Seasonal weather outlook

(Feb-Apr, 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 Feb 01, 2015. 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 less intensity. The area of jet stream may be squeezed during Feb over northern of Afghanistan and Pakistan. Below normal strength of jet stream over west of the region.

  Probability outlook: Normal to below normal intensity of jet stream is associated with below normal precipitation in the region.

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

  Probability outlook: normal precipitation is likely to occur the country. Lower and central parts of the country may be getting good rain during February.

- Surface temperatures are expected to be on lower side than normal all over the region including Pakistan, India and surroundings.

- North Atlantic Oscillation (NAO) is in positive phase (1.79) and in increasing trend (higher than previous month). As a result, tracks of western disturbances would be on northern region of the country. http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii.table

  Probability outlook: Below normal precipitation over all parts of the country will be expected. The focus of weather tracks may be towards northern parts of the country.

ENSO Alert System Status: El Niño Watch

Synopsis: There is an approximately 50-60% chance of El Niño within the late Northern Hemisphere winter and early spring, with ENSO-neutral slightly favored thereafter.

Equatorial sea surface temperatures (SST) remained above average in the western and central Pacific during January 2015 and cooled across the eastern Pacific. Accordingly, the latest weekly Niño indices were +0.5°C in the Niño-3.4 region and +0.9°C in the Niño-4 region, and closer to zero in the Niño-3 and Niño-1+2 regions. Subsurface temperature anomalies across the eastern half of the equatorial Pacific also averaged near zero during the month. However, an extensive area of positive subsurface anomalies persisted near the Date Line, while negative anomalies were prevalent closer to the surface east of 110°W. During the last couple of weeks of January, several aspects of the tropical Pacific atmosphere showed some movement toward El Niño. However, for the month as a whole, the equatorial low-level winds were mostly near average across the Pacific, while upper-level easterly anomalies continued in the east-central Pacific. Also, convection remained below average near the Date Line and enhanced in the western equatorial Pacific. While the tropical Pacific Ocean is at the borderline of El Niño, the overall atmosphere-ocean system remains ENSO-neutral.

Similar to last month, most models predict a weak El Niño (3-month values of the Niño-3.4 index between 0.5°C and 0.9°C) during the Northern Hemisphere late winter and spring. The forecaster consensus also favors Niño-3.4 SST index values in excess of 0.5°C within the coming season. However, climatologically, ocean-atmosphere coupling tends to weaken into the spring, which increases uncertainty over whether El Niño conditions will emerge. In summary, there is an approximately 50-60% chance of El Niño within the late Northern Hemisphere winter and early spring, with ENSO-neutral slightly favored thereafter.(http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Probability outlook: La Nina (1%), Neutral (46%) and El Nino (53 %) during Feb-Mar-Apr, 2015 season

- Arabian Sea Surface Temperatures are expected to be 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 (Feb-Apr, 2015)*

Synthesis of the latest model forecasts for Feb-Apr, 2015 (FMA), current synoptic situation and regional weather expert's judgment indicates that normal to slightly below normal precipitation is expected all over the country with average during February and April and significantly below normal during March. Slightly below average night temperature is likely to occur during February and March while above normal day temperature during April all over the country.

2.1. Weather outlook

"Below average precipitation is expected during the season all over the country with slightly below normal temperature during whole predicted season."

I. Average precipitation is expected over the country during February with higher deficit over eastern parts of the country including eastern Punjab, southern Baluchistan and Kashmir.

II. Average precipitation is expected over Sindh and KP provinces during February.

III. Above normal precipitation is expected over GB with good accumulation of snow fall over the northern parts of the country during February.

IV. One to two moderate rainy spells are expected over all parts of the country during first 10 days of February.

V. Below average precipitation with snow fall over the hills is expected during March.

VI. One to two spell of light to moderate are expected over the country during early and end of March.

VII. Below average precipitation is expected all over the country except Sindh during April.

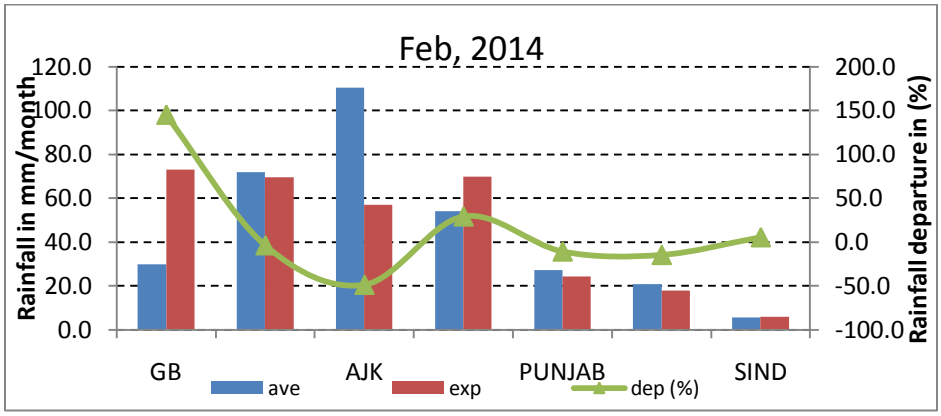
VIII. Night and day temperature would be on lower side during whole predicted months.

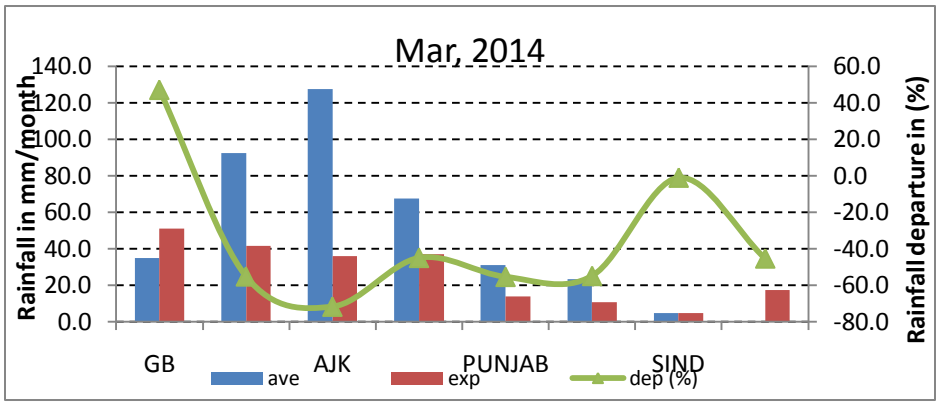
2.2. Monthly Quantitative Weather Forecast

