

Seasonal weather outlook

(Feb-Apr, 2014)

Issued on Feb 10, 2014



Issued by:

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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, 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 lower intensity with bigger convergence areas of high winds towards the west. Intensity of jet stream will be slightly below normal during predicted period

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

- A ridge at 500 hPa is expected to be at same position with higher intensity. As a result, track of the western disturbances may be changed and tilted towards northward.

Probability outlook: Precipitation is likely to occur more frequently over upper half of the country and less over southern parts of the country.

- Surface temperatures are expected to be on lower side than normal over central parts of the country as compared with normal (1981-2010). However, southern and northern parts with higher than normal temperature will be expected during January.
- North Atlantic Oscillation (NAO) is in positive phase (0.29) approaching towards neutral phase. 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: Normal precipitation over all parts of the country will be expected. The focus of weather tracks may be towards Northern parts of the country.

- While remaining ENSO-neutral, January was characterized by the periodic emergence of below-average sea surface temperatures (SSTs) across the tropical Pacific Ocean. Weekly Niño index values in Niño-3 and Niño-3.4 bounced around -0.5°C . This recent cooling was associated with the upwelling phase of an oceanic Kelvin wave, which was reflected in a dip in the oceanic heat content and below-average subsurface temperatures at depth across the eastern Pacific. Collectively, these atmospheric and oceanic conditions reflect ENSO-neutral.
- Nearly all model forecasts indicate the persistence of ENSO-neutral (Niño-3.4 index between -0.5°C and 0.5°C) through the Northern Hemisphere spring 2014, but afterwards, an increasing number of models suggest the possible onset of El Niño. Strong surface westerly winds in the western Pacific and the slight eastward shift of above-average temperatures in the subsurface western Pacific potentially portend warming in the coming months. However, the spring is also historically associated with lower forecast skill, so the chance of El Niño developing after the spring is not much different from ENSO-neutral. The consensus forecast is for ENSO-neutral to continue through the Northern Hemisphere spring 2014 (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/2014-february-quick-look/?enso_tab=enso-cpc_update)

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Probability outlook: La Nina (3%), Neutral (91%) and El Nino (6 %) during Feb-Mar-Apr, 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.
- Mediterranean Sea surface temperatures are normal to slightly above normal.
- Bay of Bengal Sea Surface Temperatures are slightly below 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 (Feb-Apr, 2014)

Synthesis of the latest model forecasts for Feb-Apr, 2014 (FMA), current synoptic situation and regional weather expert's judgment indicates that below average precipitation is expected all over the country with below normal during March and normal during February and April. Slightly below Normal temperature is likely to occur during February while above normal night temperature will be expected during March and April over most part of the country. Neutral-ENSO condition is expected to persist throughout the predicted period.

3.1. Weather outlook

"Below Average precipitation is expected during the season all over the country."

- I. Below average precipitation is expected during predicted season.
- II. In February average precipitation is expected all over the country with slightly above over GB and FATA region. Night temperatures are likely to slightly below normal over northern parts of the country and normal over rest of the country.
- III. In March below average precipitation with normal night temperature is expected all over the country. Night temperature will continue to increase gradually over Sindh and southern Punjab during the month.
- IV. In April average precipitation is expected over the country. However below normal precipitation is expected over central parts of the country including Punjab, KP, FATA and AJK. Night temperature will be on higher side than normal all over the country.

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- V. Density of fog will be less during upcoming winter months
- VI. Two to three rainy spells are expected during February. The focus of rainy spell will be towards north and southern Khyber Pakhtunkhawa (KP).
- VII. Very limited chances of well rainy spell over southern Punjab and Sindh during month of March.
- VIII. In April one to two rainy spell are expected in third decade and focus may be towards southern parts (Sindh) of the country.
- IX. March may be dry month in most of agriculture plain however; light precipitation is expected over northern parts of the country.
- X. More snowfall spells over northern glaciers are expected during February.
- XI. Expected Minimum temperature will be below normal all over the country during whole predicted months whereas March will be expected colder month than normal over the country.

3.2. 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
Precipitation is in mm/month								
Pakistan	27.2	Ave	31.7	Blw. Ave	23.1	Ave	81.9	Blw. Ave

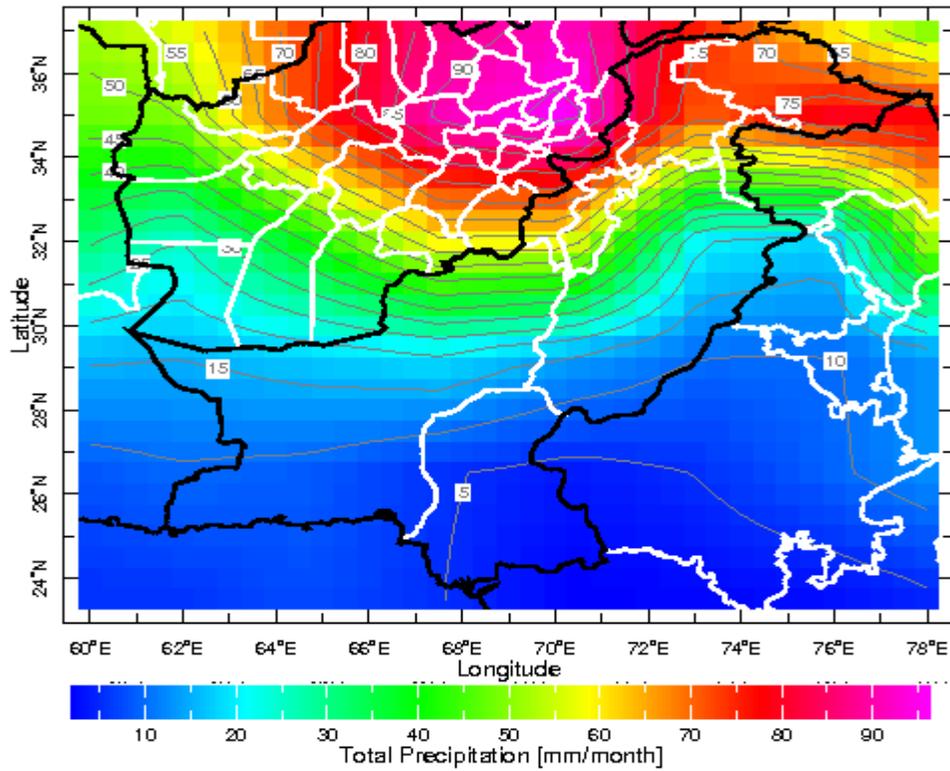
Ave.: average (1981-2010), *Exp.:* Expected rainfall , *Below Average* (Blw. Ave) < -15 %, *Average* precipitation range (Ave) = -15 to +15 %,, *Above Average* (Abv.Ave) > +15 %

