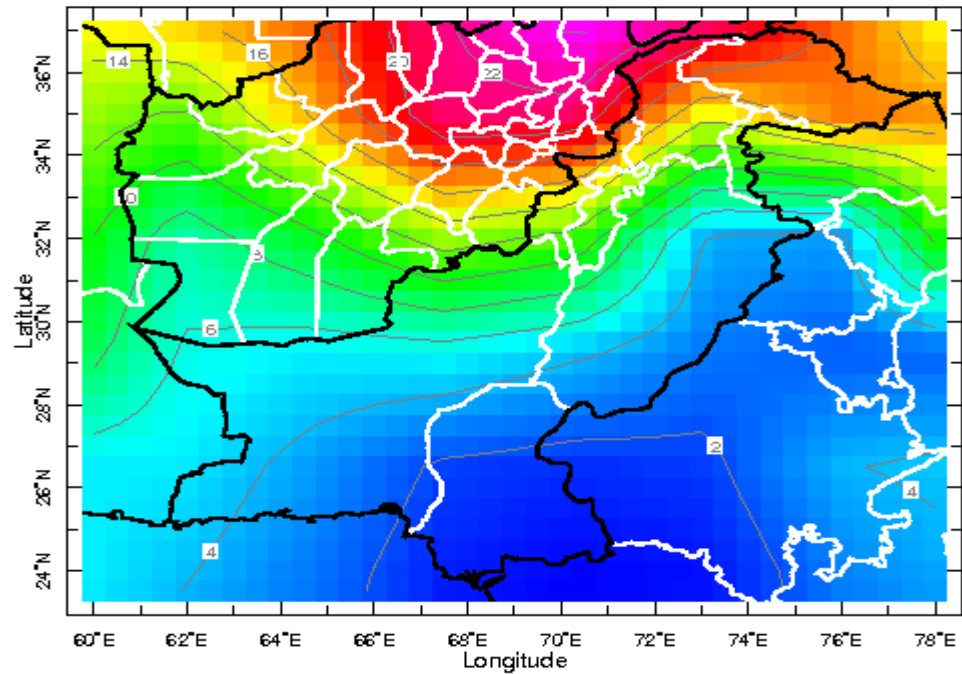
S 0000 1 Nov 2013 Time Nov 2013
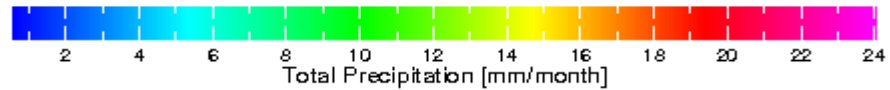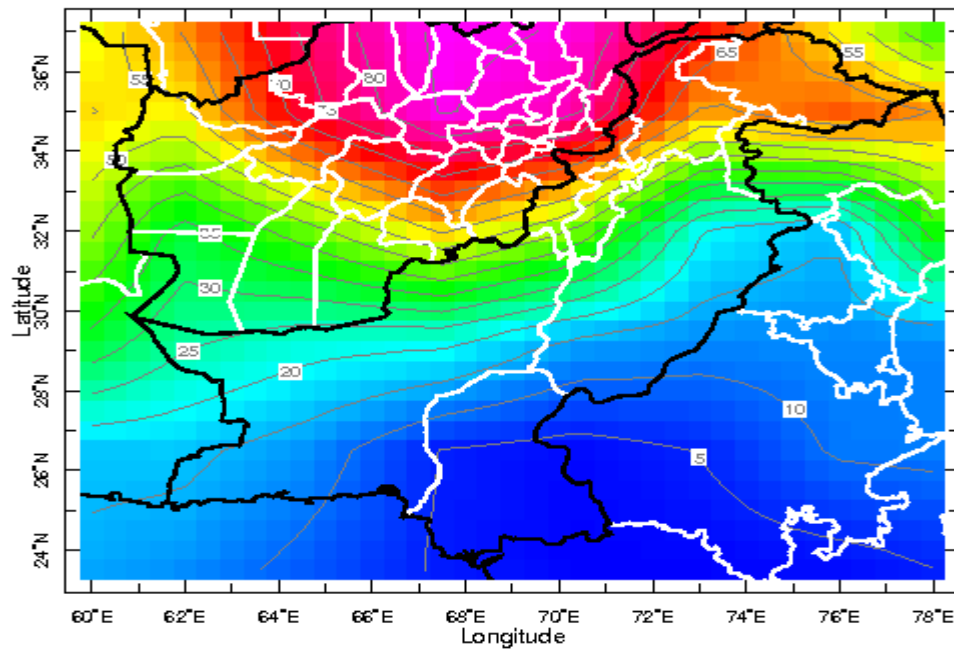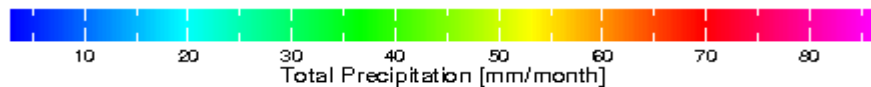
Nov, 2013

