Seasonal weather outlook for SAARC region

(May-Jul, 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 seasonal weather outlook for south Asian countries included in South Asian Association for Regional Cooperation (SAARC) (on experimental basis), taking into consideration available products from major climate prediction centres by using Global Climate Models (GCMs).

This Climate Outlook may be somewhat different from those used by the national meteorological services in the region. Thus, this product may differ from the official forecasts issued in those countries. Regional weather (precipitation) outlook is predicted from ECHAM4 global climate models by using persisted sea surface temperature on 0000 May 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. For further information concerning this and other guidance products, users are strongly advised to contact their National Meteorological Services.

Acknowledgement: *NAMC 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. Special acknowledge to Dr. M. Benno Blumenthal by providing guidance and assistance for using IRI climate software. All the output graphics have been prepared by using IRI climate software.*

Classification of average, below average and above average

- *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

2. Synoptic situation

- Location of jet stream (U wind at 200 hPa) is at normal position with higher than normal intensity. The region may prevail above than normal winds strength. The movement of higher strength winds may cover wider area than normal over the region.
- A trough at 500 hPa is expected to be over upper and lower parts of the country. As a result, weather system influenced by local weather phenomenon wills effects in these regions.
- Surface temperatures are expected to be averagel over central parts of the country as compared with normal (1981-2010). However, northern and southern parts may prevail normal surface temperature.
- North Atlantic Oscillation (NAO) is in positive phase (0.31) 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
- The model predictions of ENSO for this summer and beyond are indicating an increased likelihood of El Niño this year compared with last month. Most of the models indicate that ENSO-neutral (Niño-3.4 index between -0.5°C and 0.5°C) will persist through much of the remainder of the Northern Hemisphere spring 2014, with many models predicting the development of El Niño sometime during the summer or fall. Despite this greater model consensus, there remains considerable uncertainty as to when El Niño will develop and how strong it may become. This uncertainty is amplified by the inherently lower forecast skill of the models for forecasts made in the spring. While ENSO-neutral is favored for Northern Hemisphere spring, the chances of El Niño increase during the remainder of the year, and exceed 50% by the summer.(http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Probability outlook: La Nina (2%), Neutral (53%) and El Nino (45 %) during May-Jun-Jul, 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 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.

3. Weather outlook Summary

"Average precipitation is expected during the season (MJJ)"

Synthesis of the latest model forecasts for May-Jul 2014 (MJJ), current synoptic situation and regional weather expert's judgment indicates that average precipitation is expected during the predicted season. Below normal maximum temperature will persist over Pakistan, Afghanistan and eastern parts of India and above normal maximum temperature over Bhutan, Bangladesh and central parts of India (Madhya Pradesh, Maharashtra and Andhra Pradesh) during May. However, above normal temperature will prevail over Nepal, Bhutan and northern parts of India and Afghanistan during June.

Seasonal weather outlook (May-Jul, 2014):

As a whole, average precipitation is likely to all over the region during the season with above average during June. Below average precipitation is expected over Bhutan, Nepal and Sri Lanka. However, average rainfall is expected over rest of the region.

Nepal, Bhutan, Bangladesh, eastern and southwestern parts India will receive good rain during the season. Eastern India Indian states including western coastal belt of India including western Belt of Sri Lanka and Bangladesh will receive significantly below average rainfall. Below normal rainfall is likely to occur over Nepal, Bhutan and few areas of India including Andhra Pradesh, Tamilnadu, Karnataka and Madhya Pradesh.

Chances of cat and dogs rainy spell are expected during these transition months in the region.

Chances of drought in western Pakistan are not prominent during predicted months.

May, 2014: Average precipitation is expected in SAARC member countries as a whole with below average over Sri Lanka, Nepal Bhutan and average over India, Pakistan and Afghanistan. Rainy spells will be focused over Orissa, Jharkhand, Bihar, Assam, Kerala and Karnataka states of India, Bangladesh and Bhutan. Manipur, Nagaland and Mizoram of India state will receive below normal rainfall during predicted month of May. Rest of the region will receive average rainfall.

Above normal day temperature will be expected over central and northeastern states of India. However below normal day temperature will be expected over Punjab (India and Pakistan) Rajasthan, Manipur and Mizoram states of India.

June, 2014: Above Average precipitation is expected during June all over SAARC region with below average over Sri Lanka (– 39%), Nepal (-22%), Bhutan (-23%) and above average over India (+64%) and Afghanistan (+31%). Intensity of precipitation will be higher over Indian states of Maharashtra, Karnataka, Orissa, west Bengal and southern parts of Bangladesh. Above

normal rainfall is expected over Uttar Pradesh and Orissa of India while below normal over northeastern parts of India. Rest of the region will receive normal rainfall during the month.

Day temperature will be below normal over central and southern India, Pakistan and above normal of northern states of India, Nepal and Bhutan. No exceptional variation in day temperature will be expected over rest of the region.

July, 2014: Average precipitation is expected during July all over SAARC region with moderate below average over Pakistan (-40%), below average over Sri Lanka (– 21%), Nepal (-16%), Bhutan (-28%), Bangladesh (-22%) and India (-21%), and average Afghanistan (+05%). High intensity precipitation is expected over different states of India including Orissa, Andhra Pradesh, Karnataka, Maharashtra, and Utter Pradesh. Most of the region will receive less than normal rain. However, south eastern states of India will receive above normal rainfall during July.

Monsoon 2014 Prediction (May-August, 2014):

Current synoptic situation and its variation indicate that below normal rainfall is expected during upcoming monsoon season. Monsoon starts in June with full swing and then probably it becomes week by the time as by prevailing El Nino matureness.

Afghanistan: May is likely to be wet month with 3-4 spells (receive rainfall > 0.6 mm/day in whole coutnry.

Bangladesh: Monsoon currents are likely to prevail from last week of May and become strengthening from Ist June. First two decade of June are likely to be wet.