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

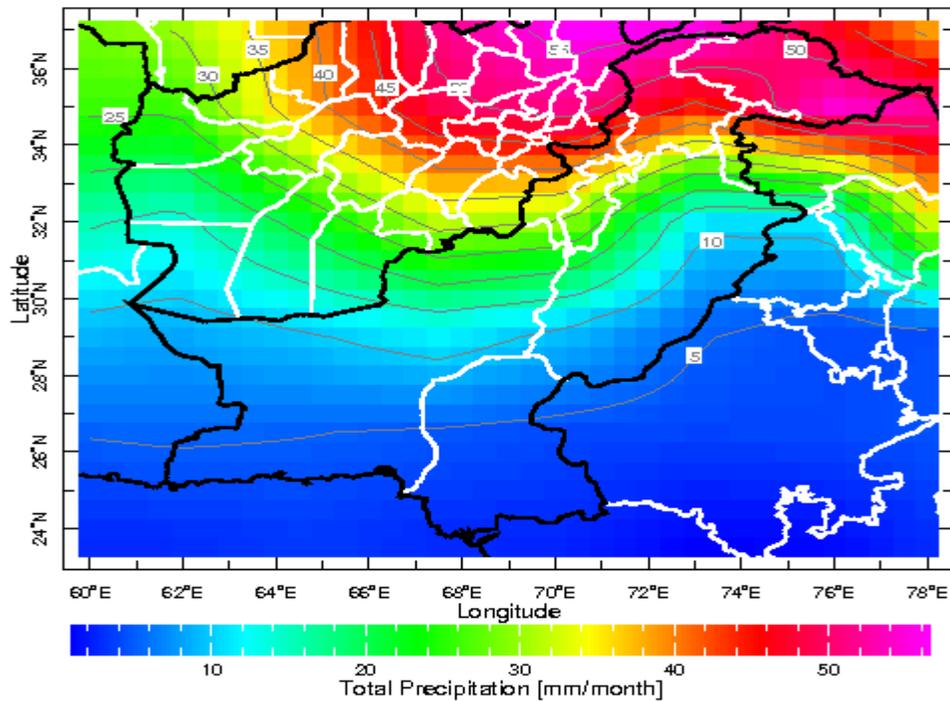
Seasonal weather outlook (Feb-Apr, 2014)