S 0000 1 Nov 2013 Time Dec 2013

Dec, 2013

8

S 0000 1 Nov 2013 Time Jan 2014
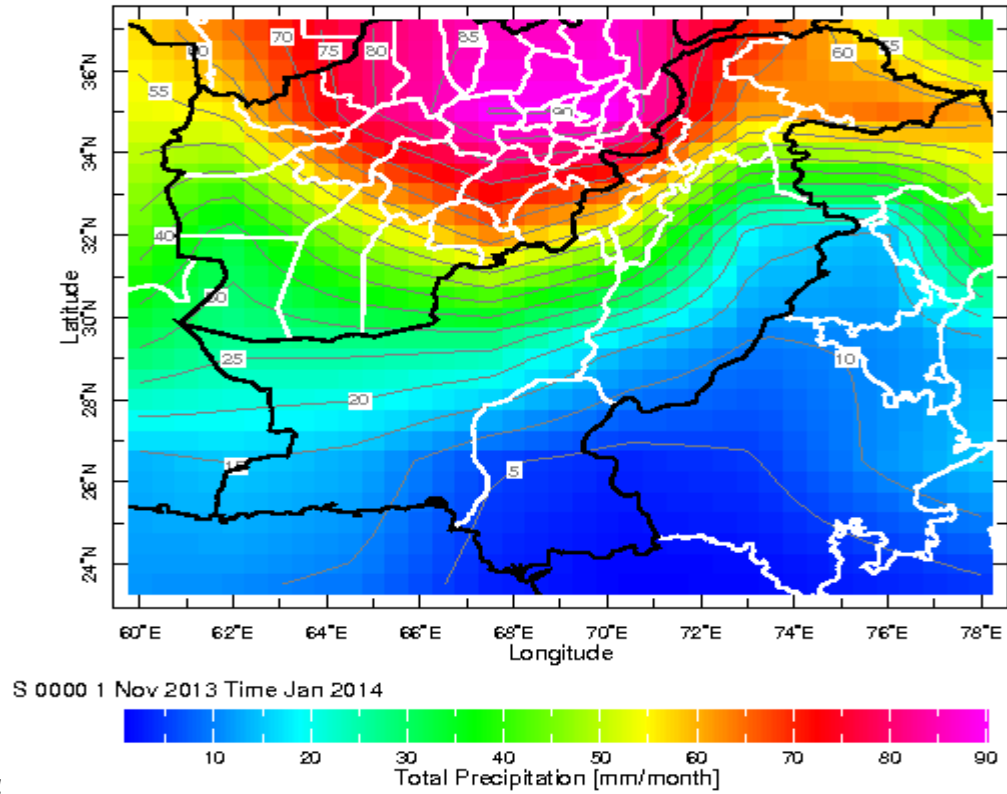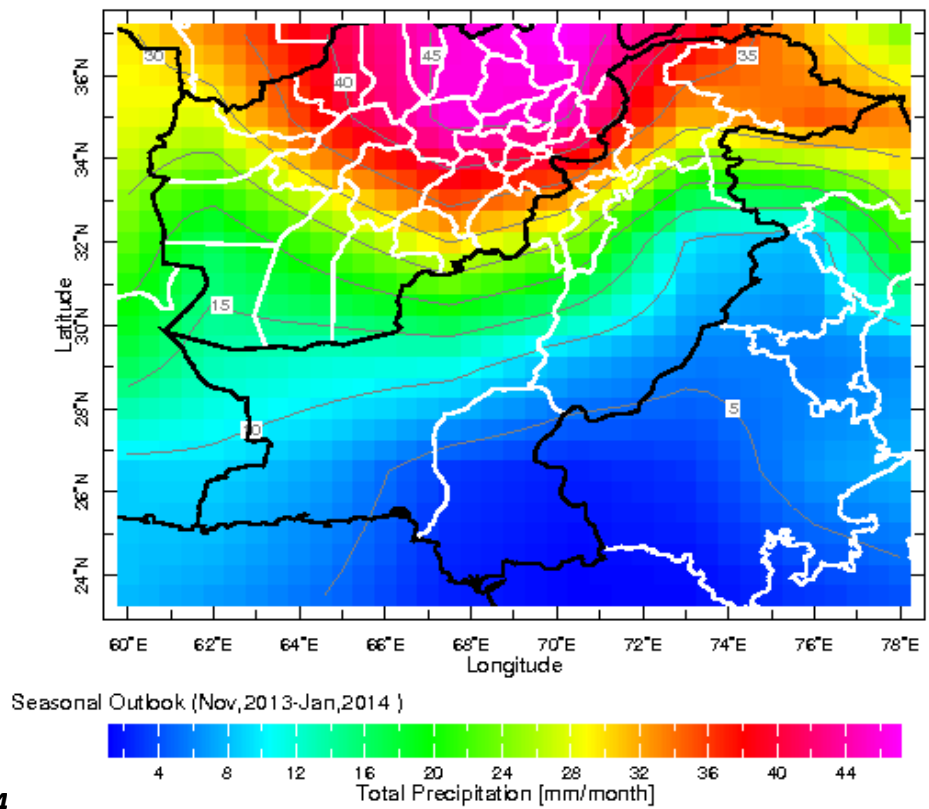
Jan, 2014