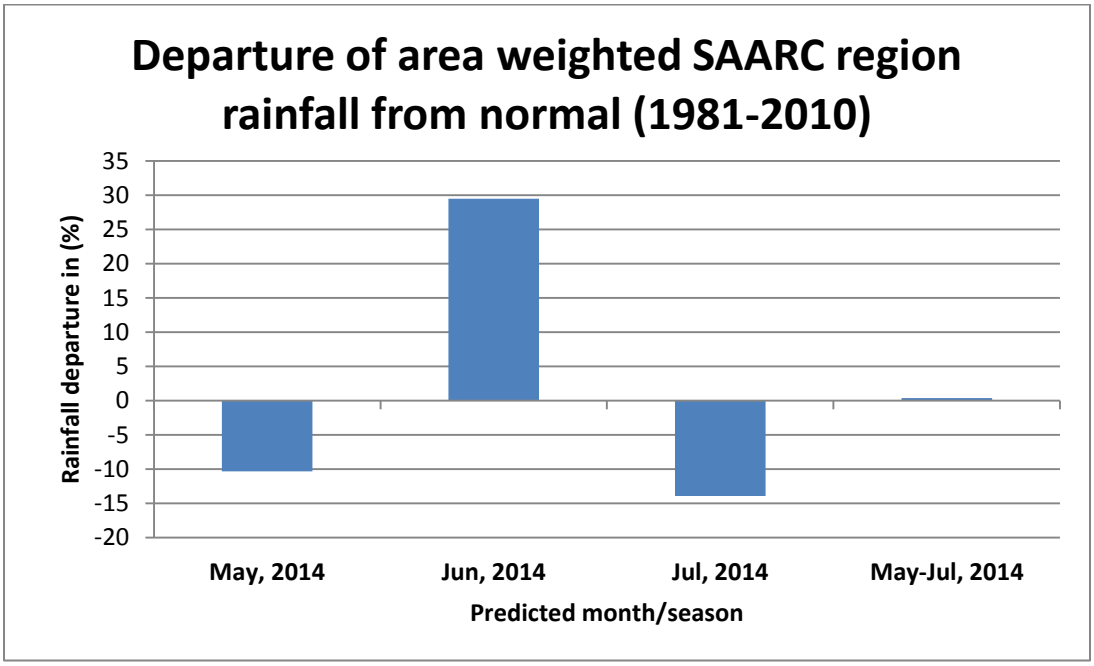
Bhutan: Monsoon rainfall starts from Ist week of June. Two to three spell are expected during June. Havey rainfall is expected during July and Ist week of August.

India: Monsoon starts on Ist week of June will slow pace and gradually increase intensity of rainfall. Good rainy spells are expected during June. Rainfall intensity will be less from June during month of July. Chances of flood in the country will be on higher side.

Nepal: Monsoon rain starts in mid of June and increase rainfall intensity gradually. Good rainy spells are expected from second week of July to second week of August.

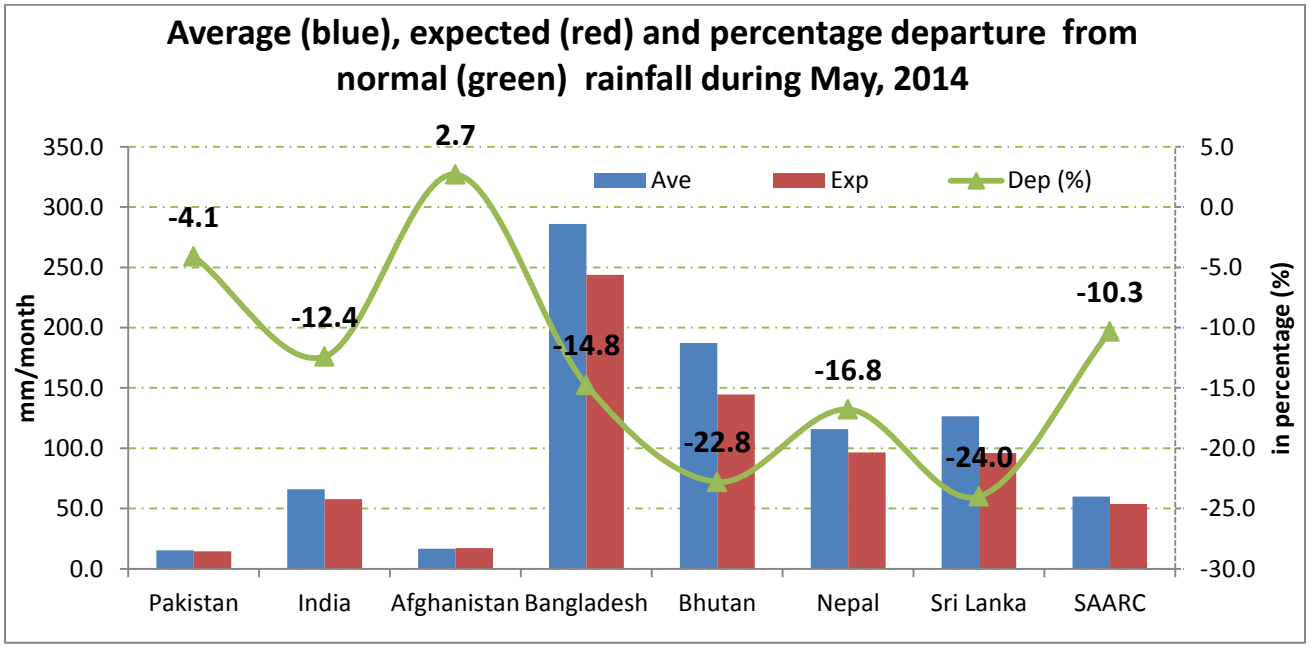
Pakistan: Monsoon starts from 21-23 June, which will be one week in advance as per official date of arrival of monsoon in the country. Good rainy spells are expected during first two week of August. Chances of flood can't be ruled out in August.

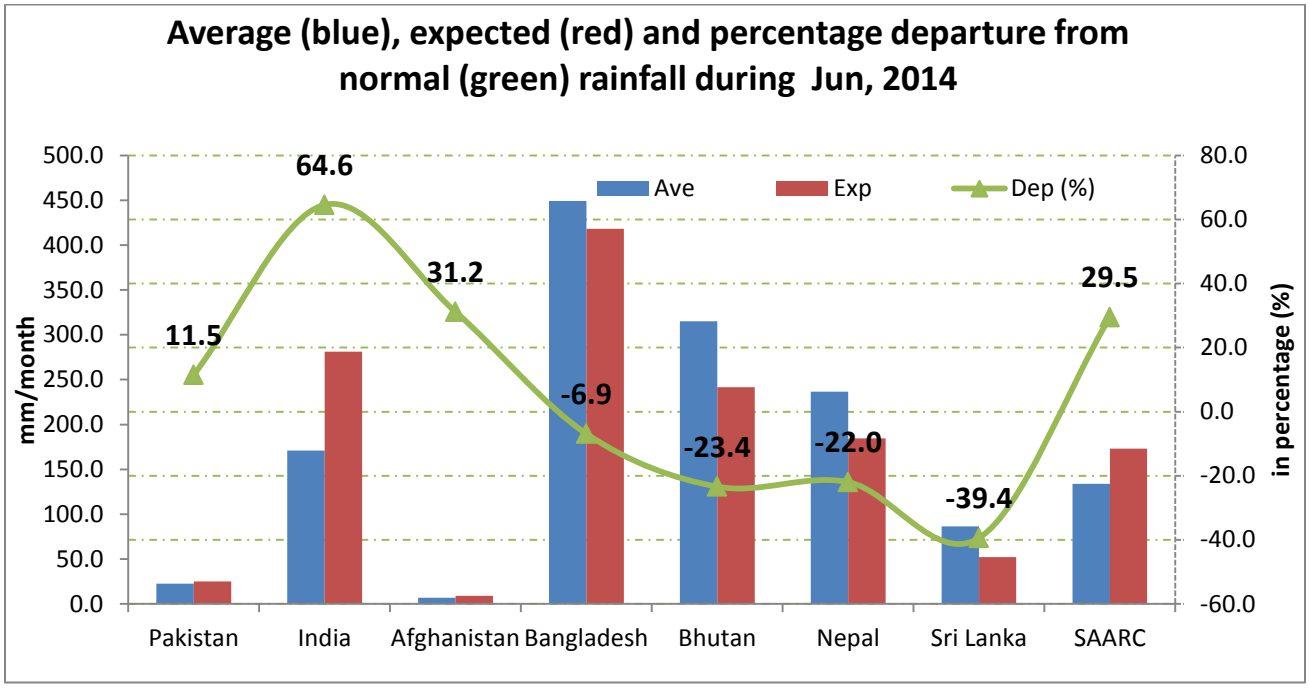
Sri Lanka: Good heavy spells of rainfall are expected during last decade of May (21-30). However, no exceptional rainy spells are expected during June and July. 1st decade of August will receive good rains in the country.

