Seasonal weather outlook

(Sept-Oct-Nov, 2013)

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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 Sep 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 approximately same as normal but with slightly above normal strength. Increasing (decreasing) trend over northern (southern) parts of the country in intensity is expected during September and coming months.

Probability outlook: Western weather system influence will be dominate during September causes more rains over northern parts of the country.

- A trough at 500 hPa is prominent over the region. A ridge over Afghanistan can also be seen over central parts of the country. Mostly normal pattern is followed during September.

Probability outlook: Western weather system will give rain over northern parts and southwest and central western parts and of the country (Baluchistan and lower Punjab) will receive less rain during September.

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

- North Atlantic Oscillation (NAO) is in slightly positive phase (0.97) and may cause to shift western disturbances towards north during coming months.. (Data source: CPU, monthly mean index)

Probability outlook: Normal rainfall over the country. The focus of weather tracks may be towards northern side.

- Most of the set of dynamical and statistical model predictions neutral conditions for the Sep-0ct-Nov (SON). ENSO-neutral conditions persisted during July 2013, as reflected by near-average sea surface temperatures (SSTs) across the central and east-central equatorial Pacific and below-average SSTs in the eastern Pacific. Most model forecasts continue to predict ENSO-neutral (Niño-3.4 index between -0.5°C and 0.5°C) into the Northern Hemisphere till spring 2014. The statistical model forecasts remain cooler in the Niño-3.4 region relative to the dynamical model forecasts. Similar to last month, the forecast consensus favors ENSO-neutral (60% chance or greater) through October – December 2013. Data source: http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

Probability outlook: La Nina (21%), Neutral (66%) and El Nino (13 %) during Sep-Oct-Nov season

- Arabian Sea Surface Temperatures are above normal near the coast of Pakistan.
- Caspian Sea surface temperatures are above 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 rainfall over the region and below than normal over Bangladesh and eastern coast of India

3. *Seasonal Weather Outlook Summary (Sep- Nov-2013)*

Synthesis of the latest model forecasts for Sep-Nov, 2013 (SON), current synoptic situation and regional weather expert's judgment indicates that normal rainfall is expected all over the country with slightly above normal during September and below normal during October and November. The slightly above normal temperature is likely to occur in central parts of the country during predicted period. Temperature will be higher over central parts of the country including south Punjab, North Eastern Baluchistan, upper Sindh and southern KP from surroundings. Neutral-ENSO condition is expected to persist throughout the predicted period.

3.1. Weather outlook

"Slightly above normal during September, below Normal during October and November"

I. Average (± 10 %) rainfall is expected during predicted season 2013.

II. Monsoonal current likely to cut-off from third week of September.

II. Intensity and frequency of monsoon will be normal during slightly above normal during September.

III. Western weather currents will mostly effective from October but due to positive NAO, it focus will be over northern parts of the country.

IV. Main spell with intensity of 2 mm area weighted rainfall over the country is likely to come during end of second week of September.

V. The focus of monsoonal weather systems during September will be towards central and Upper Punjab, KP and Kashmir. However, one spell of

monsoonal rain is expected over Sind and lower Punjab during September as well.

VI. Expected Maximum day temperature will be slightly above normal all over the country during the season. In September, above normal temperature is likely to prevail all over the country with highest over central parts of the country including North east Baluchistan, south Punjab and upper Sind. Day temperature will drop below than normal over extreme northern parts of the country during September, while still become above normal over southern parts of the country.

VII. Flash flooding over foot hills of the Sulaiman ranges can not be ignored during last phase (September) of monsoon

VIII. Minimum temperature will be on higher side during October and November from the normal throughout the country.

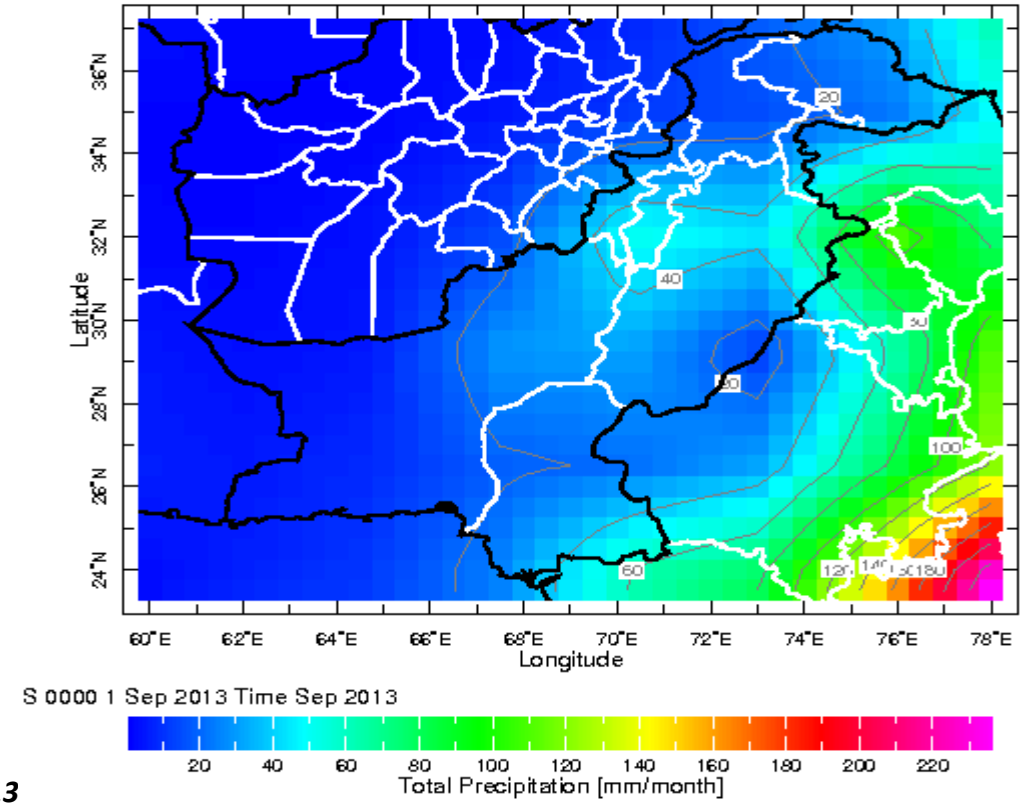
3.2. Monthly Quantitative Weather Forecast