Seasonal Outlook (Nov,2013-Jan,2014)

Nov, 2013-Jan, 2014

Expected daily rainfall

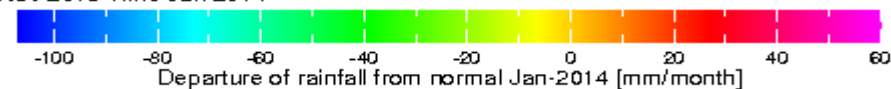**November, 2013**
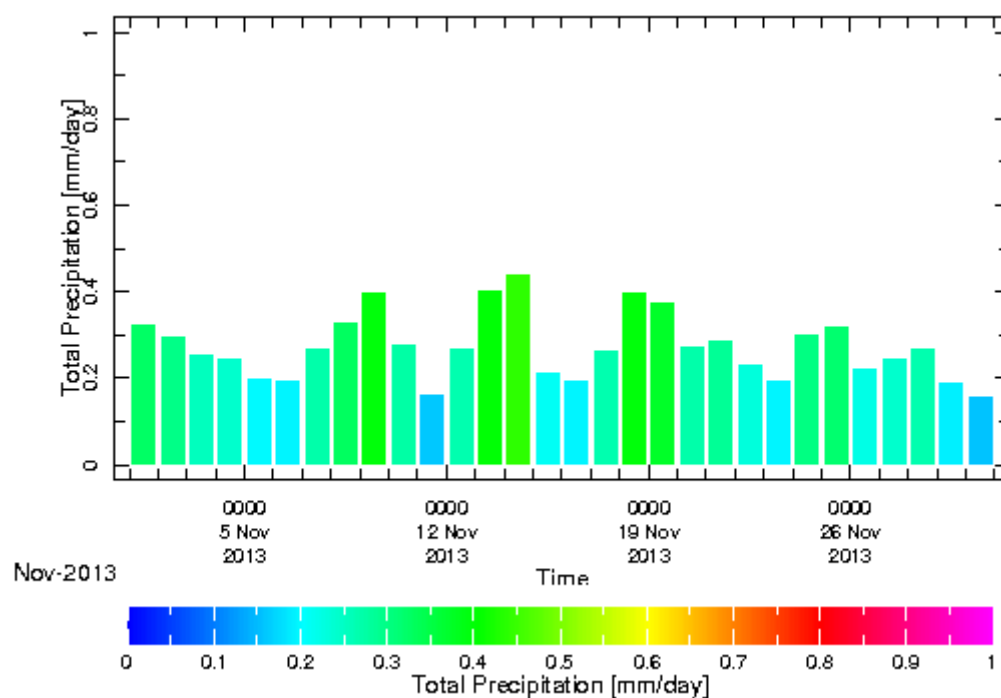
December, 2013