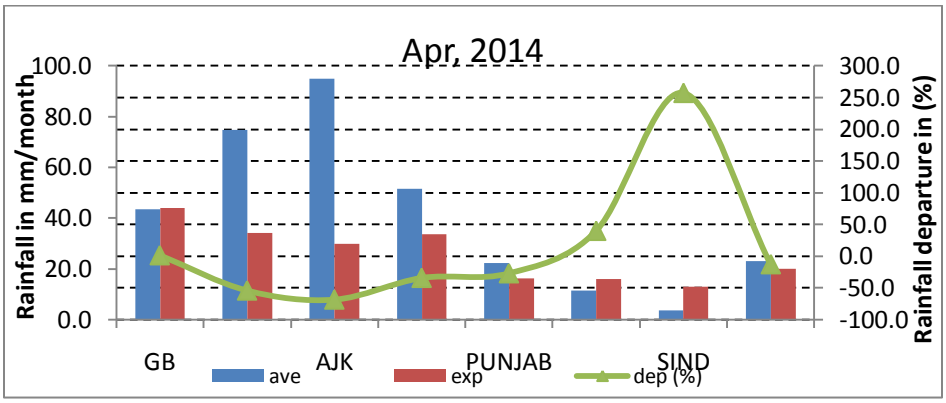
	Feb, 2014		Mar, 2014		Apr, 2014		Feb-Apr, 2014	
	ave	**exp**	**ave**	**exp**	**ave**	**exp**	**ave**	**exp**
GB	29.7	Abv. Ave	34.6	Abv. Ave	43.5	Ave	107.8	Abv. Ave
KP	71.9	Ave	92.5	Blw. Ave	74.7	Blw. Ave	239.1	Blw. Ave
AJK	110.5	Blw. Ave	127.5	Blw. Ave	94.9	Blw. Ave	332.9	Blw. Ave
FATA	54.0	Abv. Ave	67.4	Blw. Ave	51.5	Blw. Ave	172.8	Blw. Ave
PUNJAB	27.2	Ave	30.9	Blw. Ave	22.4	Blw. Ave	80.5	Blw. Ave
BALUCHISTAN	20.9	Ave	23.3	Blw. Ave	11.5	Abv. Ave	55.7	Blw. Ave
SIND	5.4	Ave	4.7	Ave	3.6	Abv. Ave	13.7	Abv. Ave
Pakistan	**27.2**	**Ave**	**31.7**	**Blw. Ave**	**23.1**	**Ave**	**81.9**	**Blw. Ave**

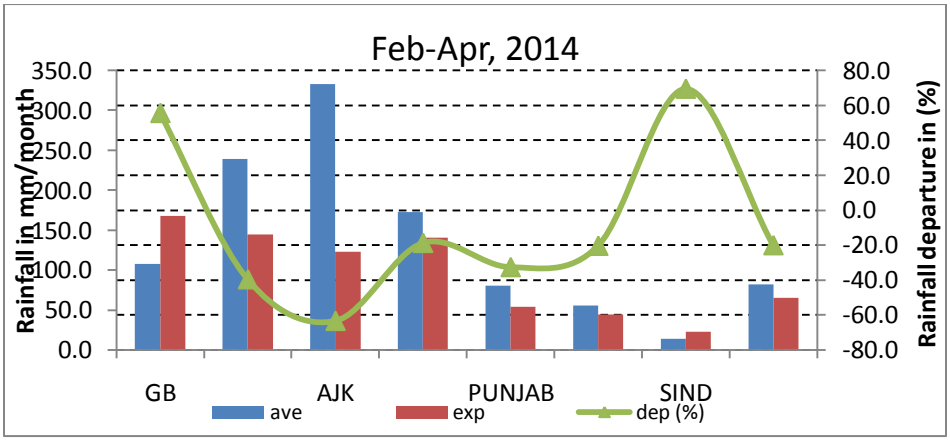
Ave.: *average (1981-2010),* ***Exp.****: Expected rainfall,* ***Below Average*** *(Blw. Ave) < -15 %,* ***Average*** *precipitation range (Ave) = -15 to +15 %,,* ***Above Average*** *(Abv.Ave) > +15 %*

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.

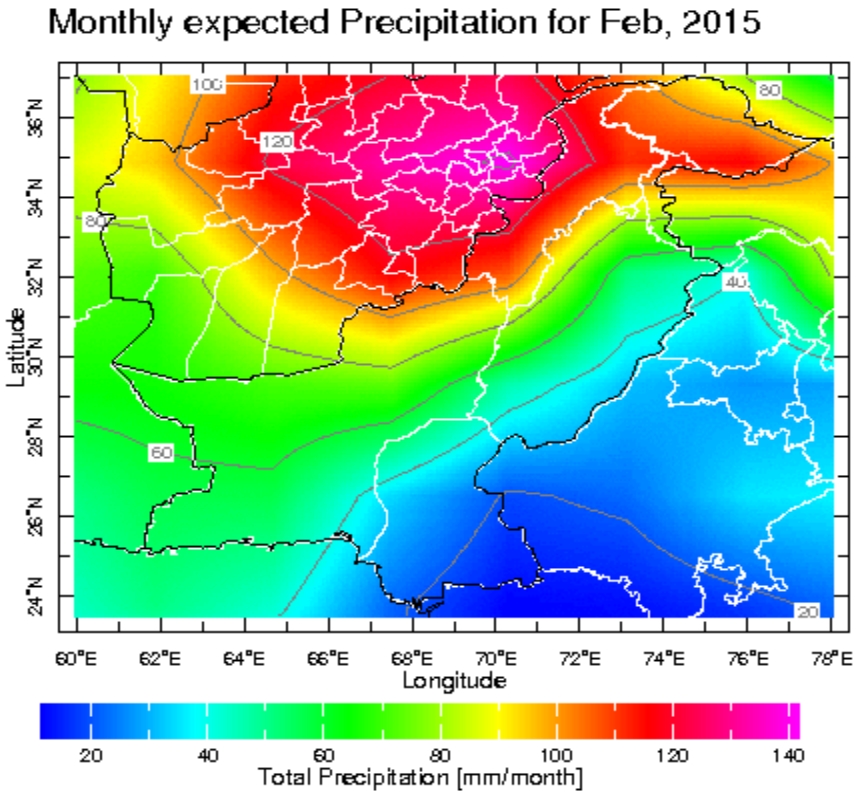

Feb, 2014
Rainfall in mm/month
Rainfall departure in (%)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
200.0
150.0
100.0
50.0
0.0
-50.0
-100.0
GB
AJK
PUNJAB
SIND
ave
exp
dep (%)