	Sep, 2013		Oct, 2013		Nov, 2013		Sep-Nov, 2013	
	Average	Expected	Average	Expected	Average	Expected	Average	Expected
GB	12.4	Abv. Ave	9.6	Abv. Ave	10.0	Abv. Ave	31.9	Abv. Ave
KP	42.7	Blw. Ave	23.9	Blw. Ave	20.0	Blw. Ave	86.7	BNw. Ave
AJK	70.9	Blw. Ave	31.7	Blw. Ave	23.6	Blw. Ave	126.2	BNw. Ave
FATA	29.7	Ave	13.2	Blw. Ave	10.9	Blw. Ave	53.9	Ave
PUNJAB	36.8	Ave	8.4	Blw. Ave	4.2	Blw. Ave	49.4	Ave
BALUCHISTAN	4.8	Abv. Ave	3.7	Blw. Ave	3.2	Ave	11.7	Abv. Ave
SIND	20.2	Abv. Ave	4.5	Blw. Ave	1.6	Blw. Ave	26.4	Abv. Ave
Precipitation is in mm/month								
Pakistan	20.3	Abv. Ave	7.8	Blw. Ave	5.7	Blw. Ave	33.7	Ave

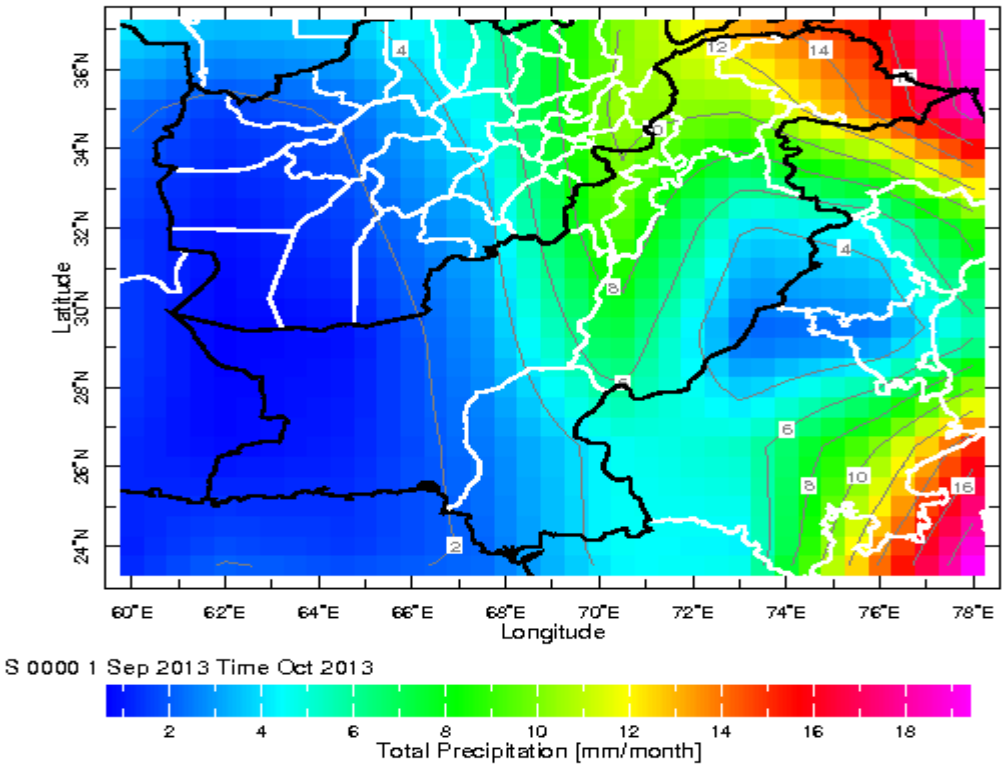
- ***Below Average (Blw. Ave) < -10 %,***
- ***Average precipitation range (Ave) = -10 to +10 %,***
- ***Above Average (Abv.Ave) > +10 %***

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

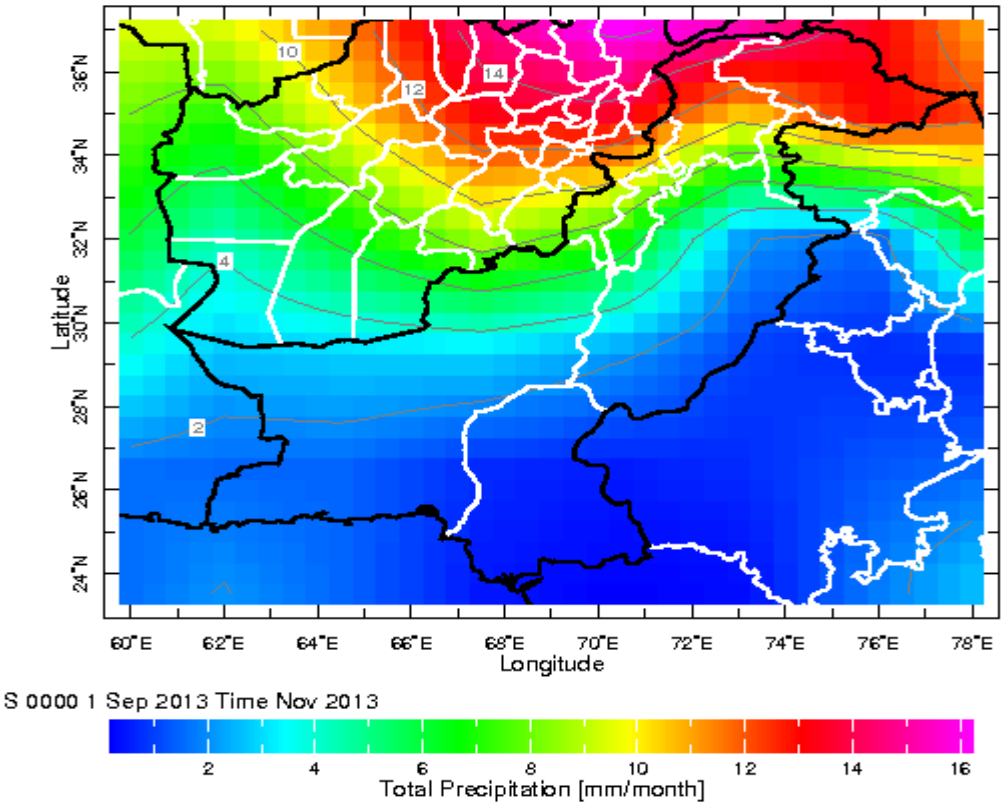
4. Spatial distribution of expected rainfall during coming season (GCM-ECHAM)