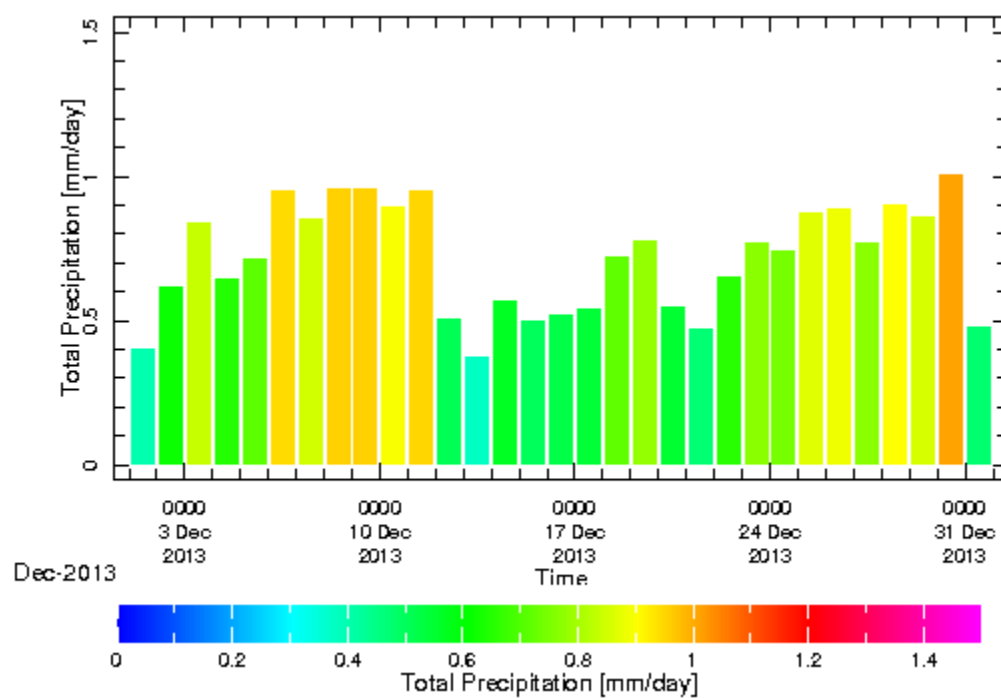
January, 2014

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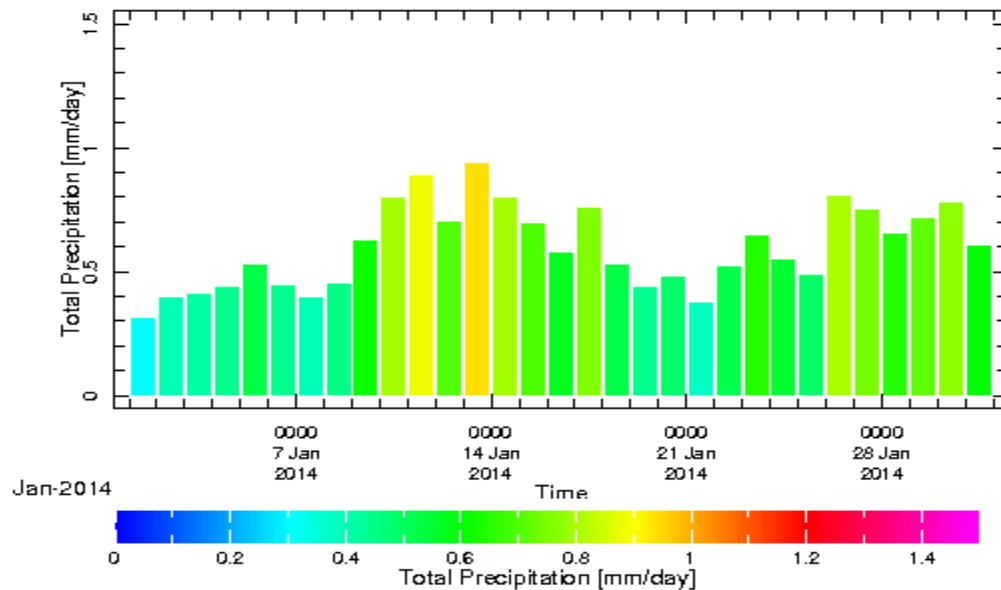
Note: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