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

Monthly expected Precipitation for Feb, 2014

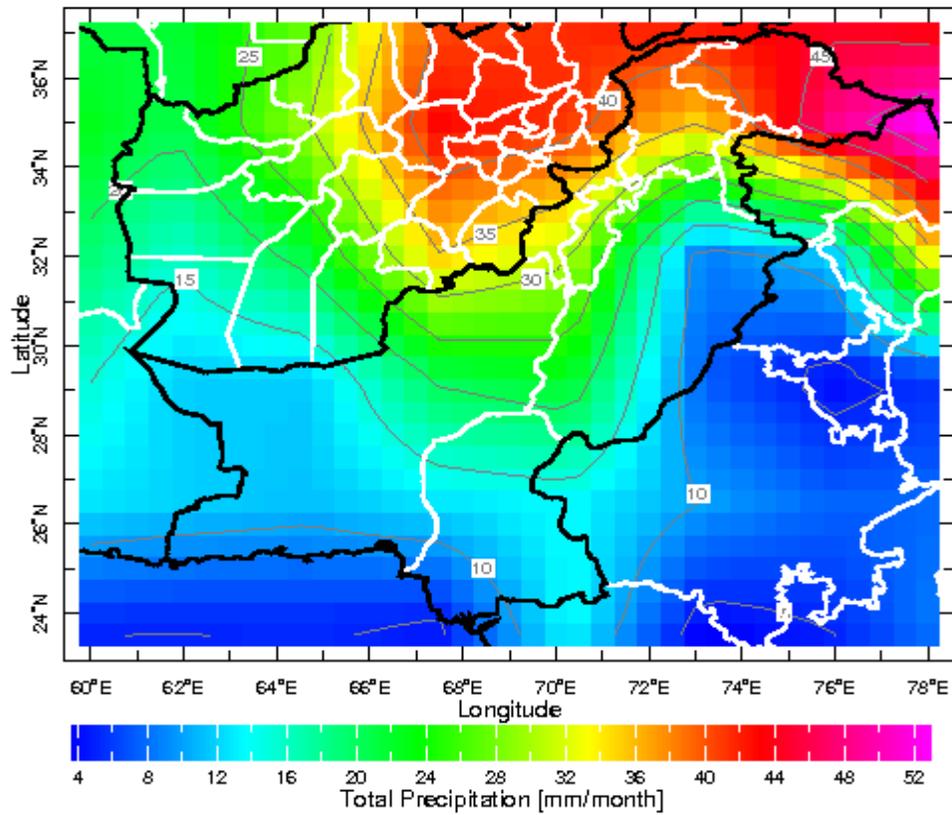


Monthly expected Precipitation for Mar, 2014

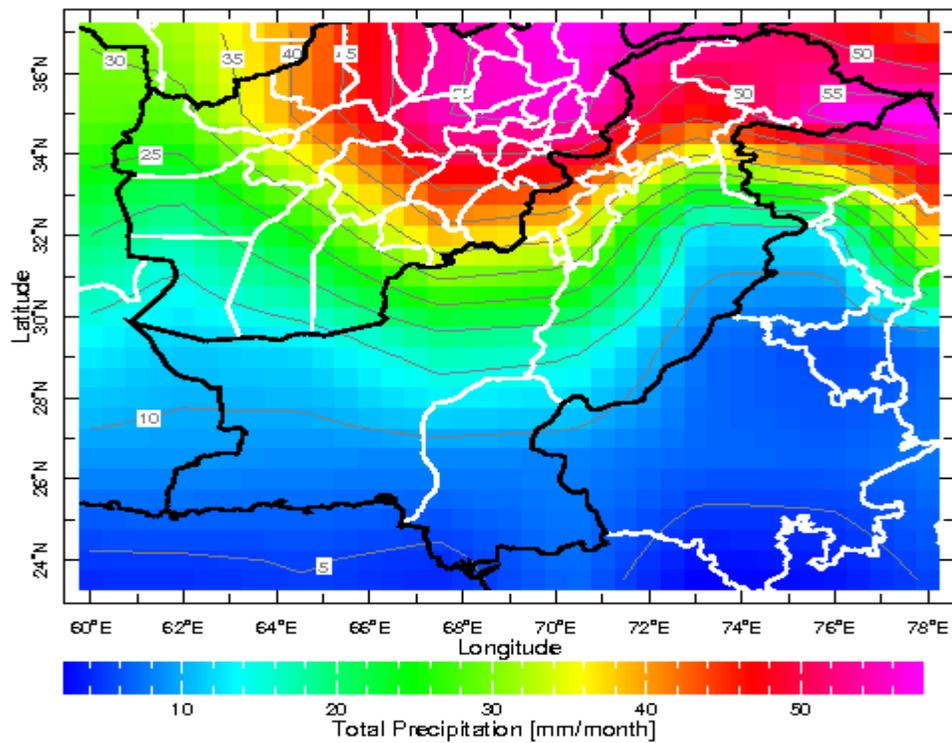


Seasonal weather outlook (Feb-Apr, 2014)

Monthly expected Precipitation for Apr, 2014



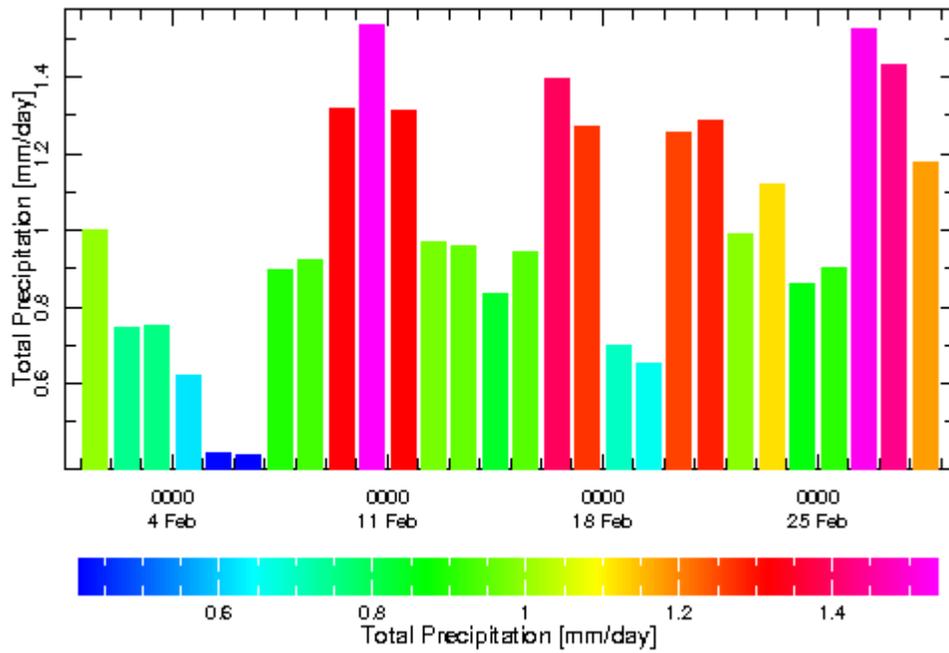
Seasonal Precipitation Outlook (Feb-Apr, 2014)



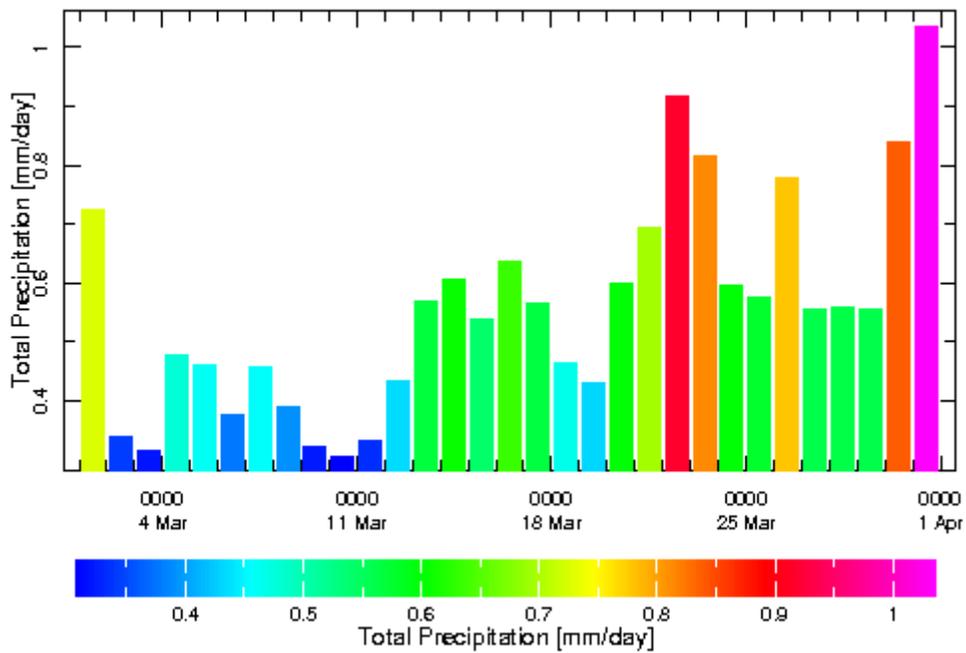
Seasonal weather outlook (Feb-Apr, 2014)