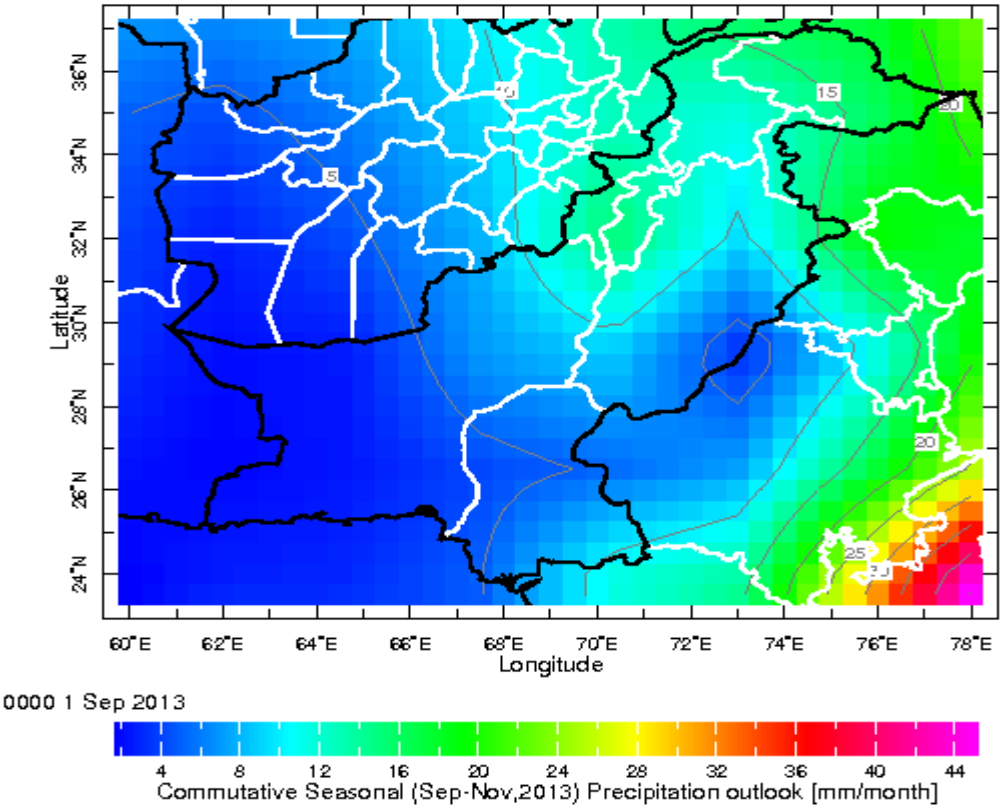
SEP, 2013



OCT, 2013



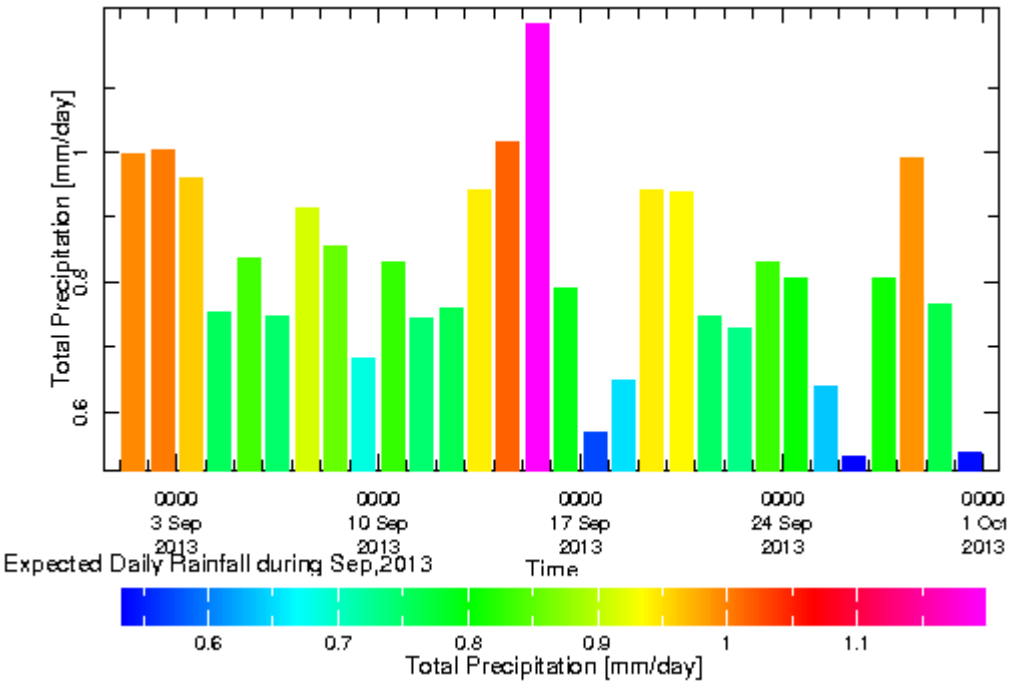
NOV, 2013



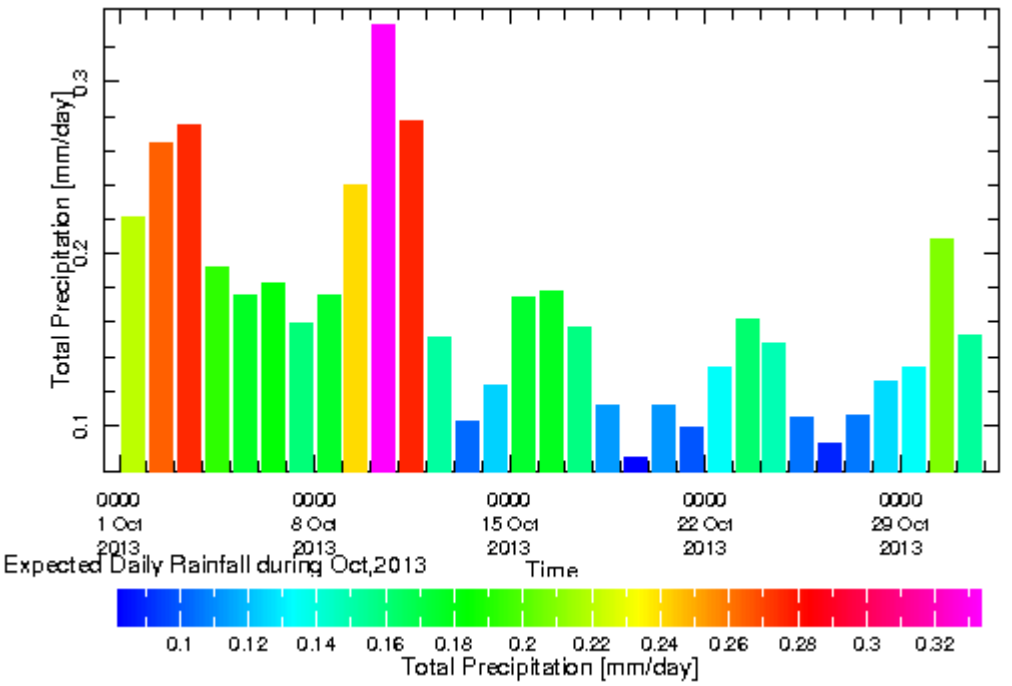
Sep-Nov, 2013