Monthly departure from normal (rainfall) during coming season

S 0000 1 Nov 2013 Time Nov 2013

Nov, 2013

S 0000 1 Nov 2013 Time Dec 2013

Departure of rainfall from normal Dec-2013 [mm/month]

Dec, 2013

S 0000 1 Nov 2013 Time Jan 2014

Departure of rainfall from normal Jan-2014 [mm/month]

Jan, 2014

0000 1 Nov 2013

Departure of rainfall from normal Nov,2013-Jan,2014 [mm/month]

Nov2013-Jan, 2014

Spatial distribution of expected minimum temperature during
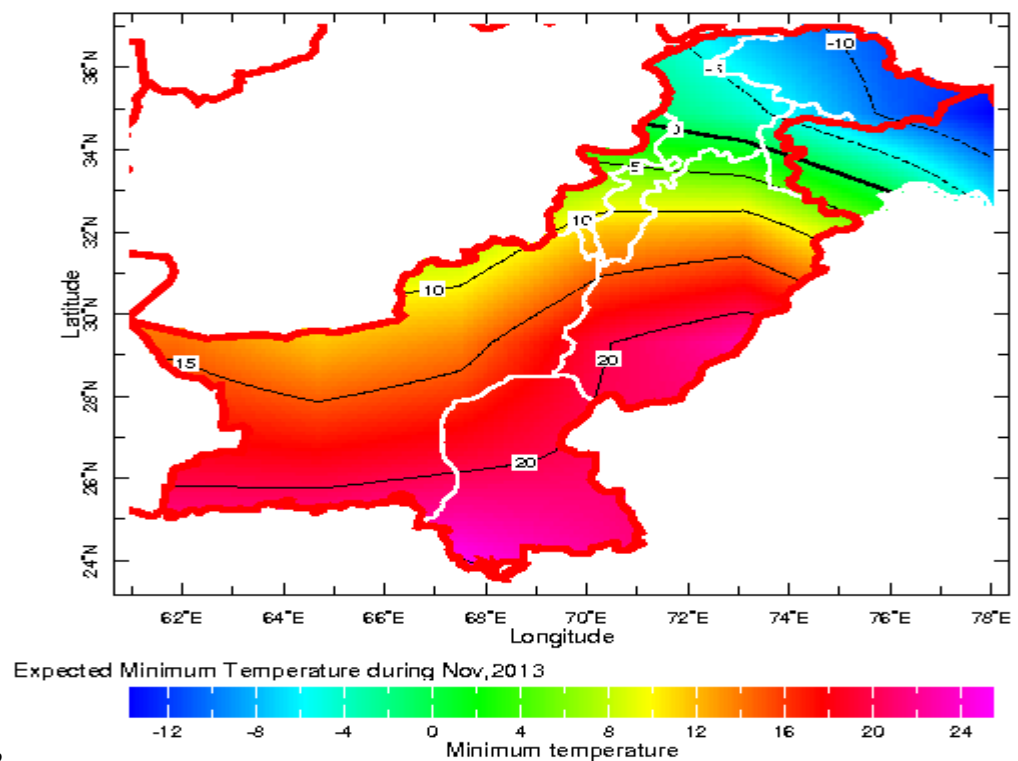
Expected Minimum Temperature during Nov,2013