5. Expected daily rainfall

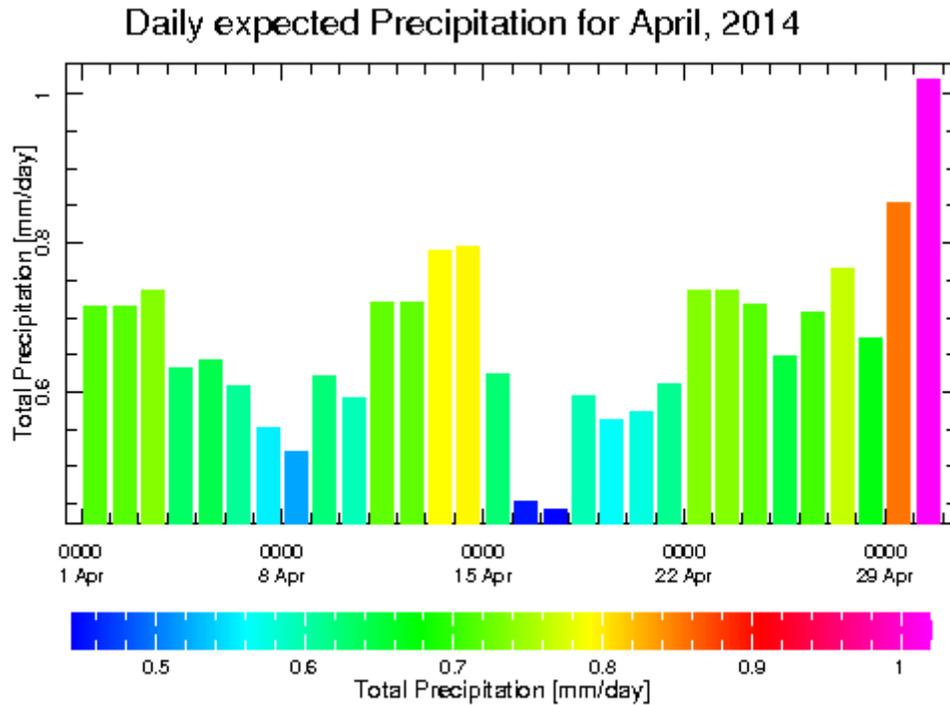
Daily expected Precipitation for February, 2014



Daily expected Precipitation for March, 2014



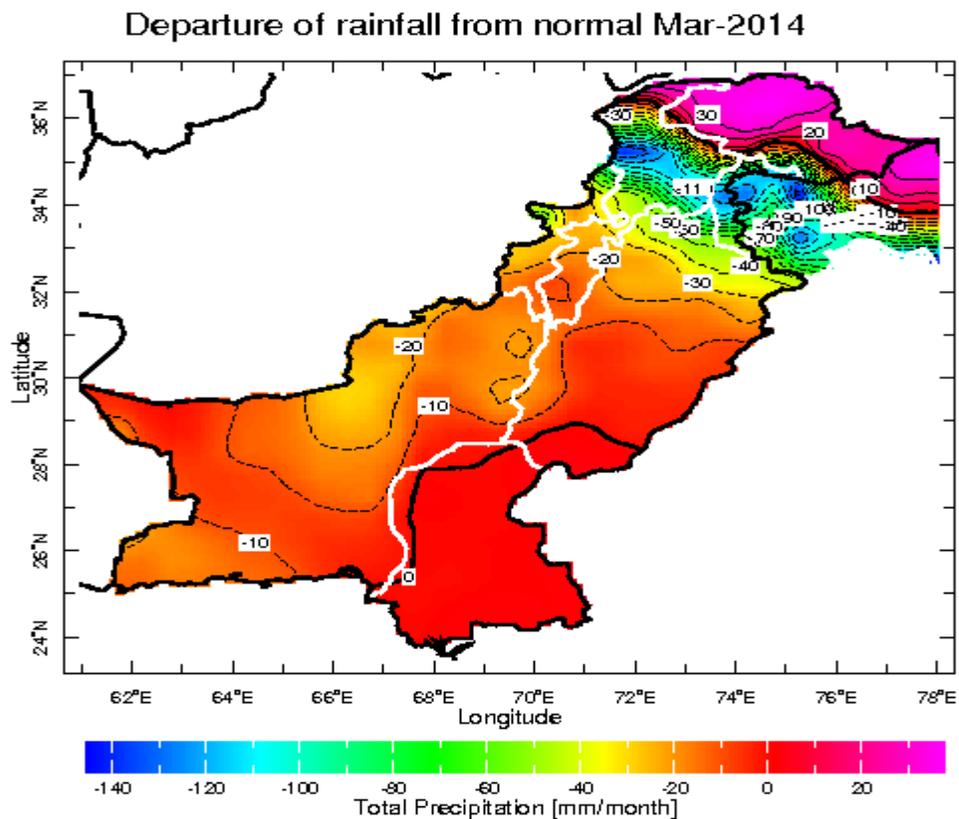
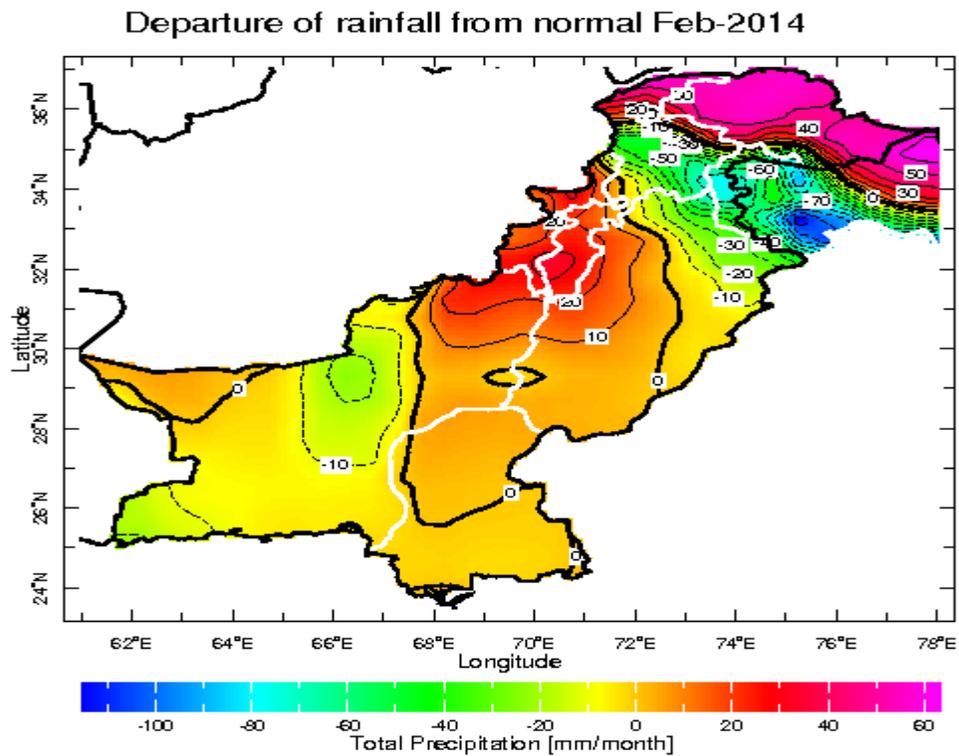
Seasonal weather outlook (Feb-Apr, 2014)