Expected daily rainfall

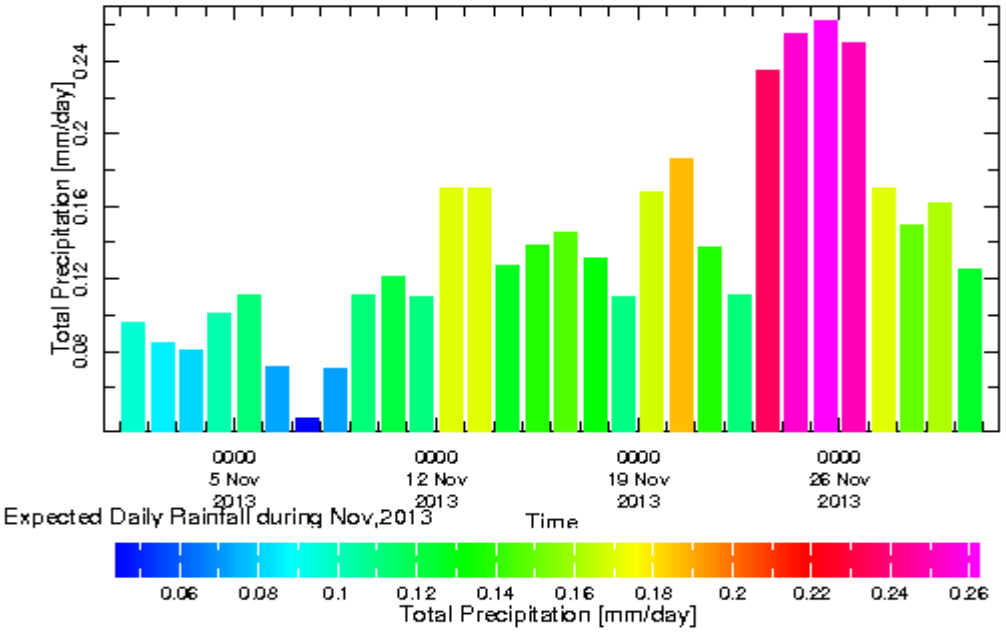
September, 2013



October, 2013

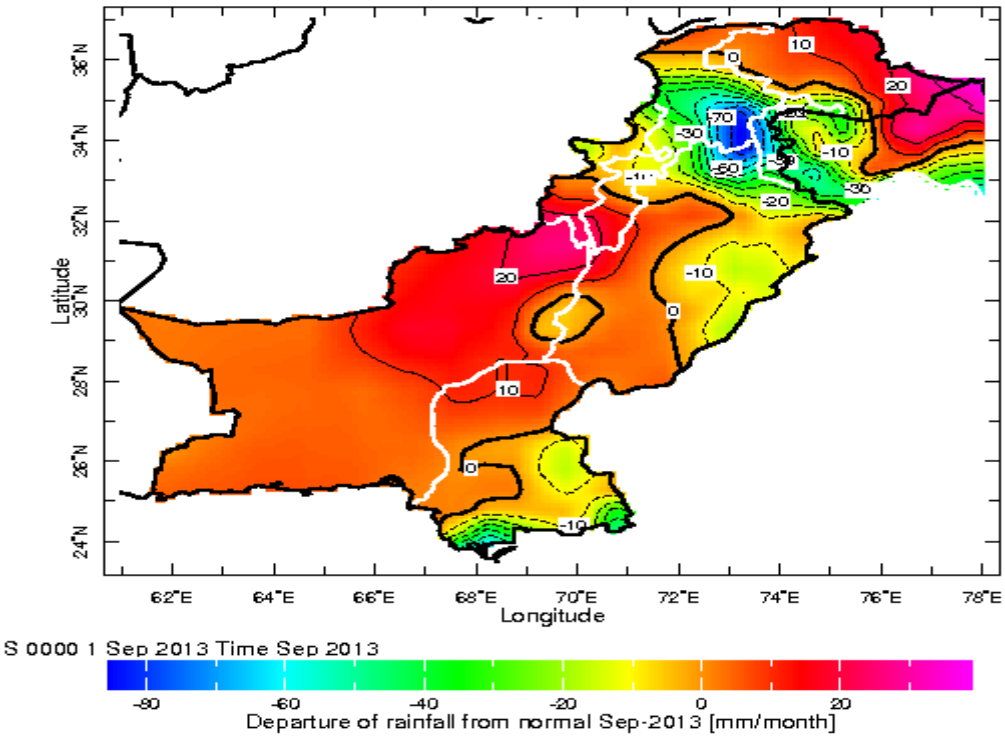


November, 2013

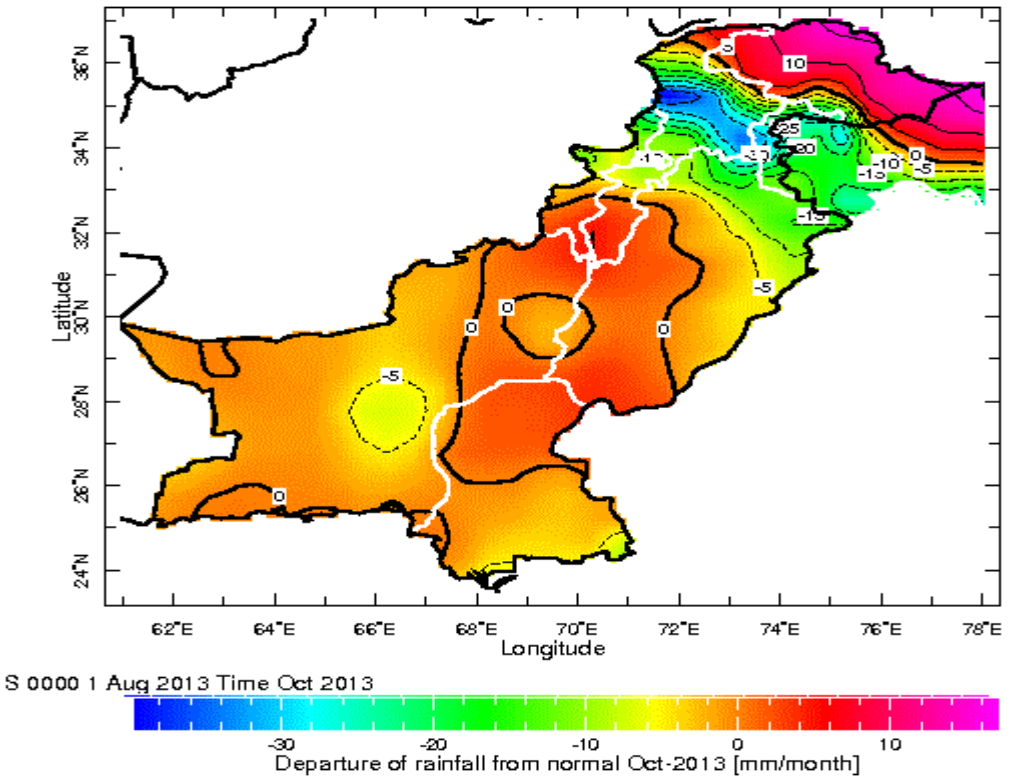