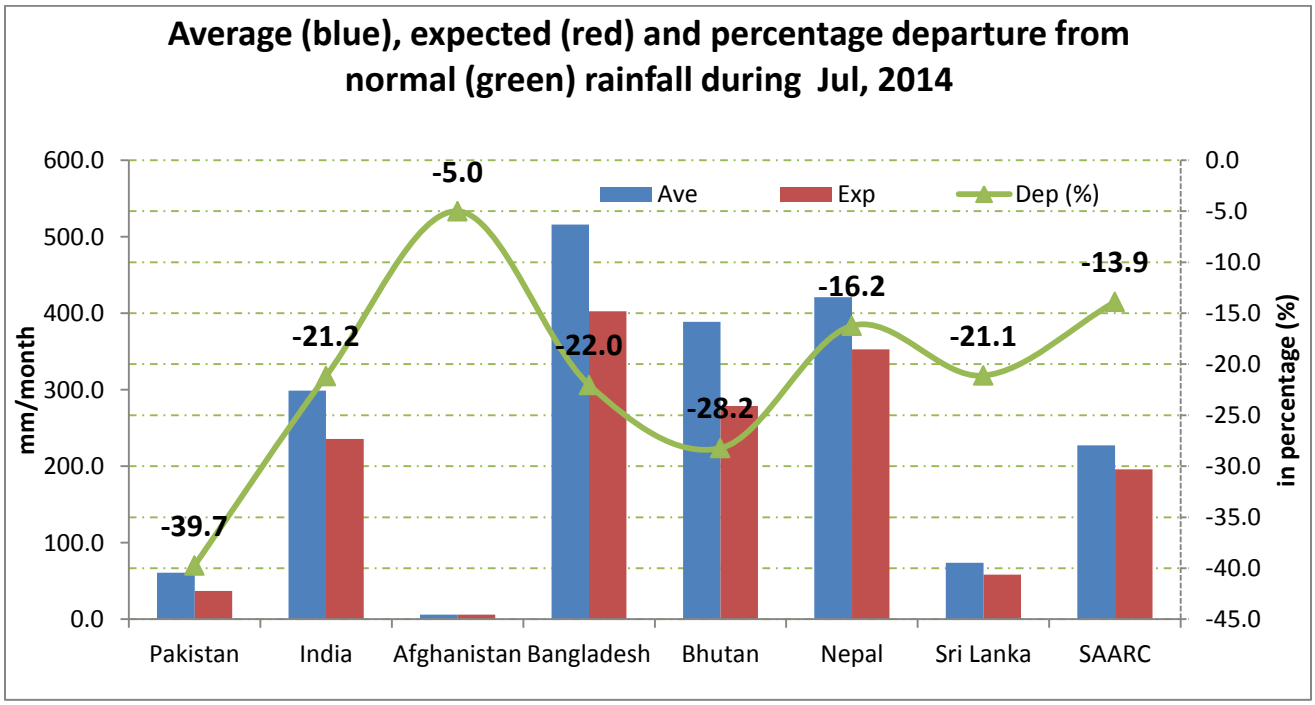


Note: Departure of Area-weighted rainfall of SAARC region has been computed by subtracting ECHAM predicted monthly/seasonally rainfall from GPCC of corresponding month/season.

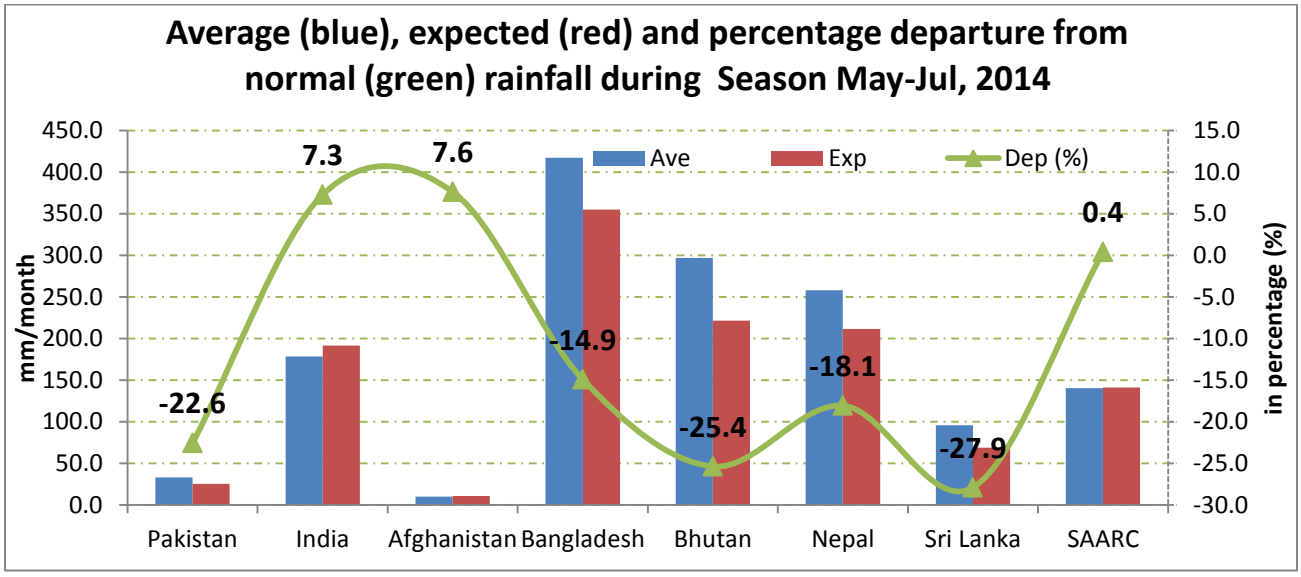
4. Country wise monthly and seasonal quantitative outlook along with departure of precipitation from normal