Minimum temperature

Nov, 2013

Expected Minimum Temperature during Dec,2013
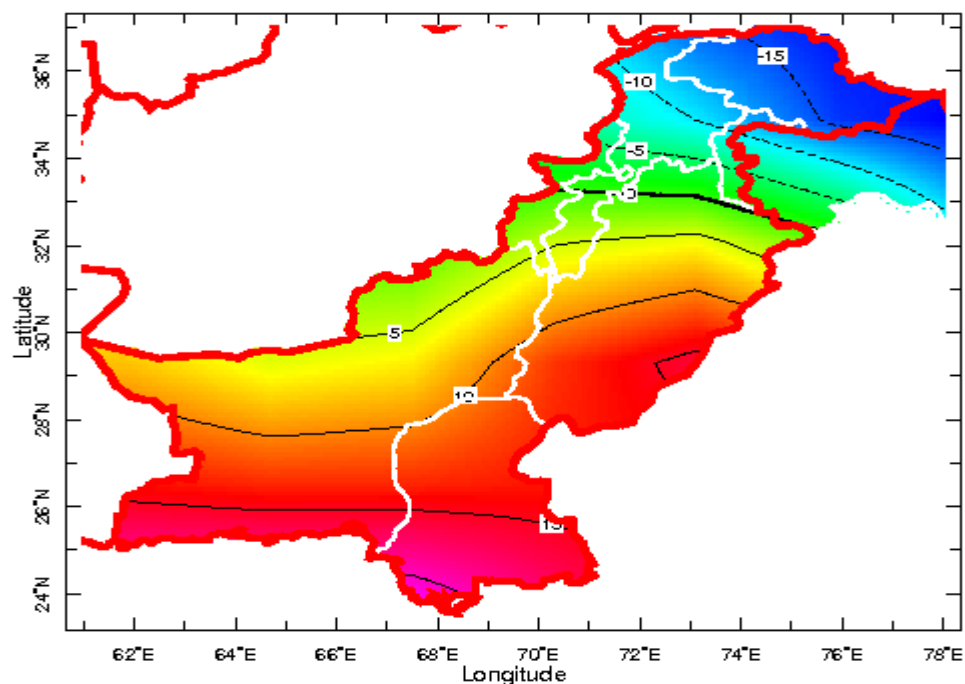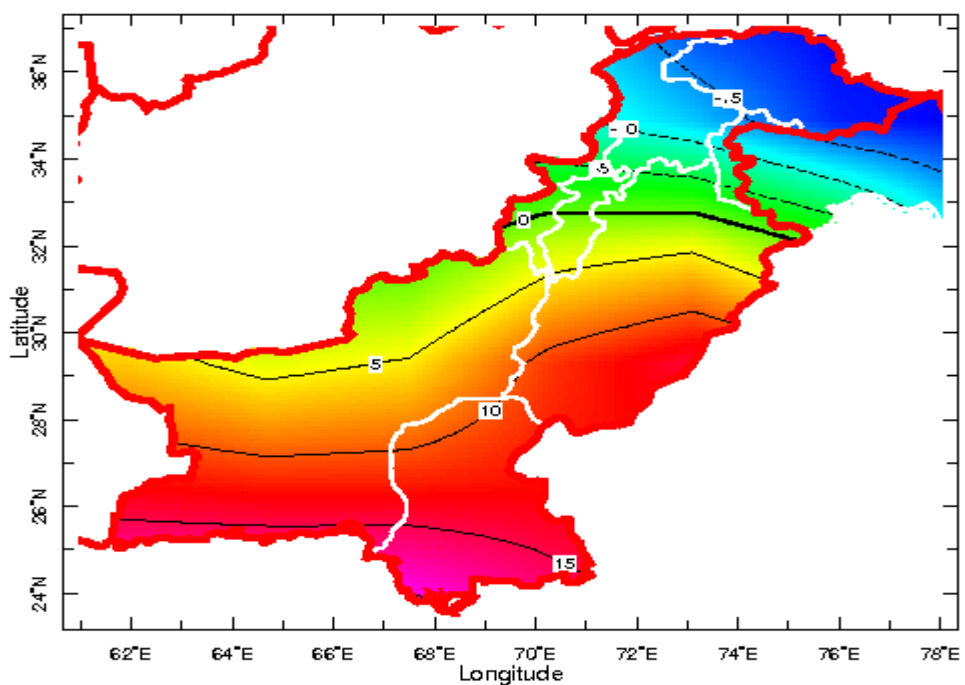
Dec, 2013