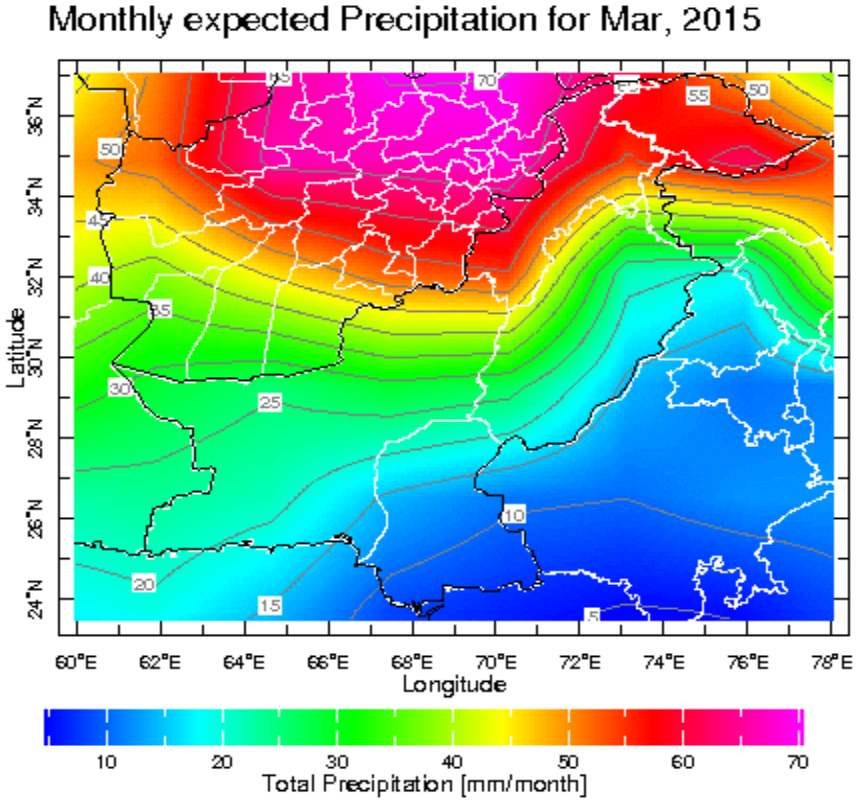

Mar, 2014
Rainfall in mm/month
Rainfall departure in (%)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
GB
AJK
PUNJAB
SIND
ave
exp
dep (%)


Apr, 2014
Rainfall in mm/month
Rainfall departure in (%)
100.0
80.0
60.0
40.0
20.0
0.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
-50.0
-100.0
GB
AJK
PUNJAB
SIND
ave
exp
dep (%)

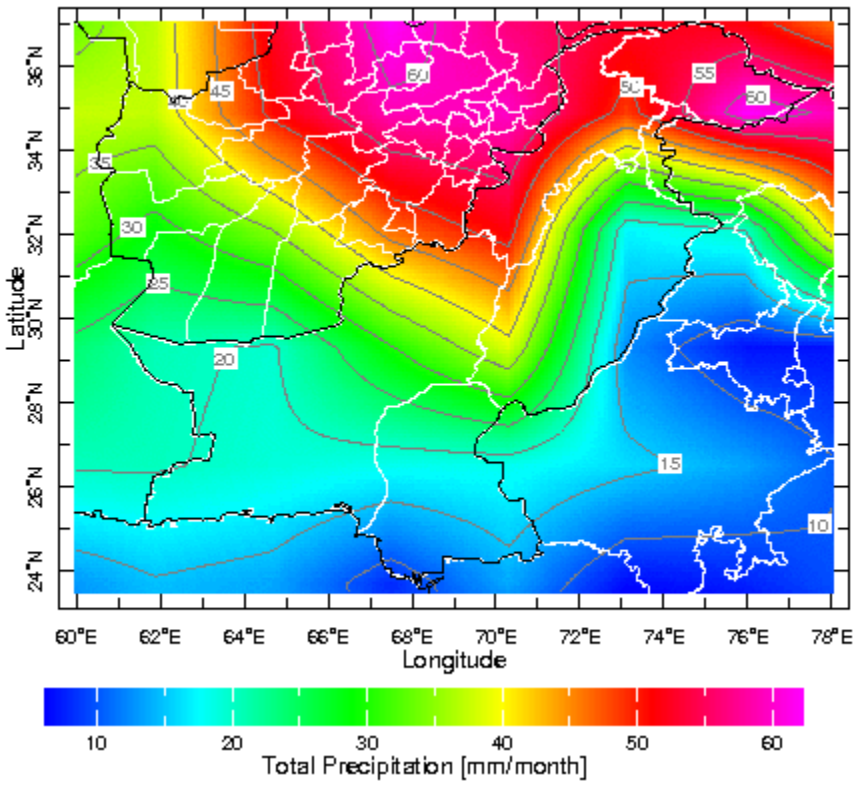

Feb-Apr, 2014
Rainfall in mm/month
Rainfall departure in (%)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
GB
AJK
PUNJAB
SIND
ave
exp
dep (%)