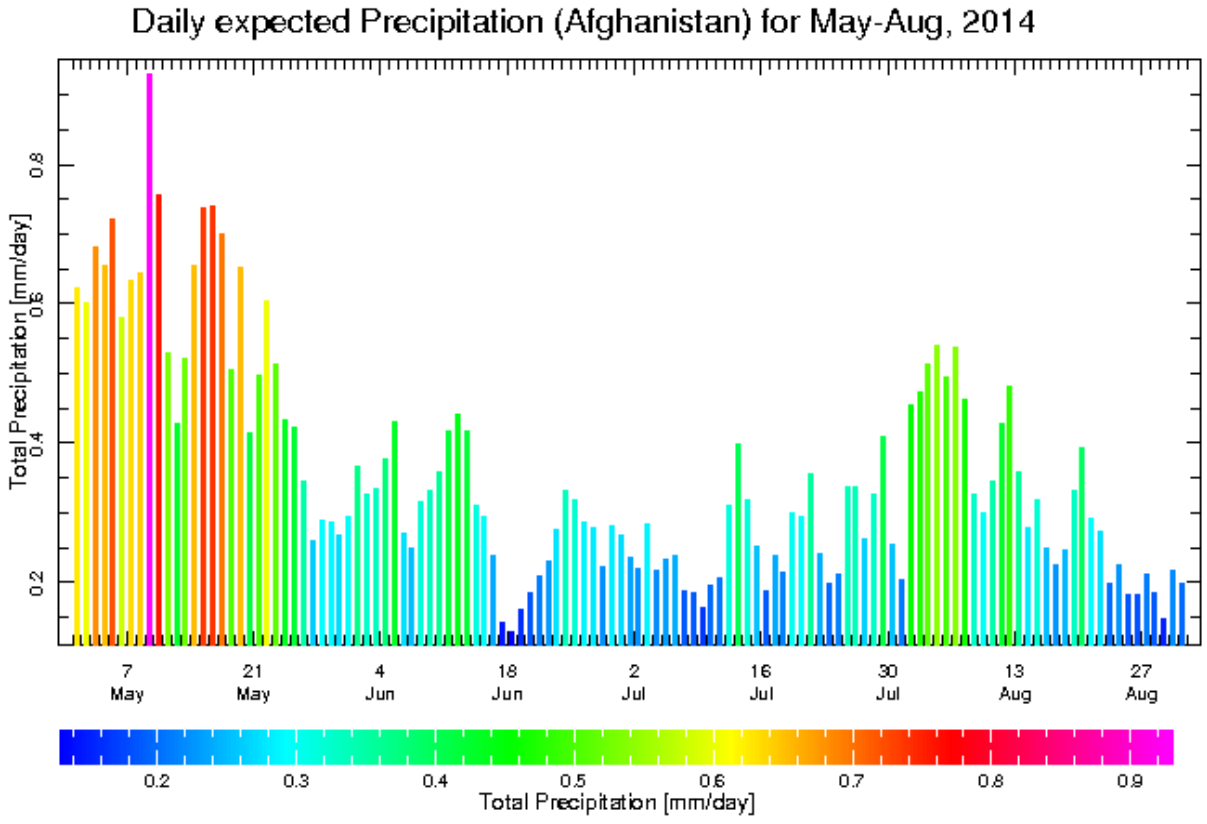


Note for quantitative graph: X axis indicates countries, left y axis stands for bar chart (blue for average and red for expected rainfall in mm/month) and right y axis stands for line chart (green) indicates departure of rainfall from normal in percentage. Average rainfall period is 1981-2010.

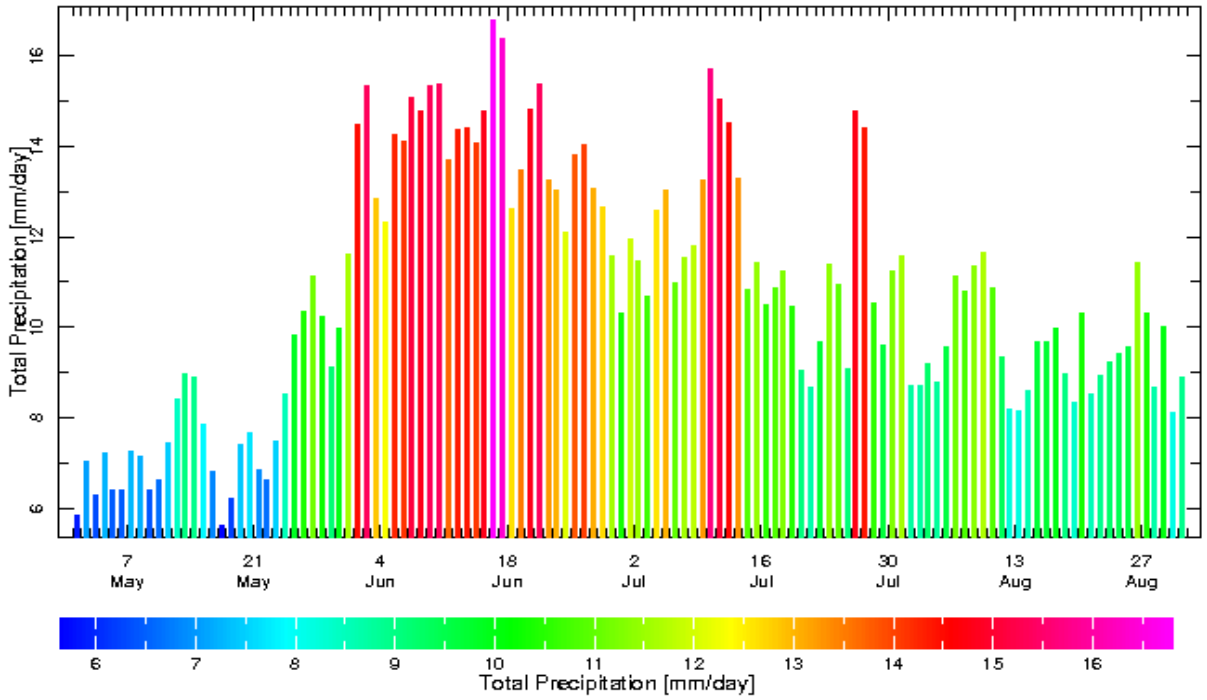


5. *Daily country wise precipitation predictrion for coming months (May-Aug, 2014)*