Expected Minimum Temperature during Jan,2014
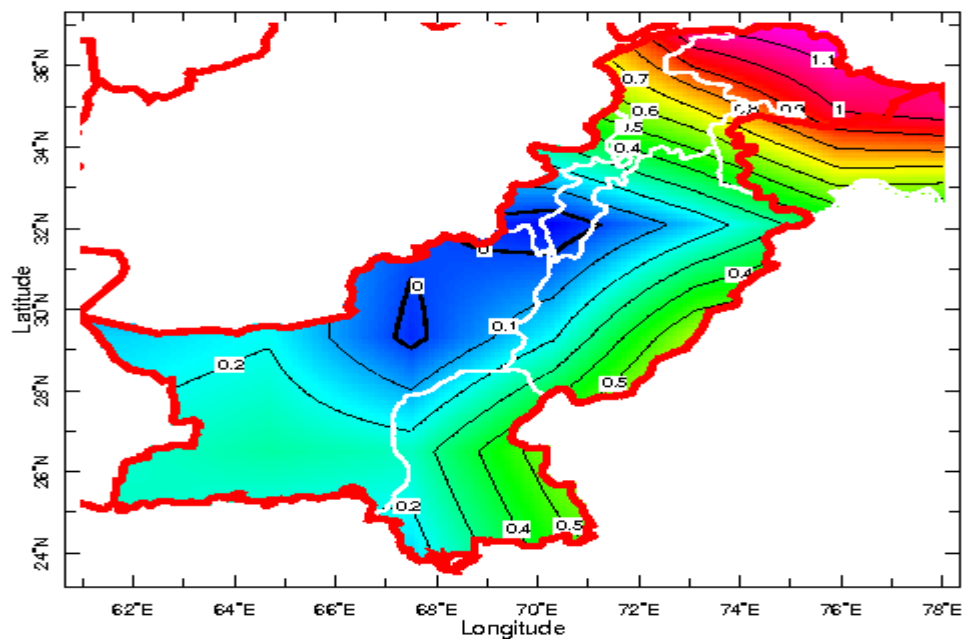
Jan, 2104