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

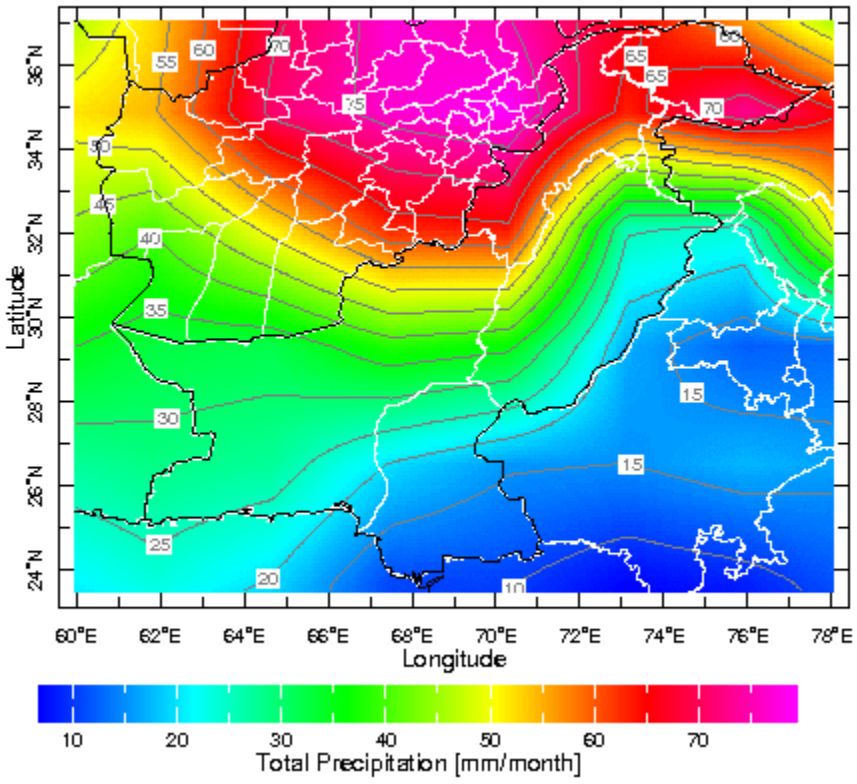




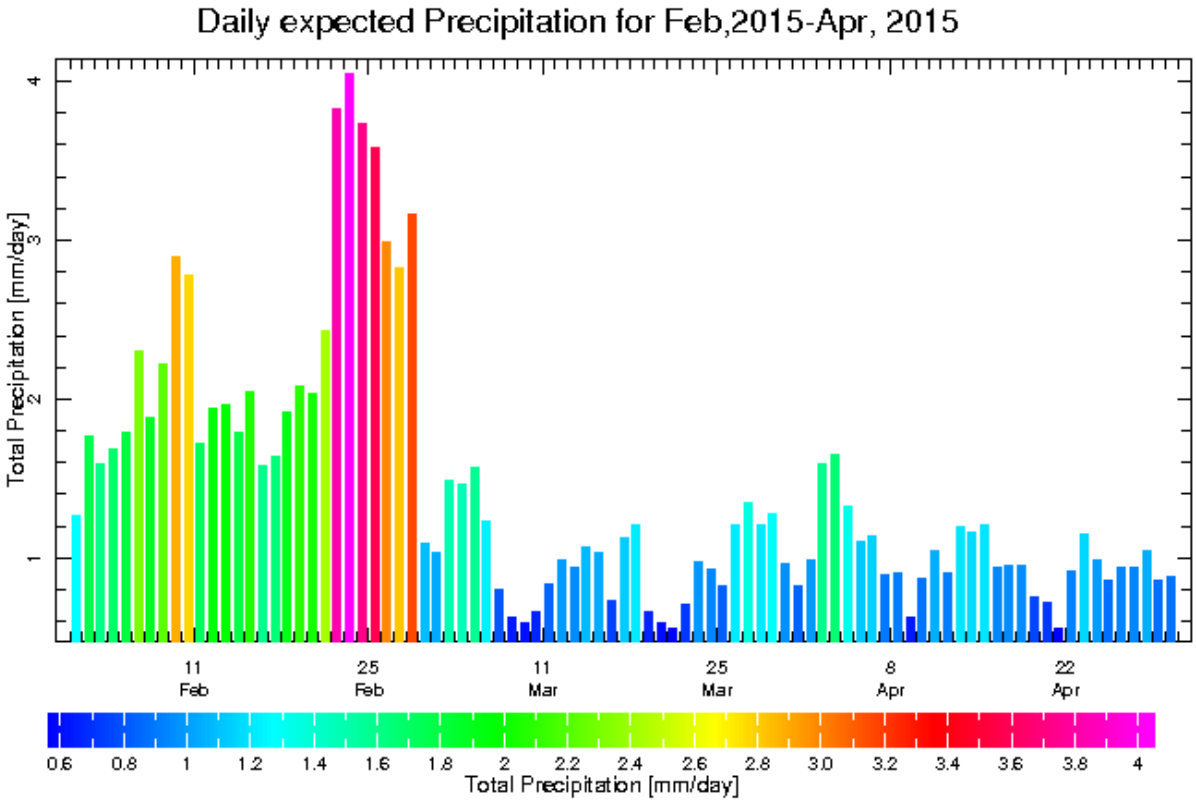
Monthly expected Precipitation for Apr, 2015