Note: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

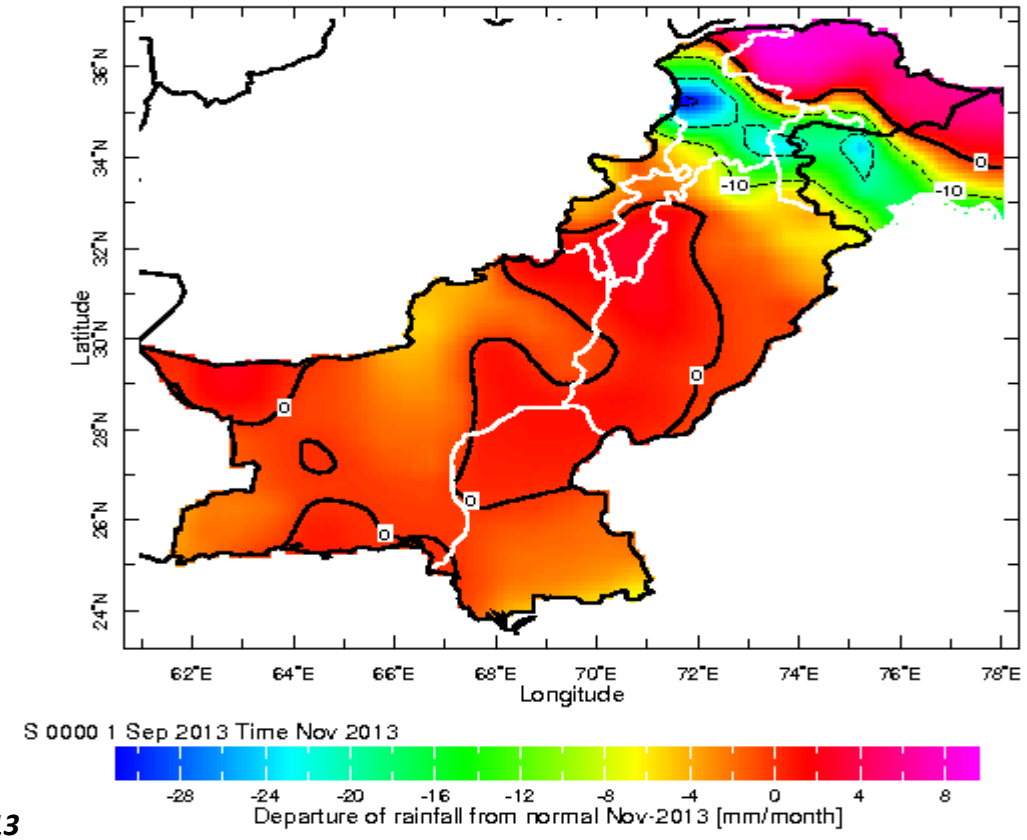
Monthly departure from normal (rainfall) during coming season