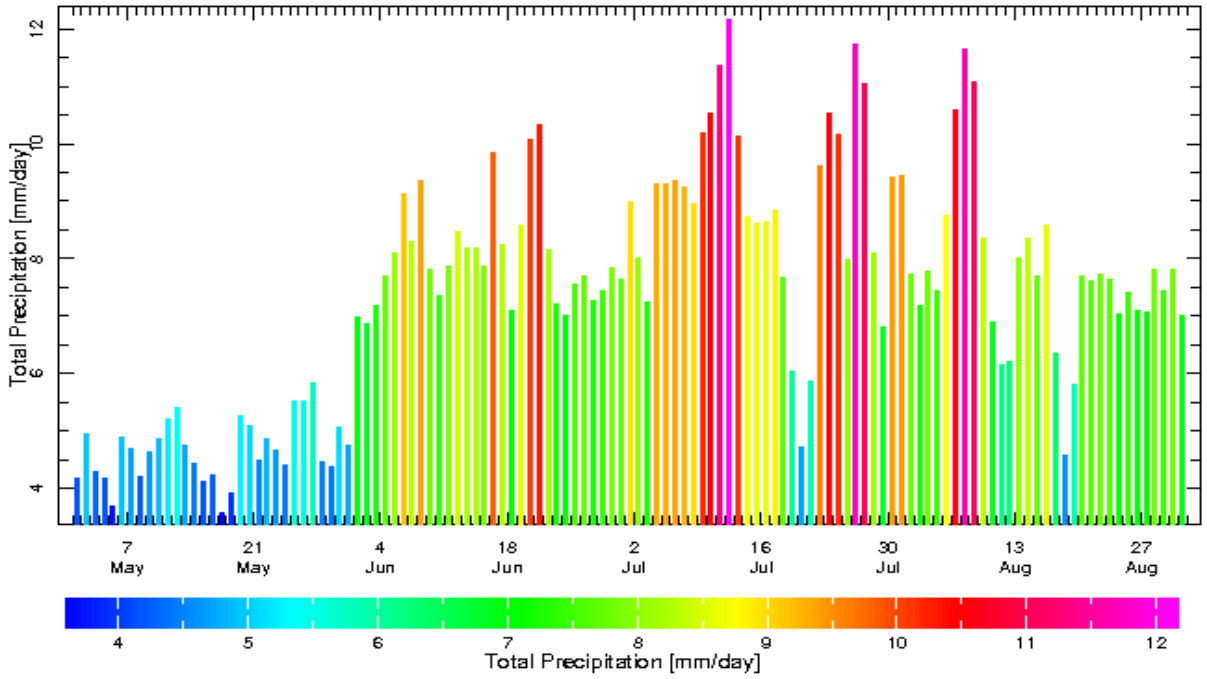
Note for daily weather prediction: *It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.*



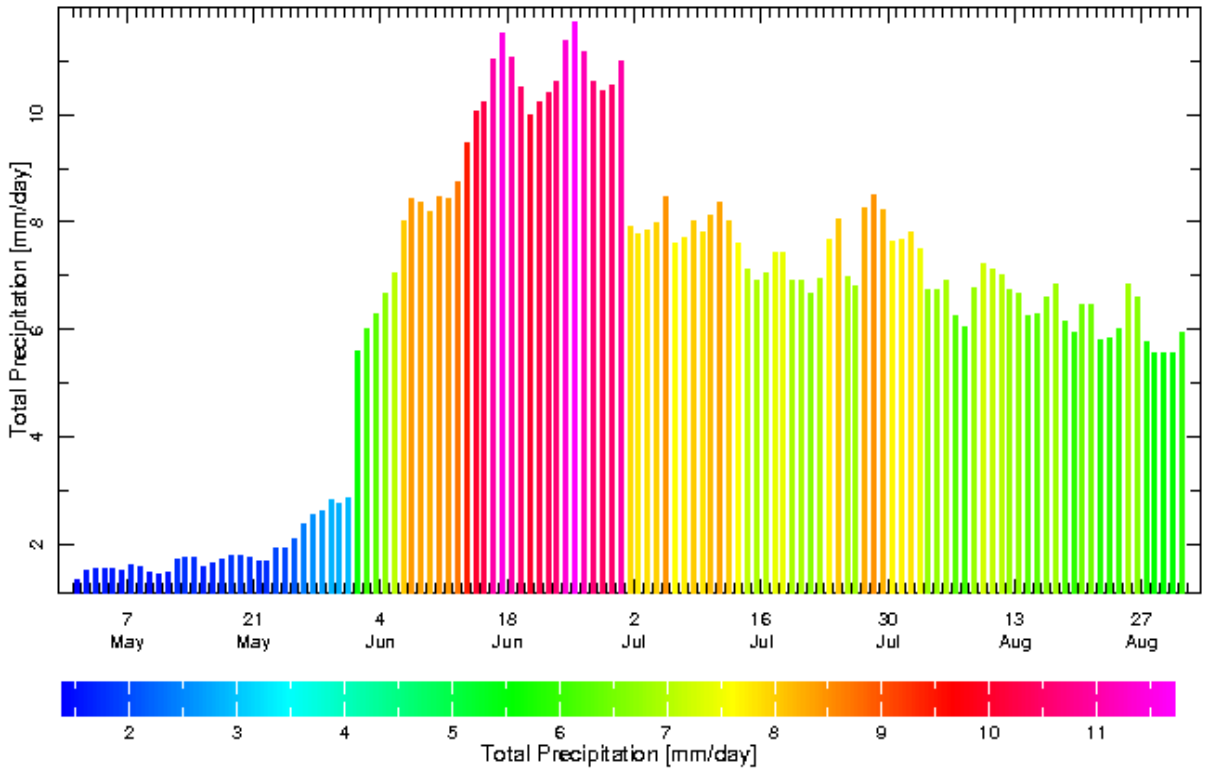
Daily expected Precipitation (Bangladesh) for May-Aug, 2014