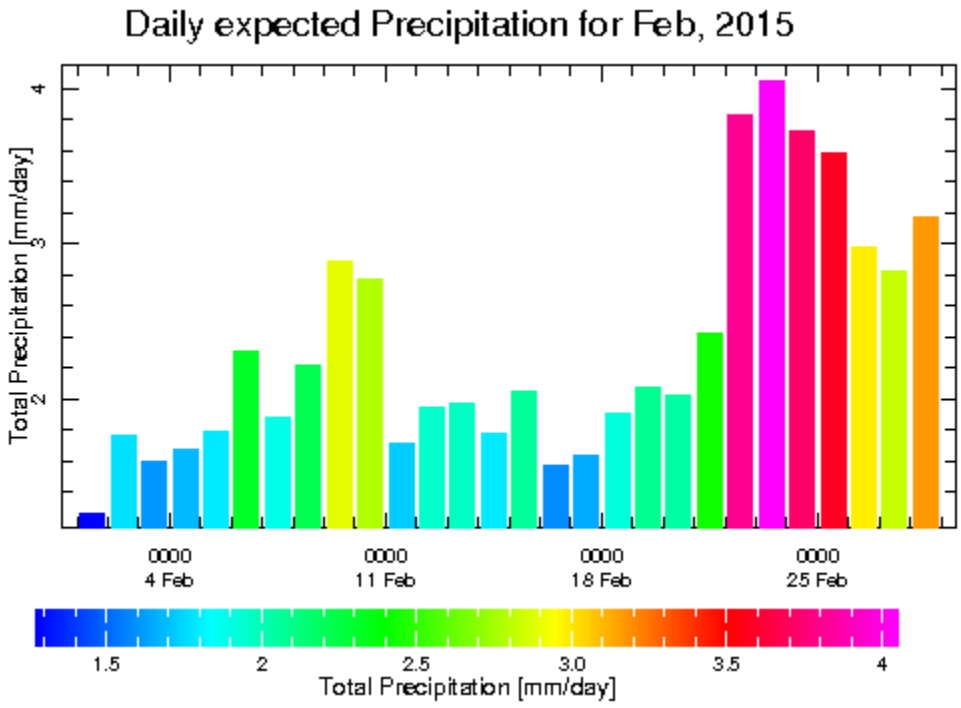


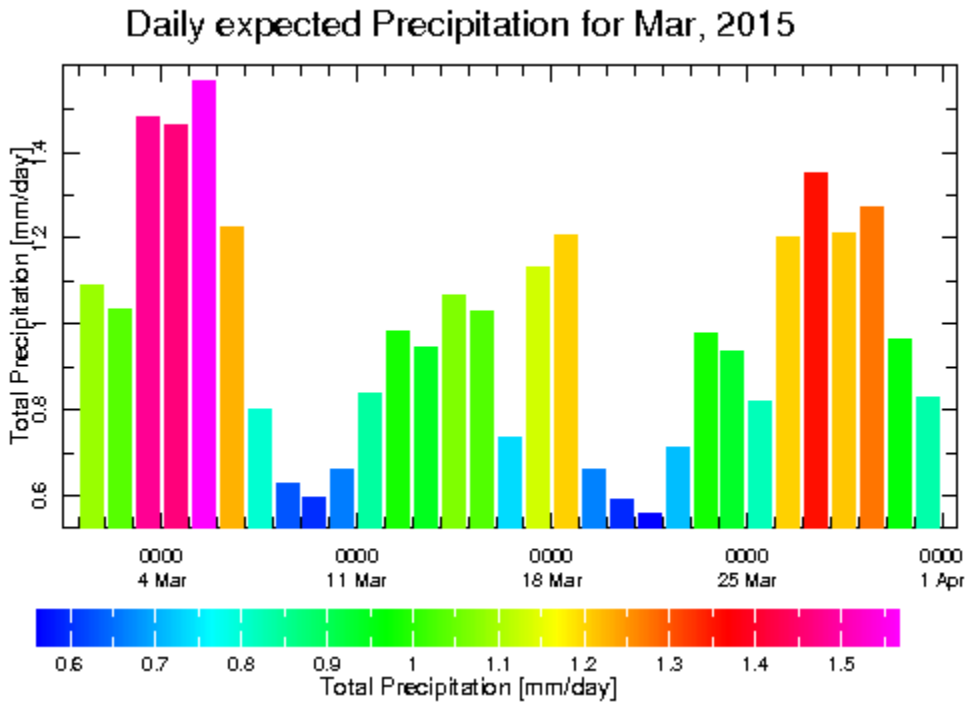
Seasonal Precipitation Outlook (Feb-Apr,2015)