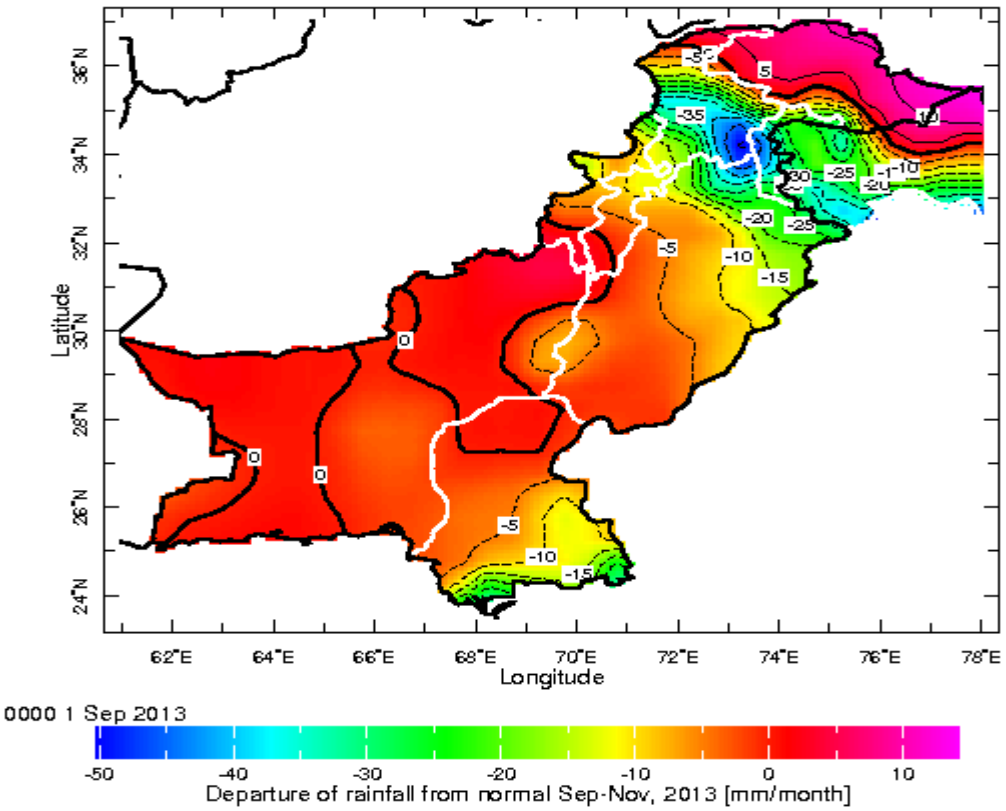
Sep, 2013



Oct, 2013

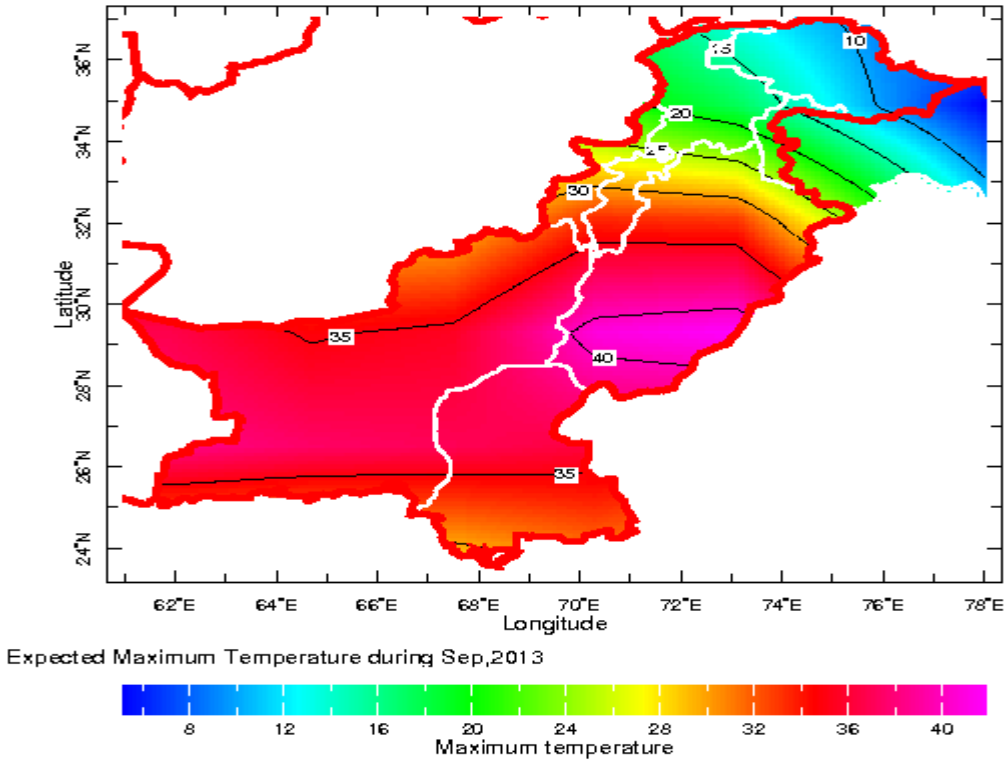


Nov, 2013



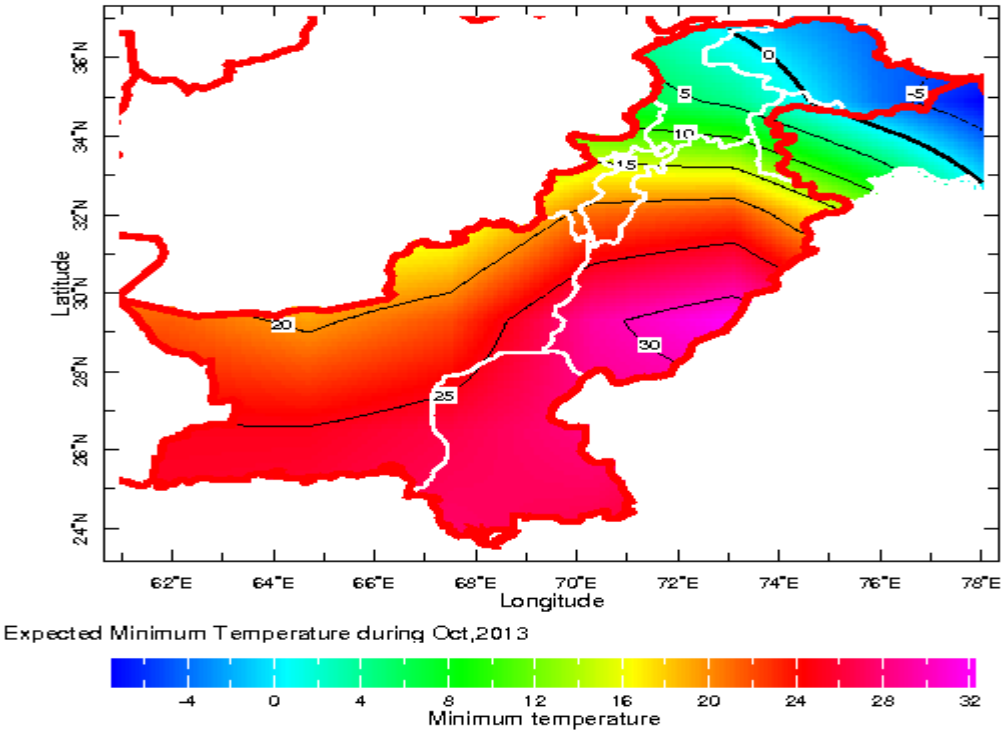
Sep-Nov, 2013

Spatial distribution of expected max. temperature during Sep ,2013