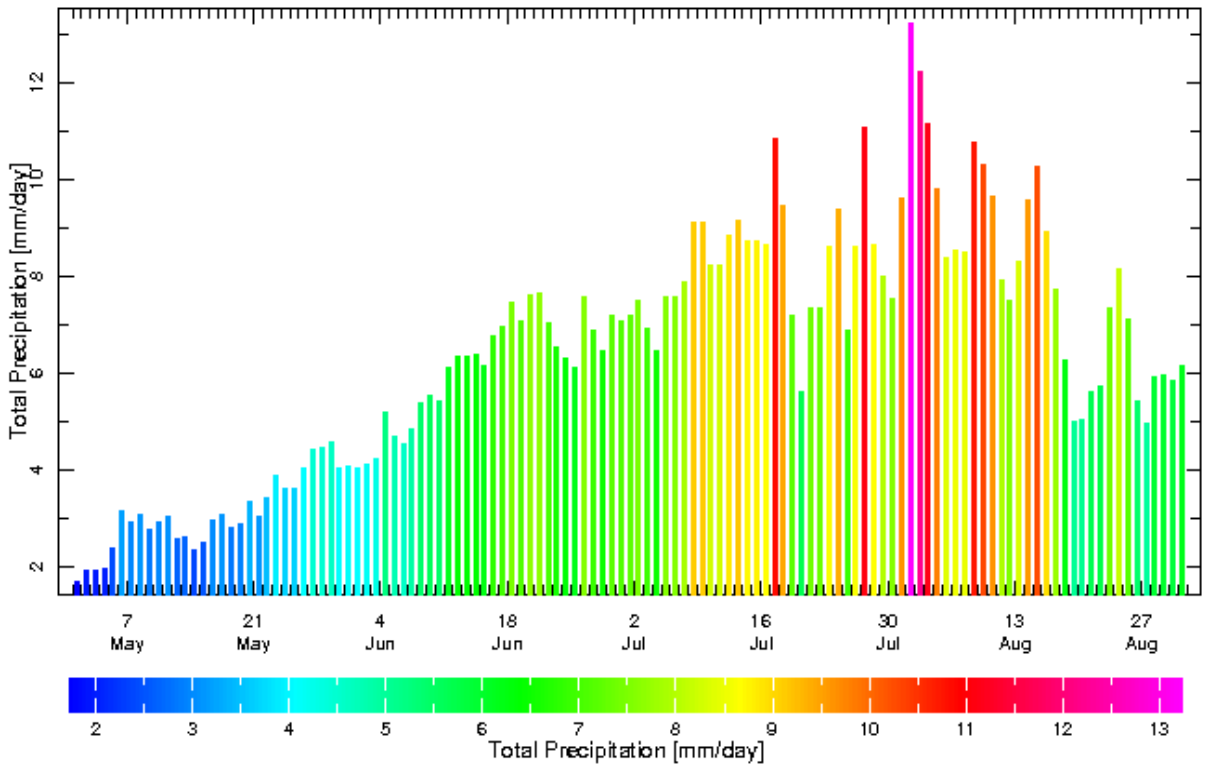
Daily expected Precipitation (Bhutan) for May-Aug, 2014

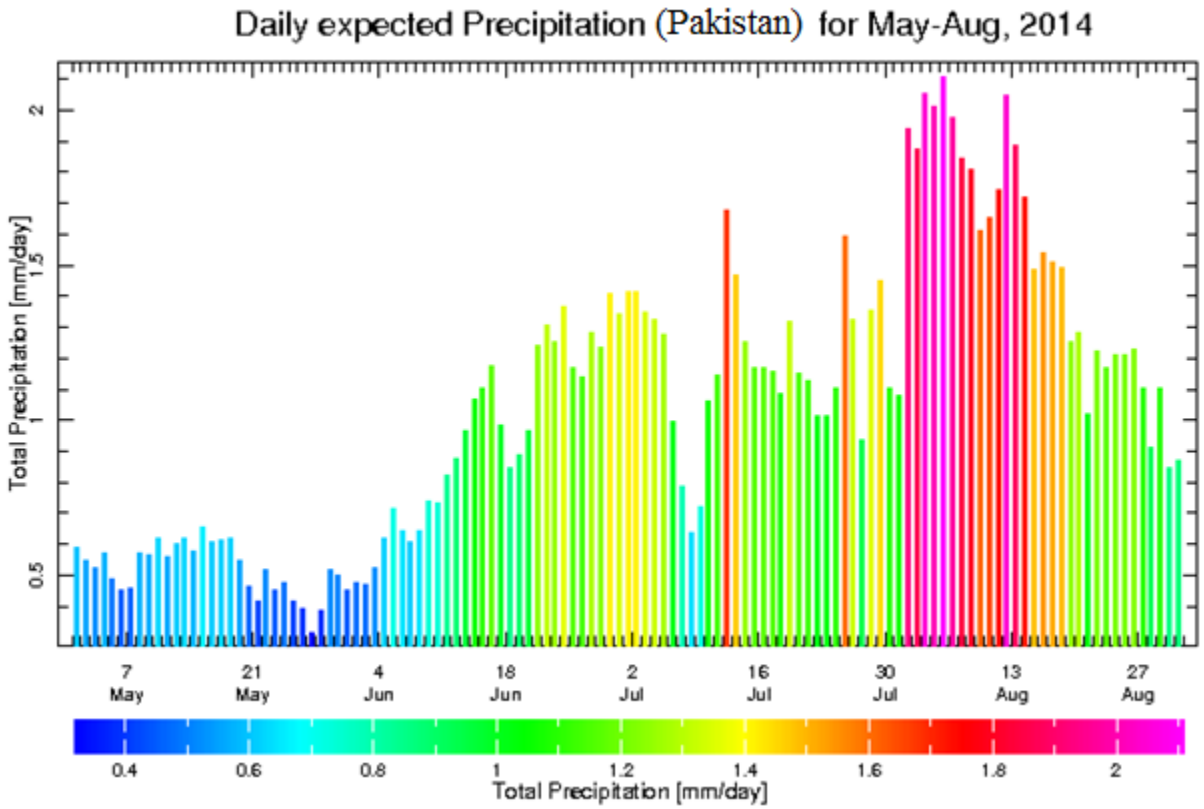


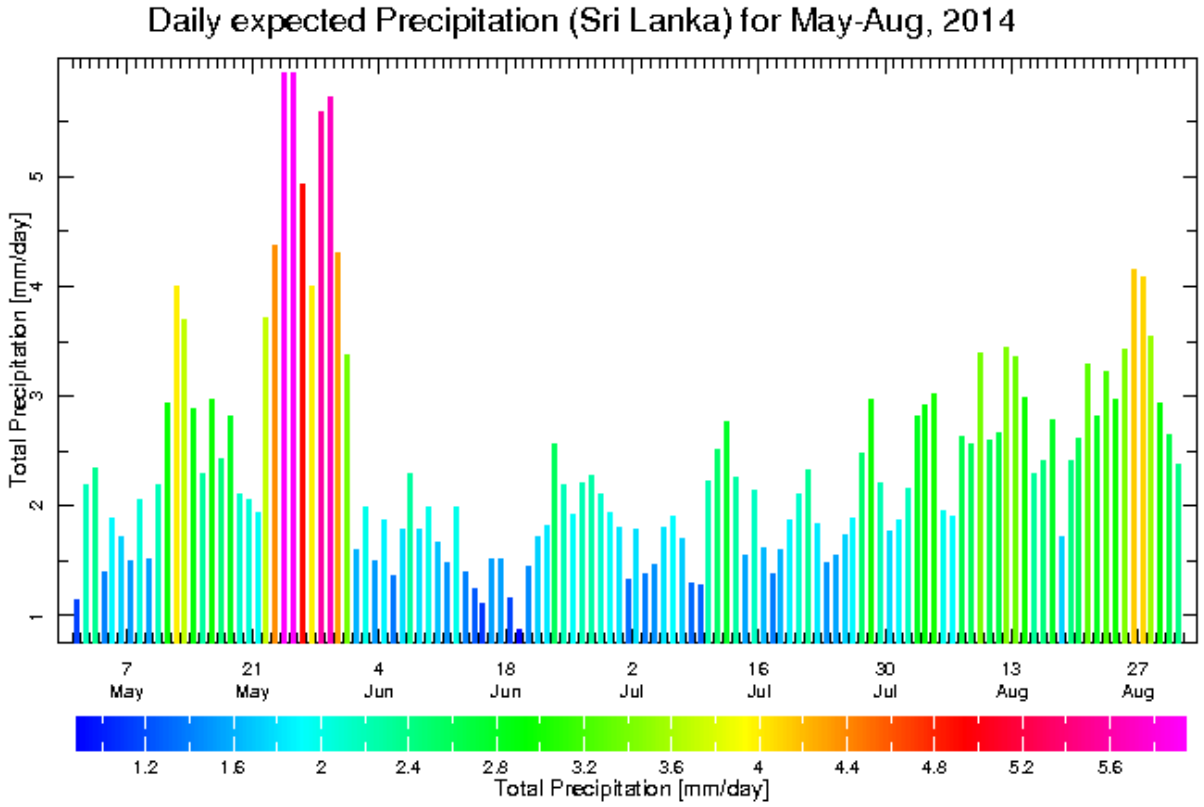
Daily expected Precipitation (India) for May-Aug, 2014