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.

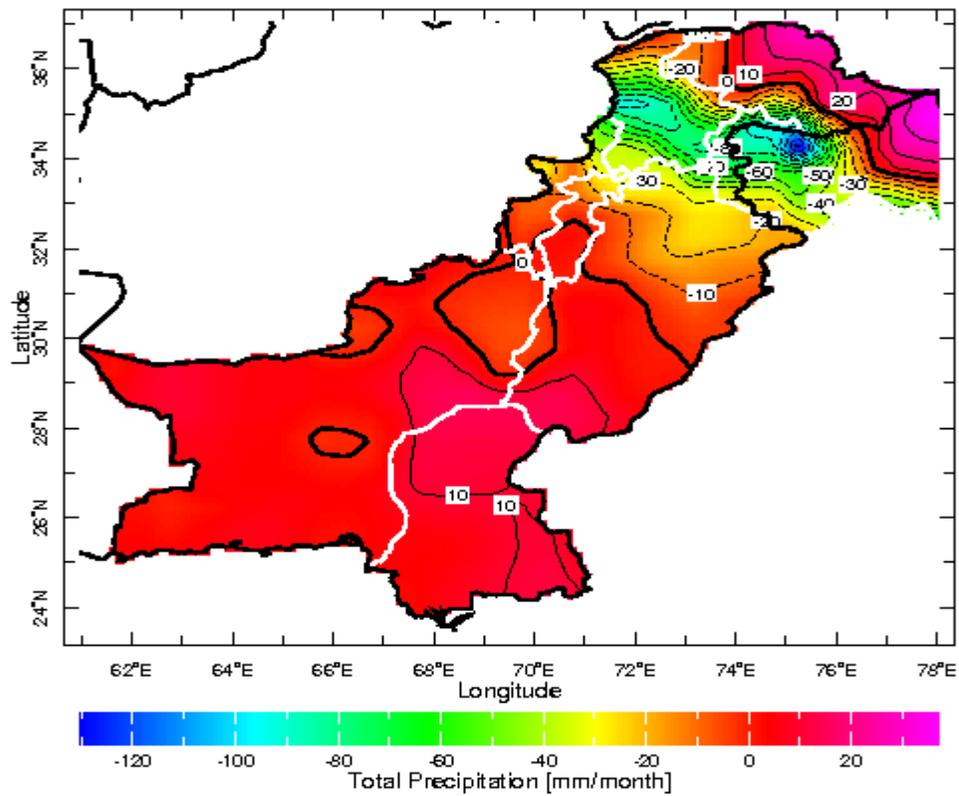
Seasonal weather outlook (Feb-Apr, 2014)