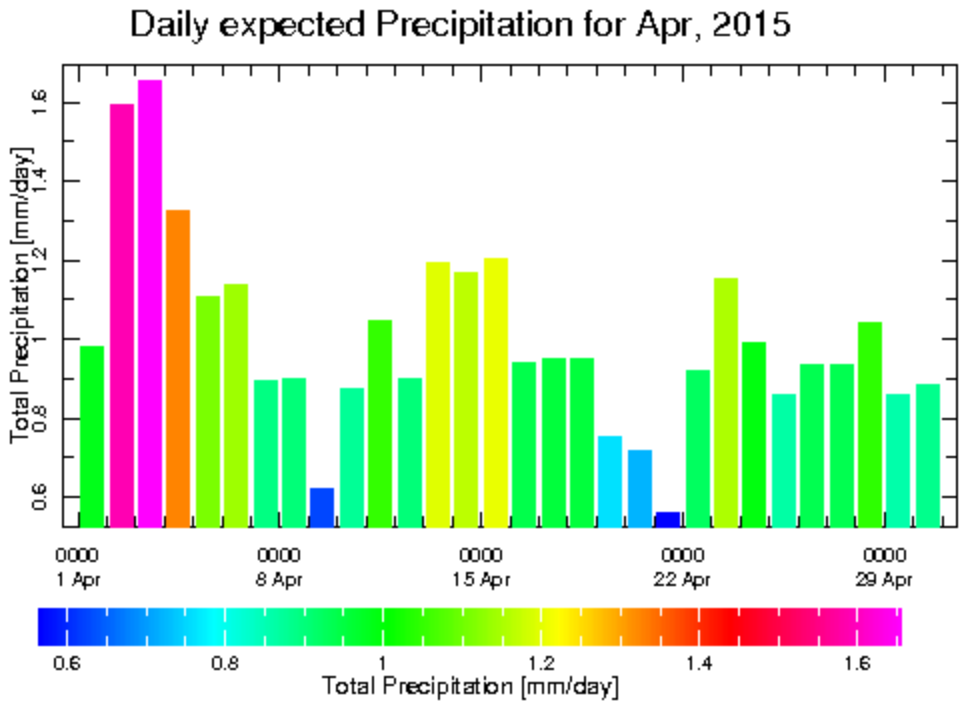


4. Expected daily rainfall



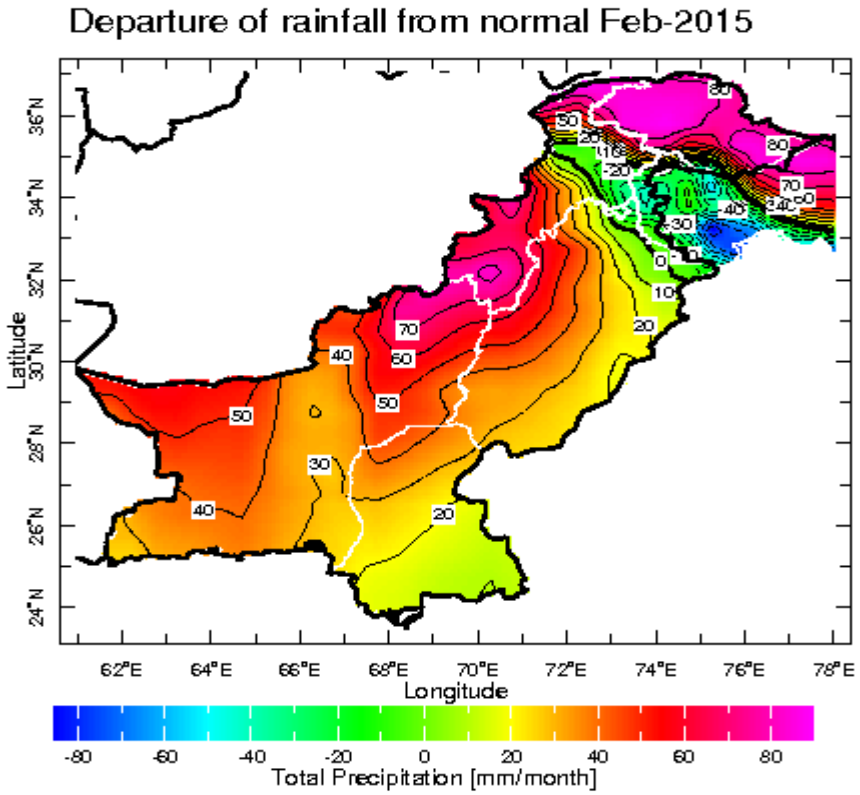


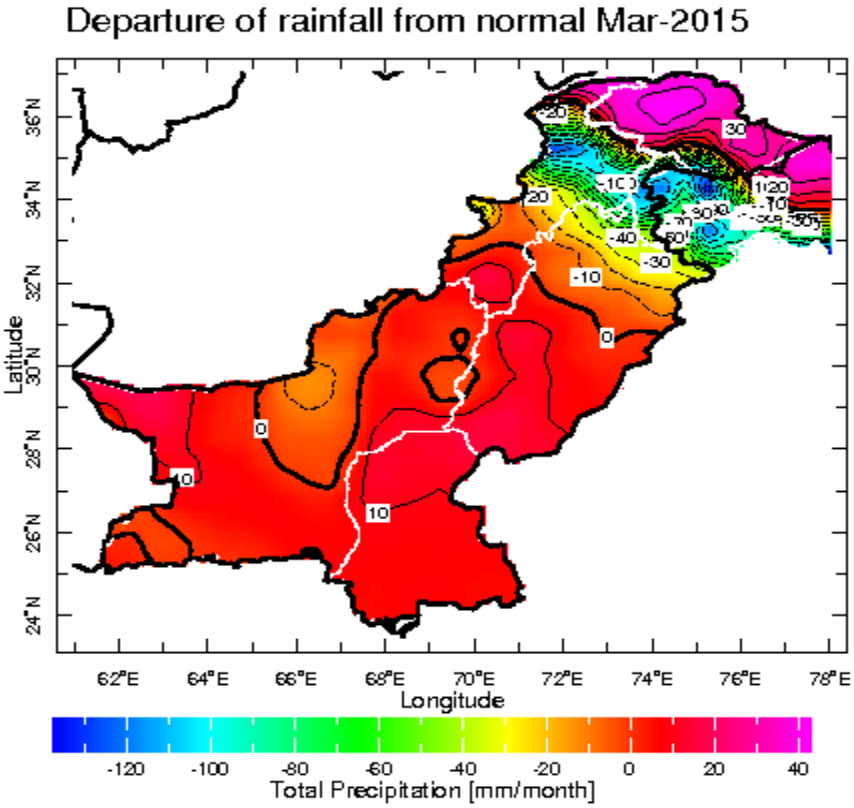




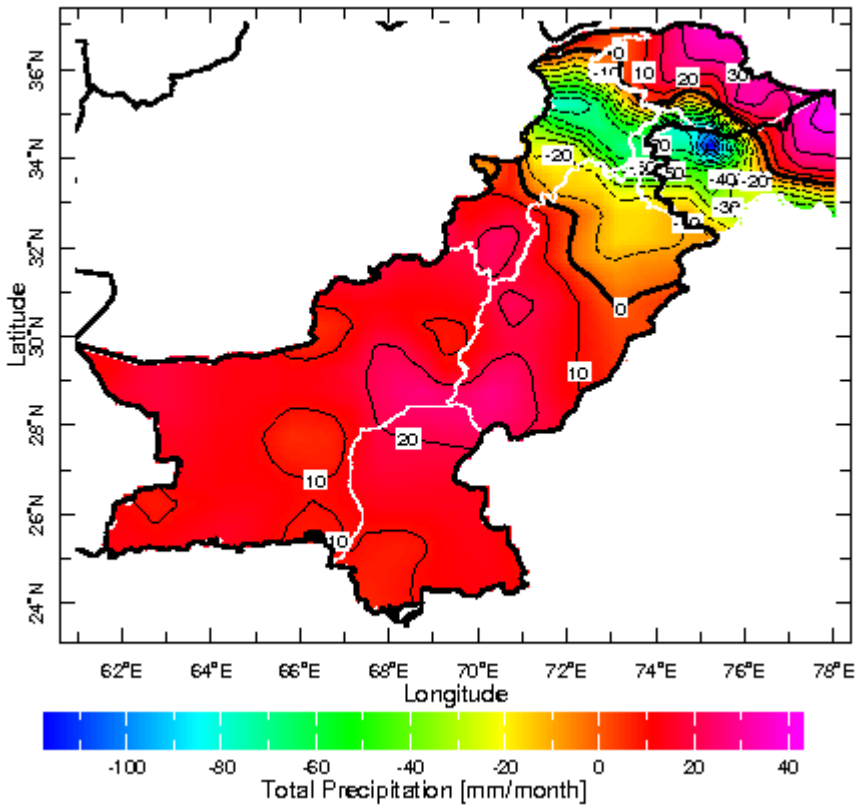
Note: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