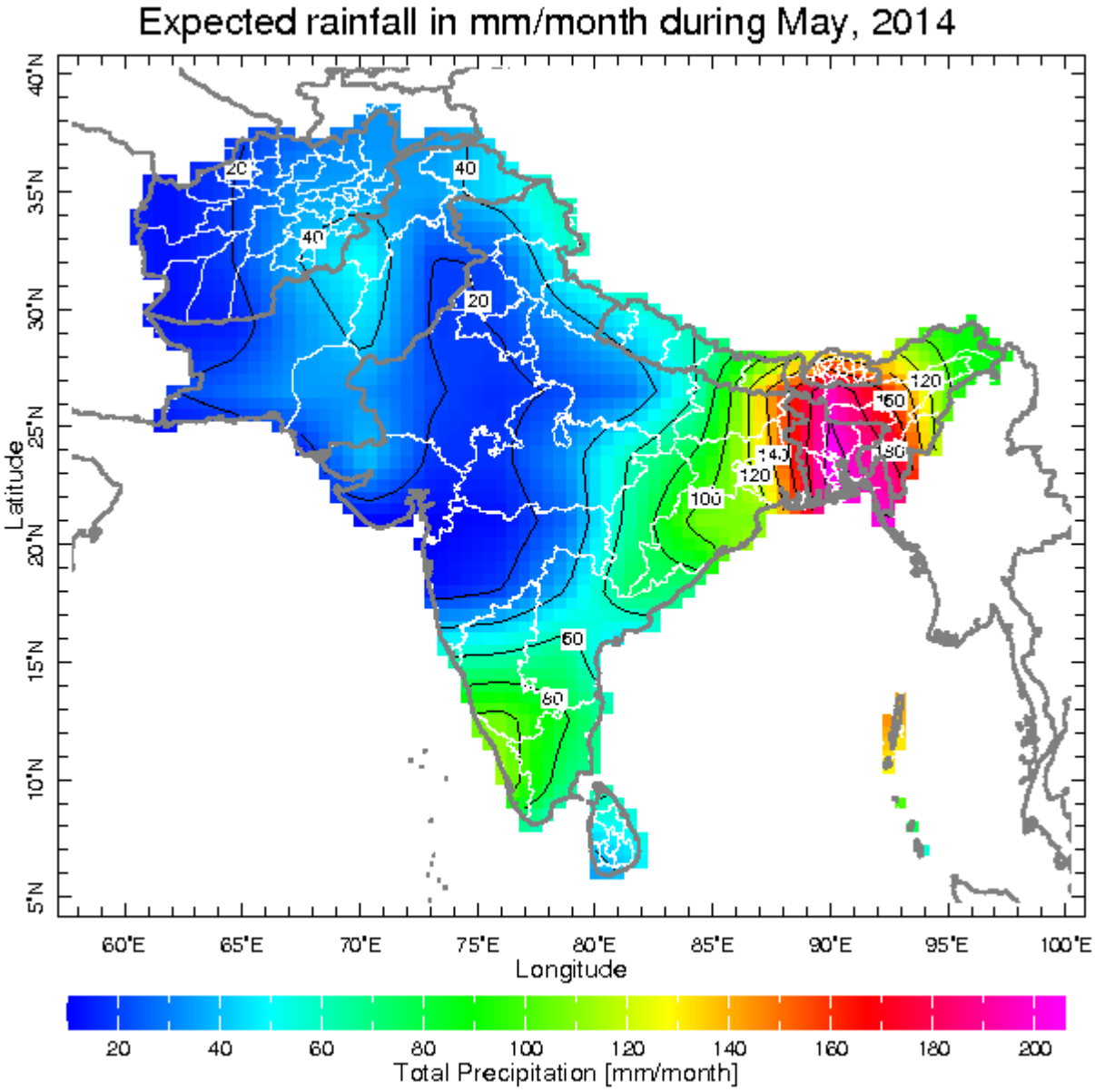
Daily expected Precipitation (Nepal) for May-Aug, 2014