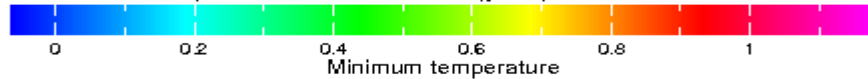**Departure of expected minimum temperature from normal**
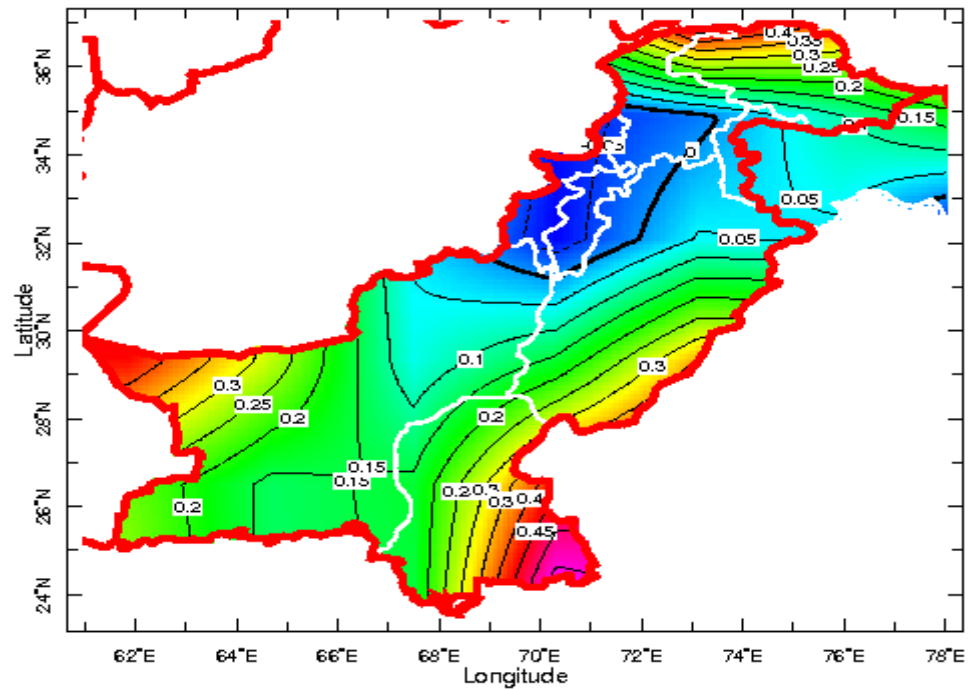
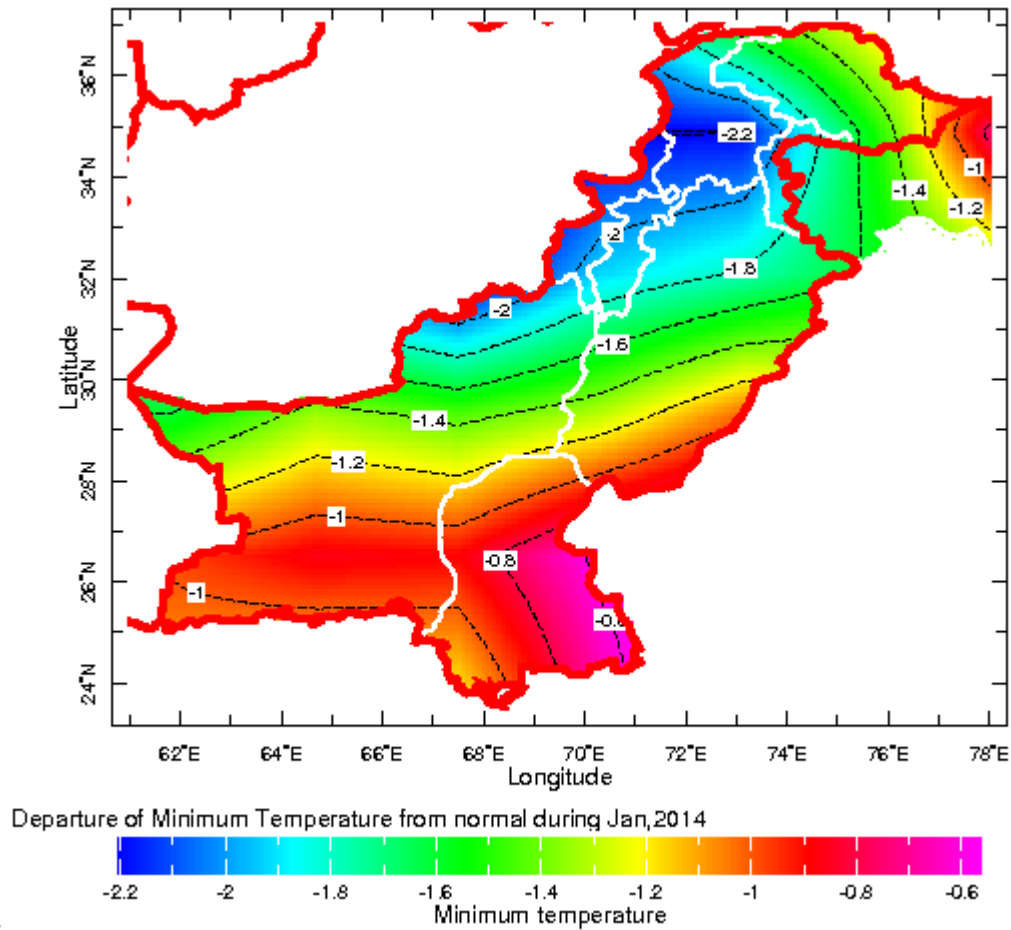Departure of Minimum Temperature from normal during Nov,2013
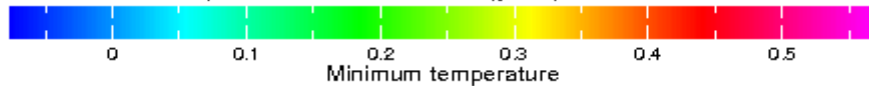
Nov, 2013

Departure of Minimum Temperature from normal during Dec,2013

Dec, 2013

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Departure of Minimum Temperature from normal during Jan,2014

Jan, 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/*