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

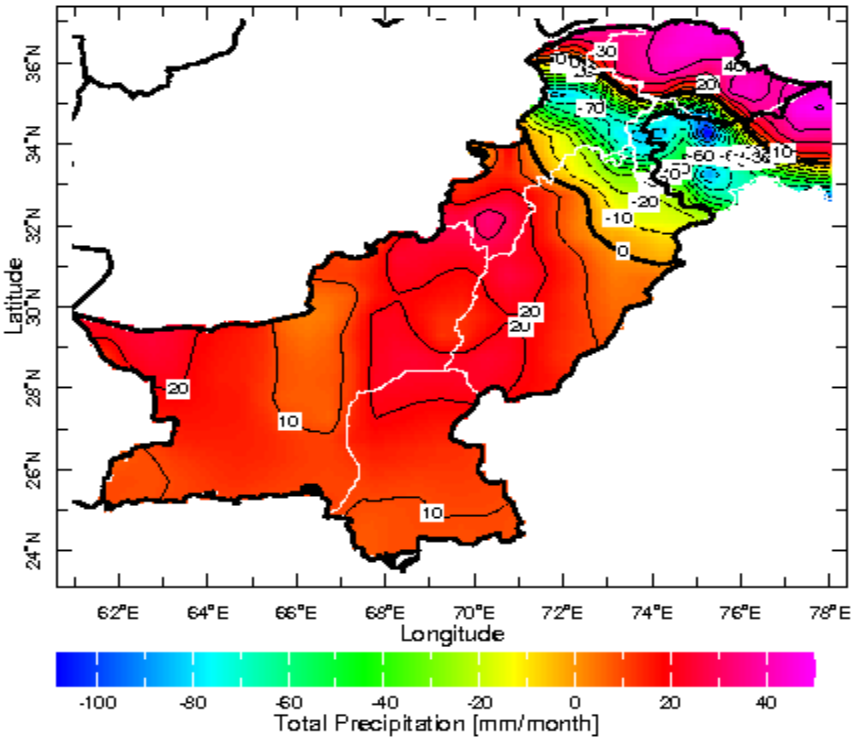




Departure of rainfall from normal Apr-2015

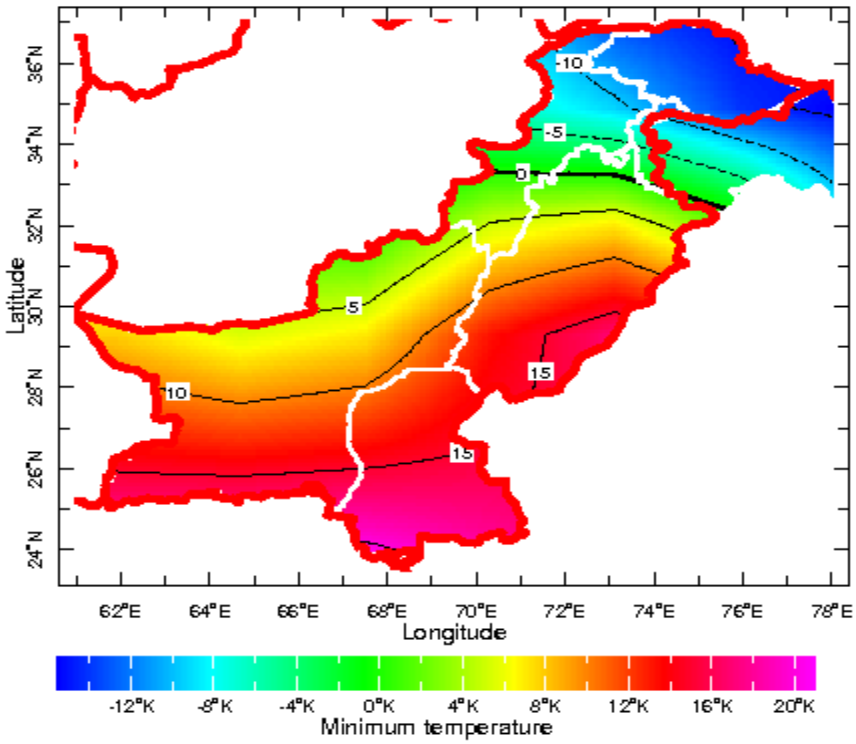


Departure of rainfall from normal (Feb-Apr,2015)

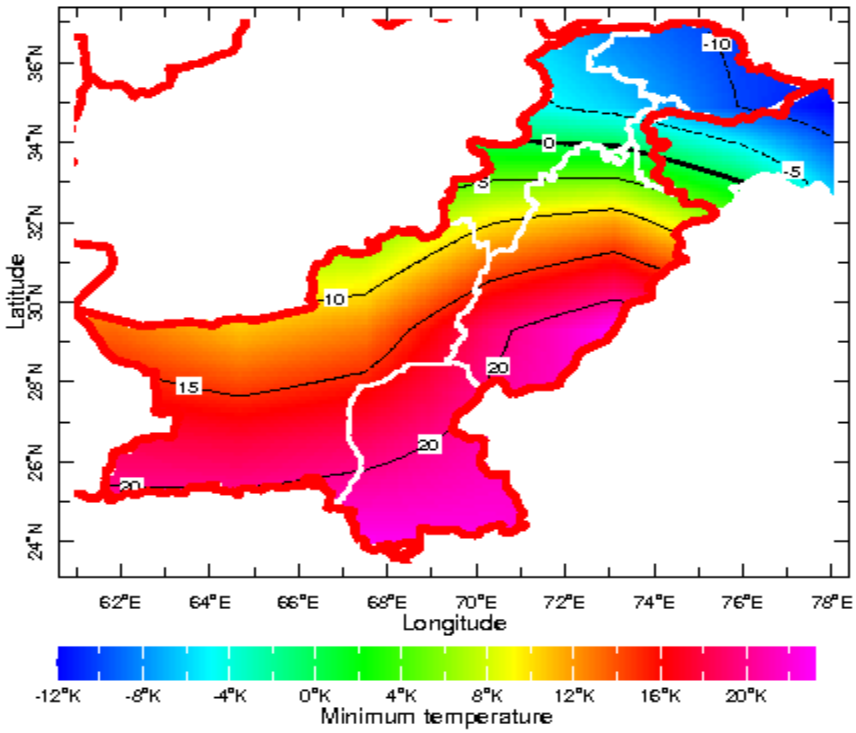


6. Spatial distribution of expected minimum/maximum temperature

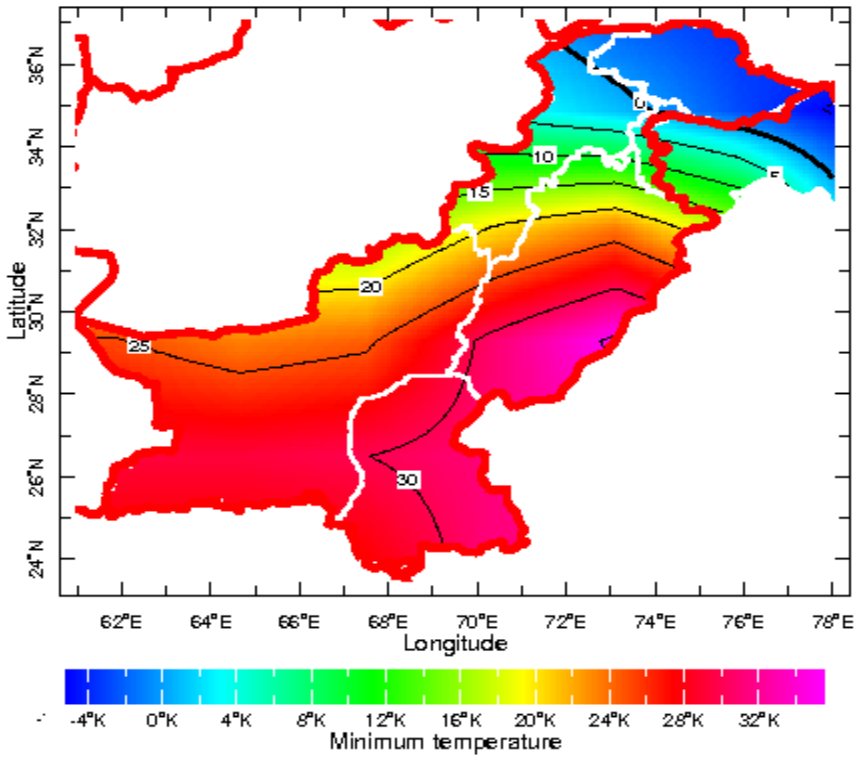
Expected Minimum Temperature during Feb, 2015