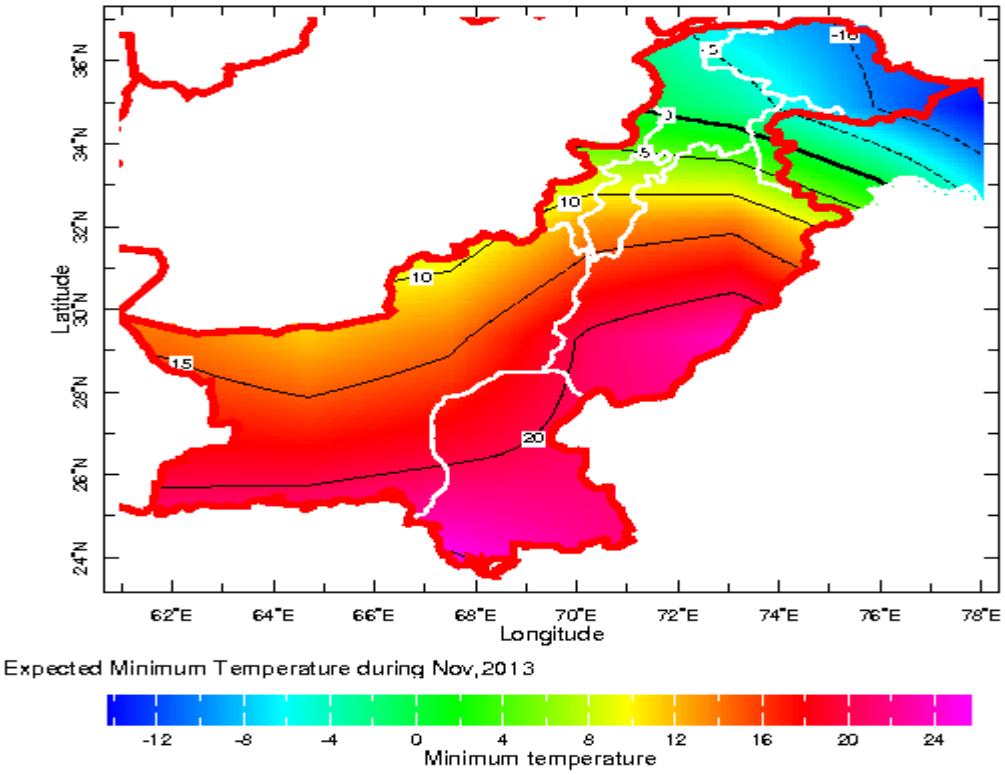


Sep, 2013

Spatial distribution of expected minimum temperature during Oct and Nov, 2013

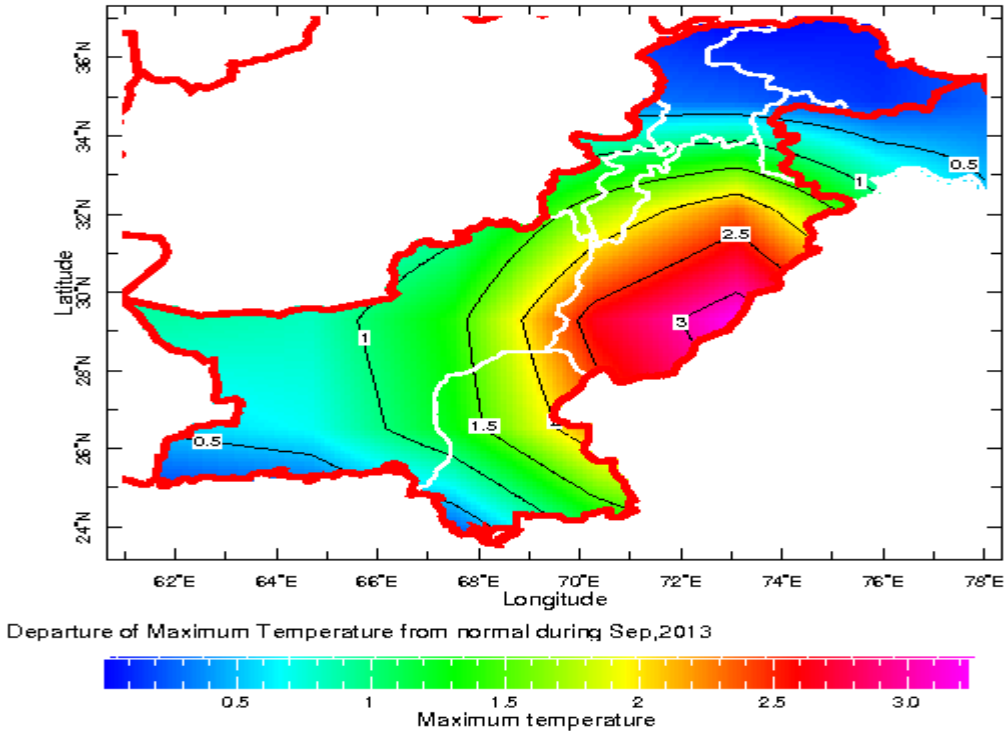


OCT, 2013



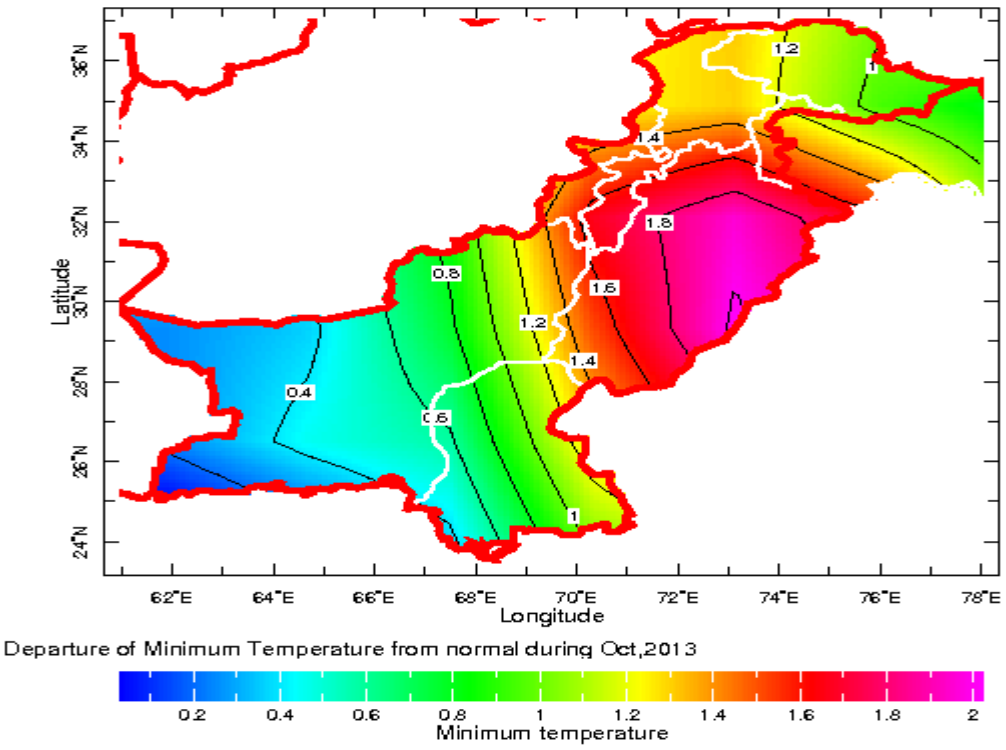
Nov, 2013