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

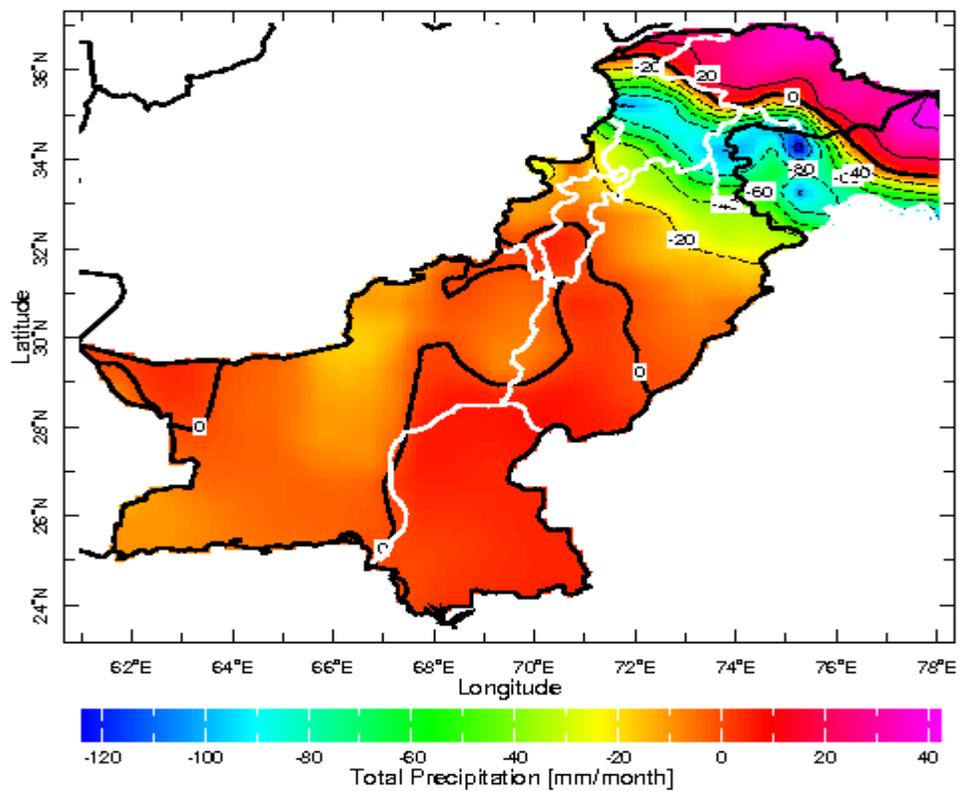


Seasonal weather outlook (Feb-Apr, 2014)

Departure of rainfall from normal Apr-2014



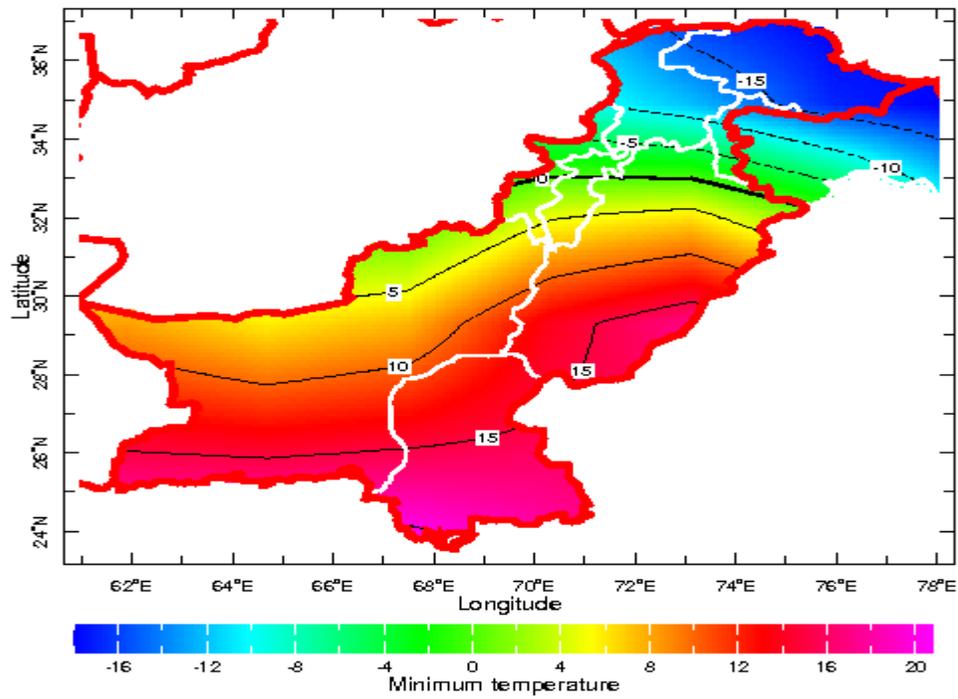
Departure of rainfall from normal (Feb-Apr, 2014)



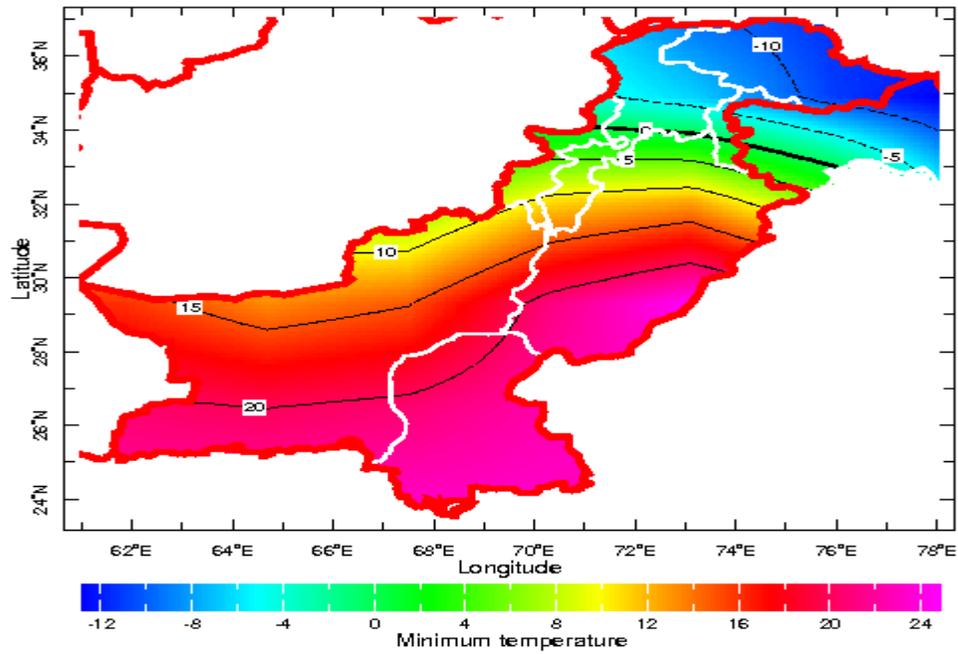
Seasonal weather outlook (Feb-Apr, 2014)