Expected Minimum Temperature during Mar, 2015

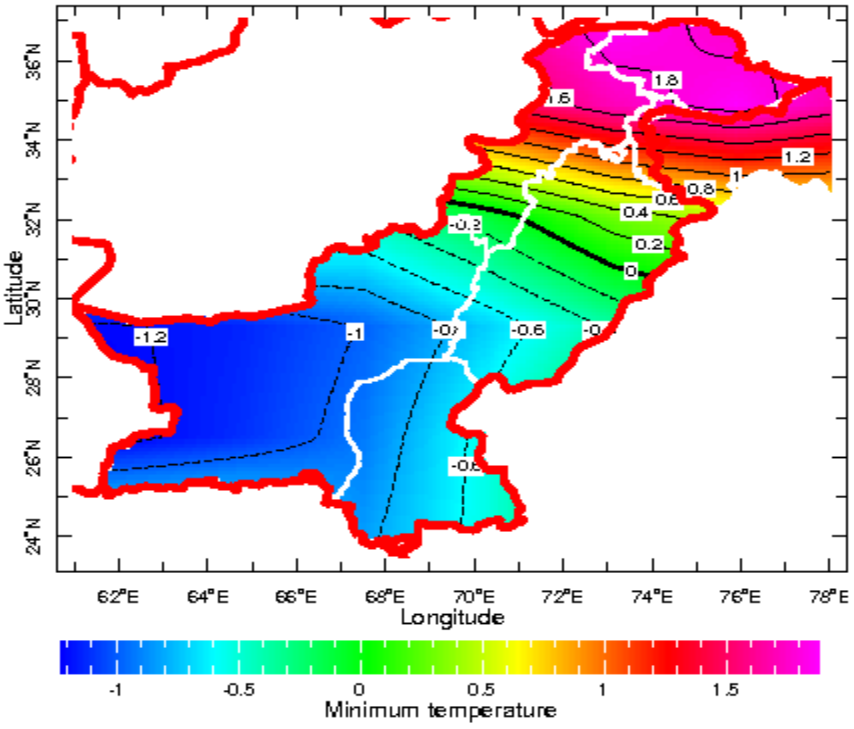


Expected Maximum Temperature during Apr, 2015

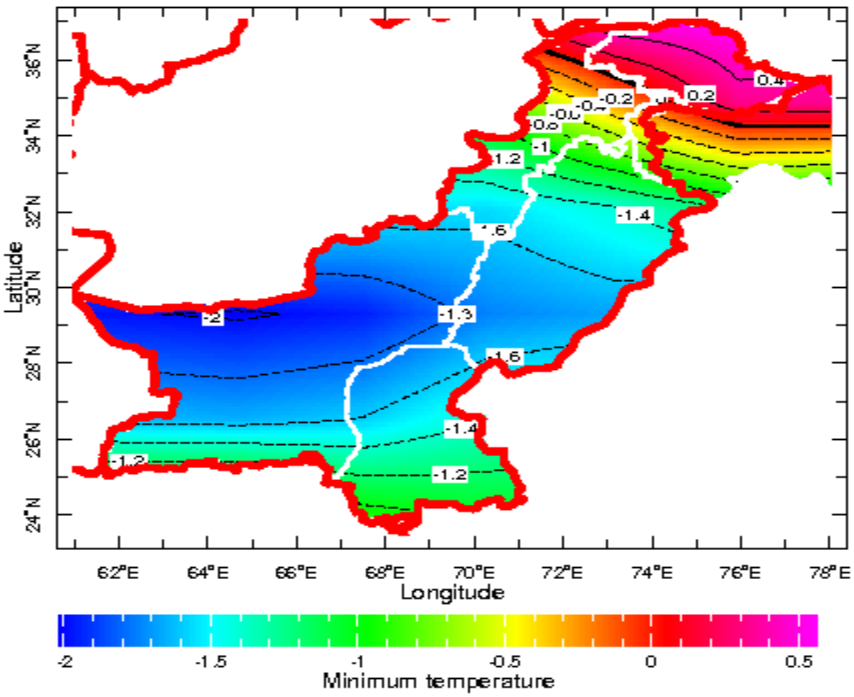


7. *Departure of expected minimum/maximum temperature from normal*

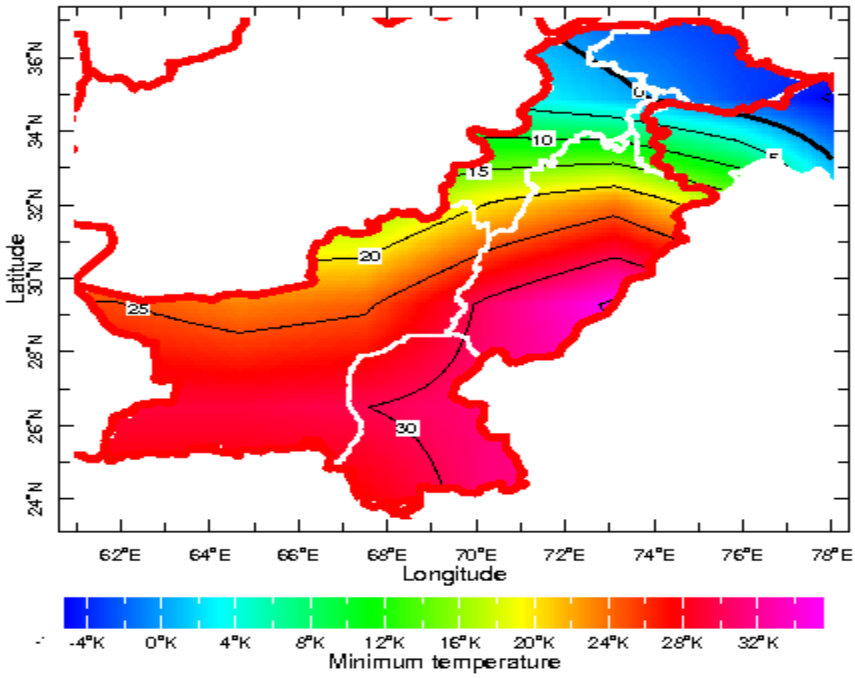
Expected Dep. of Min. Temp. from normal, Feb-2015



Expected Dep. of Min. Temp. from normal, Mar-2015



Expected Maximum Temperature during Apr, 2015



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/