Departure of expected maximum temperature from normal

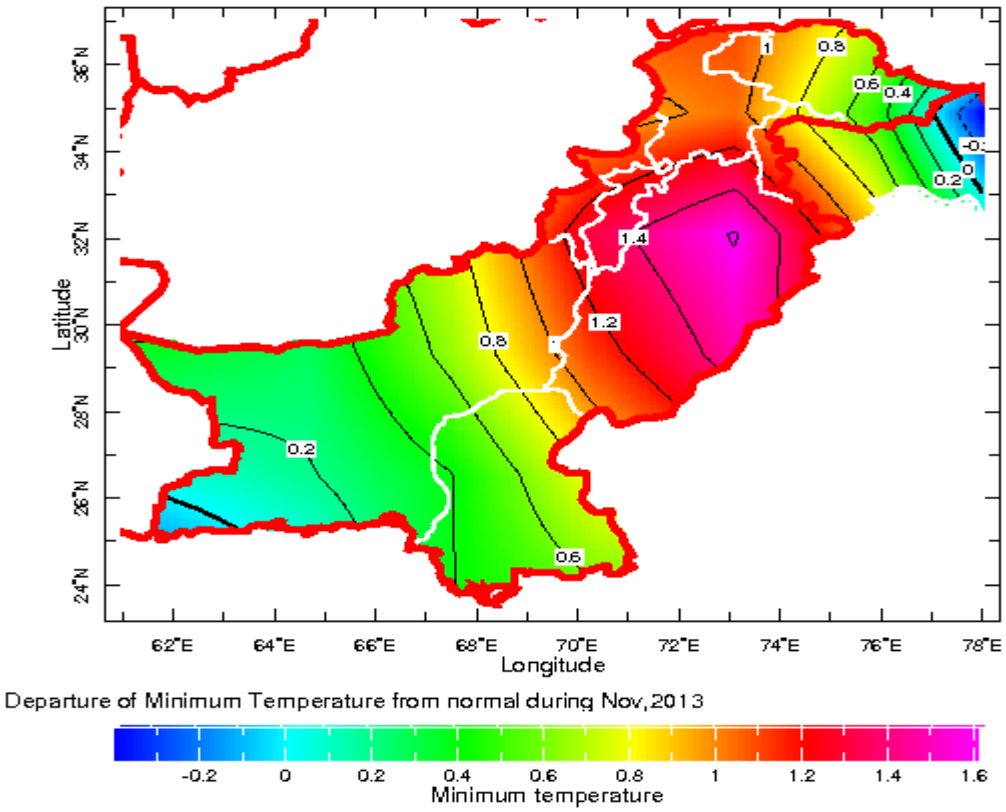


Sep, 2013

Departure of expected minimum temperature from normal



Oct, 2013



Nov, 2013

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/