7. Spatial distribution of expected minimum temperature during

Expected Minimum Temperature during Feb,2014

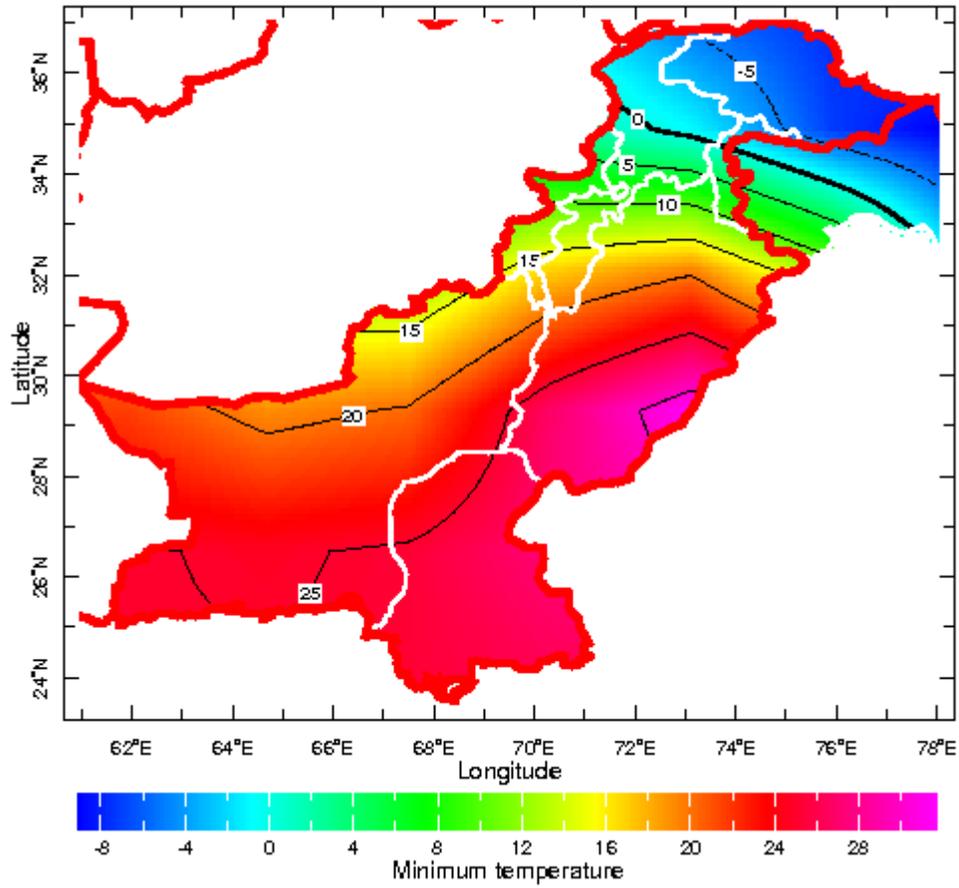


Expected Minimum Temperature during Mar,2014



Seasonal weather outlook (Feb-Apr, 2014)

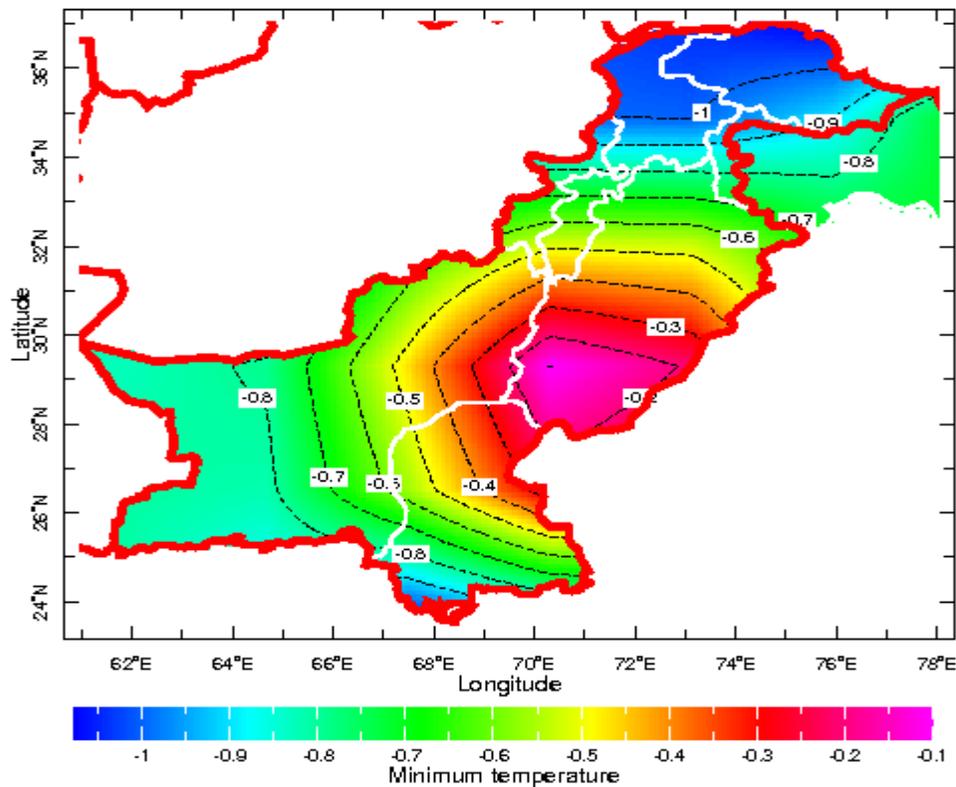
Expected Minimum Temperature during Apr, 2014



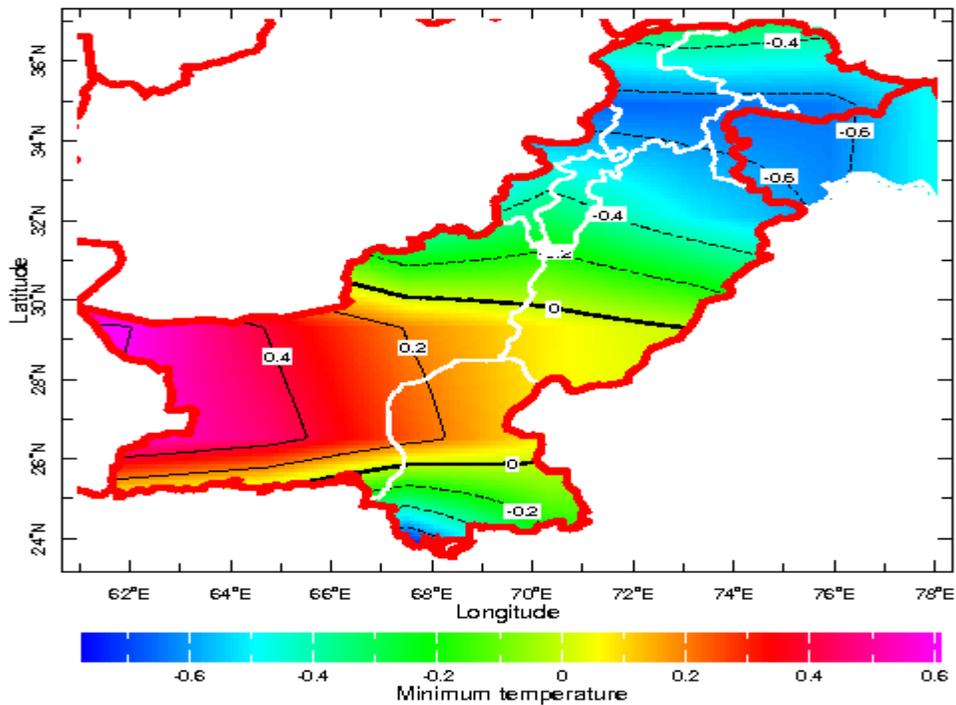
Seasonal weather outlook (Feb-Apr, 2014)

8. Departure of expected minimum temperature from normal

Departure of Minimum Temp. from normal during Feb,2014

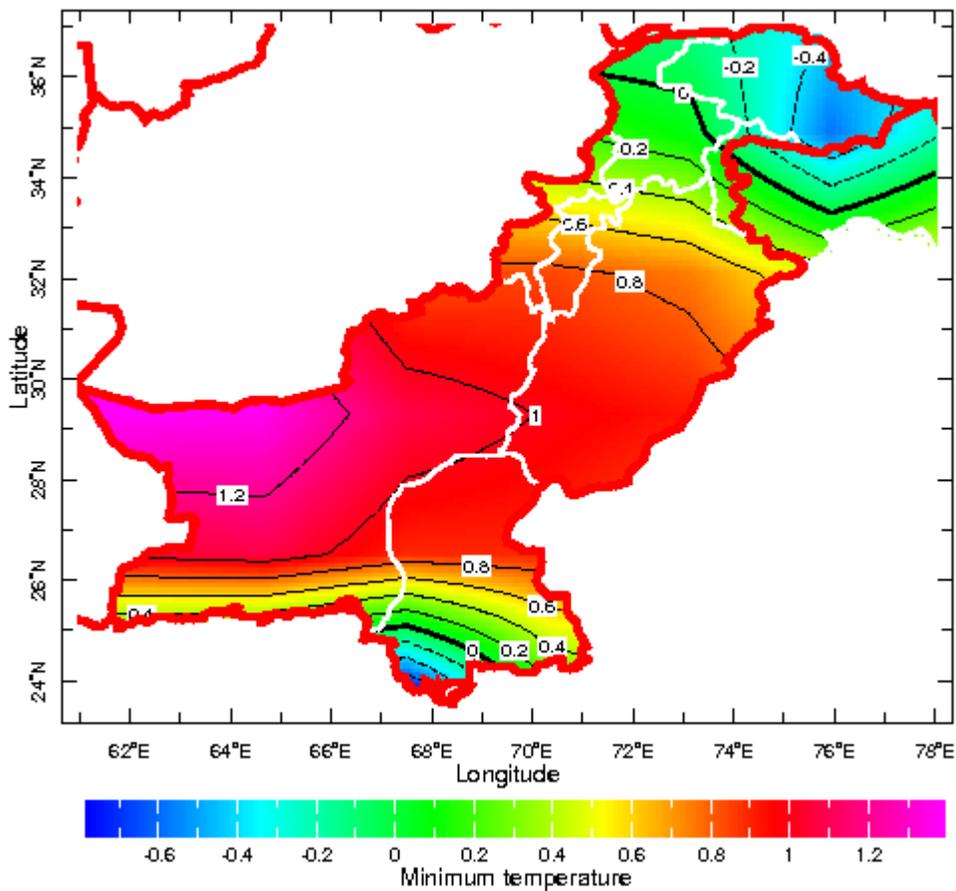


Departure of Minimum Temp. from normal during Mar,2014



Seasonal weather outlook (Feb-Apr, 2014)

Departure of Minimum Temp. from normal during Apr, 2014



Note: Research wing of NAMC is regularly monitoring variation in synoptic situation of the globe and using different global climate models regional weather prediction data for preparation 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/>