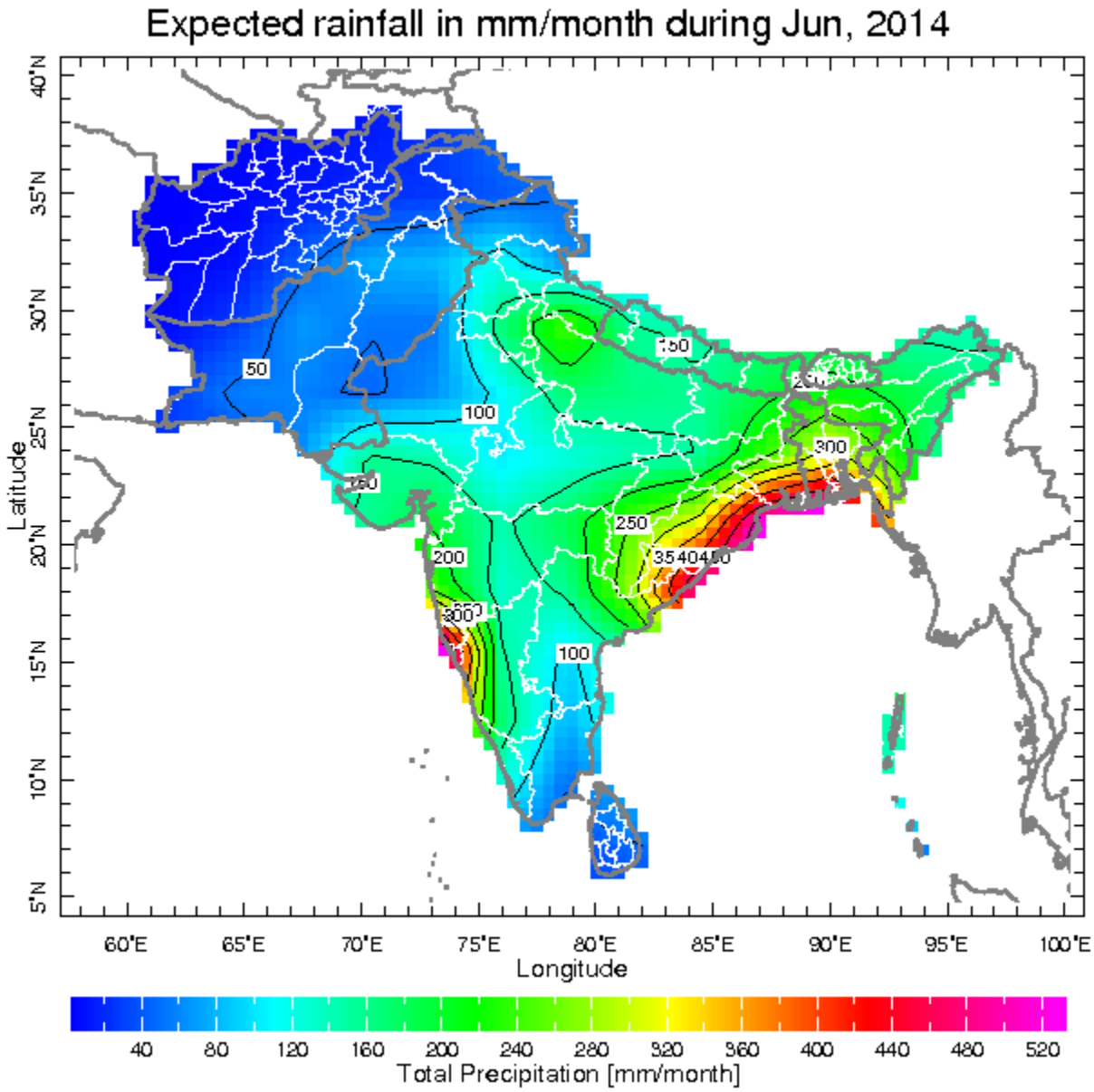


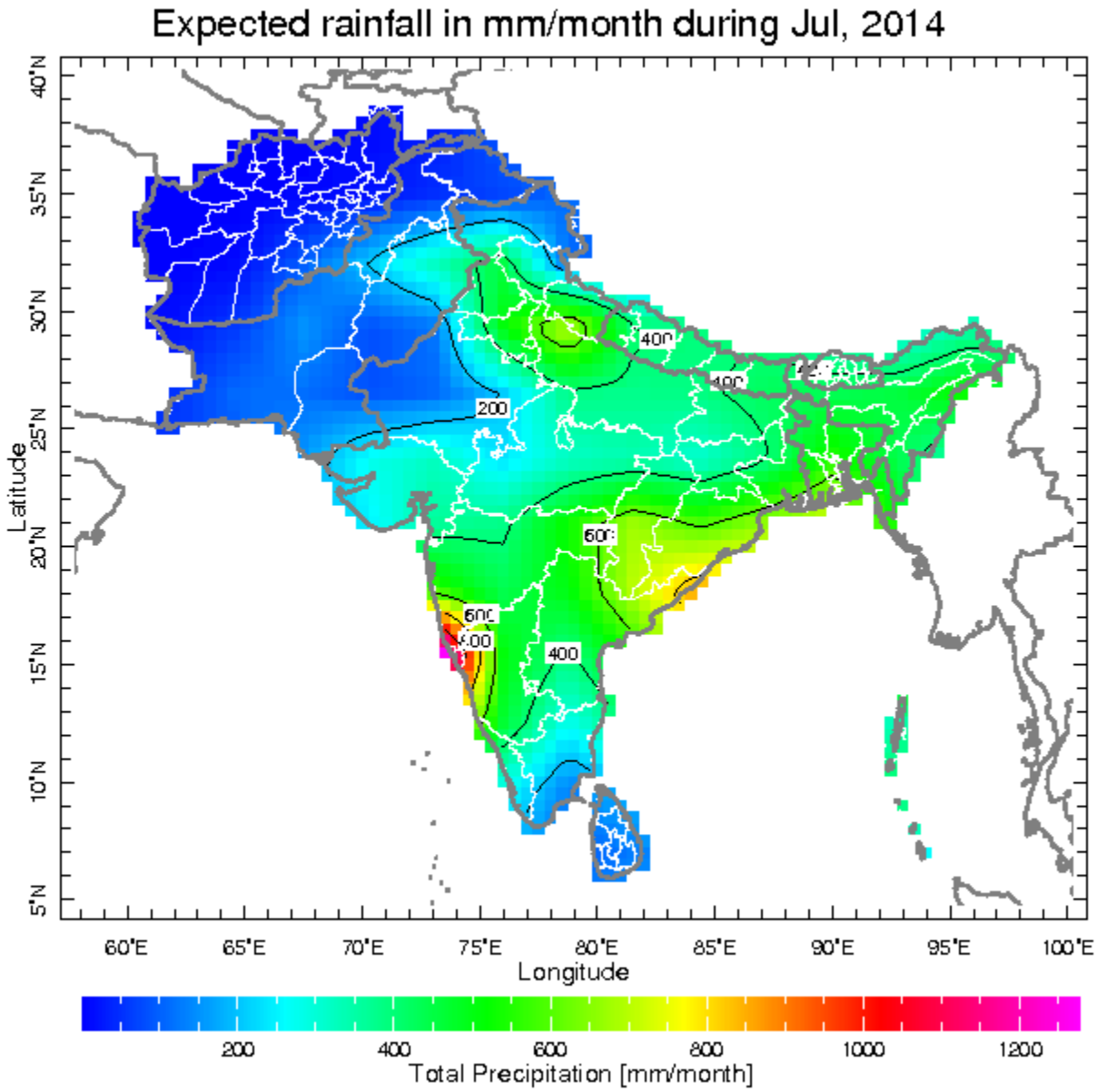

Daily expected Precipitation (Pakistan) for May-Aug, 2014
Total Precipitation [mm/day]
0.5
1
1.5
2
7 May
21 May
4 Jun
18 Jun
2 Jul
16 Jul
30 Jul
13 Aug
27 Aug
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Total Precipitation [mm/day]

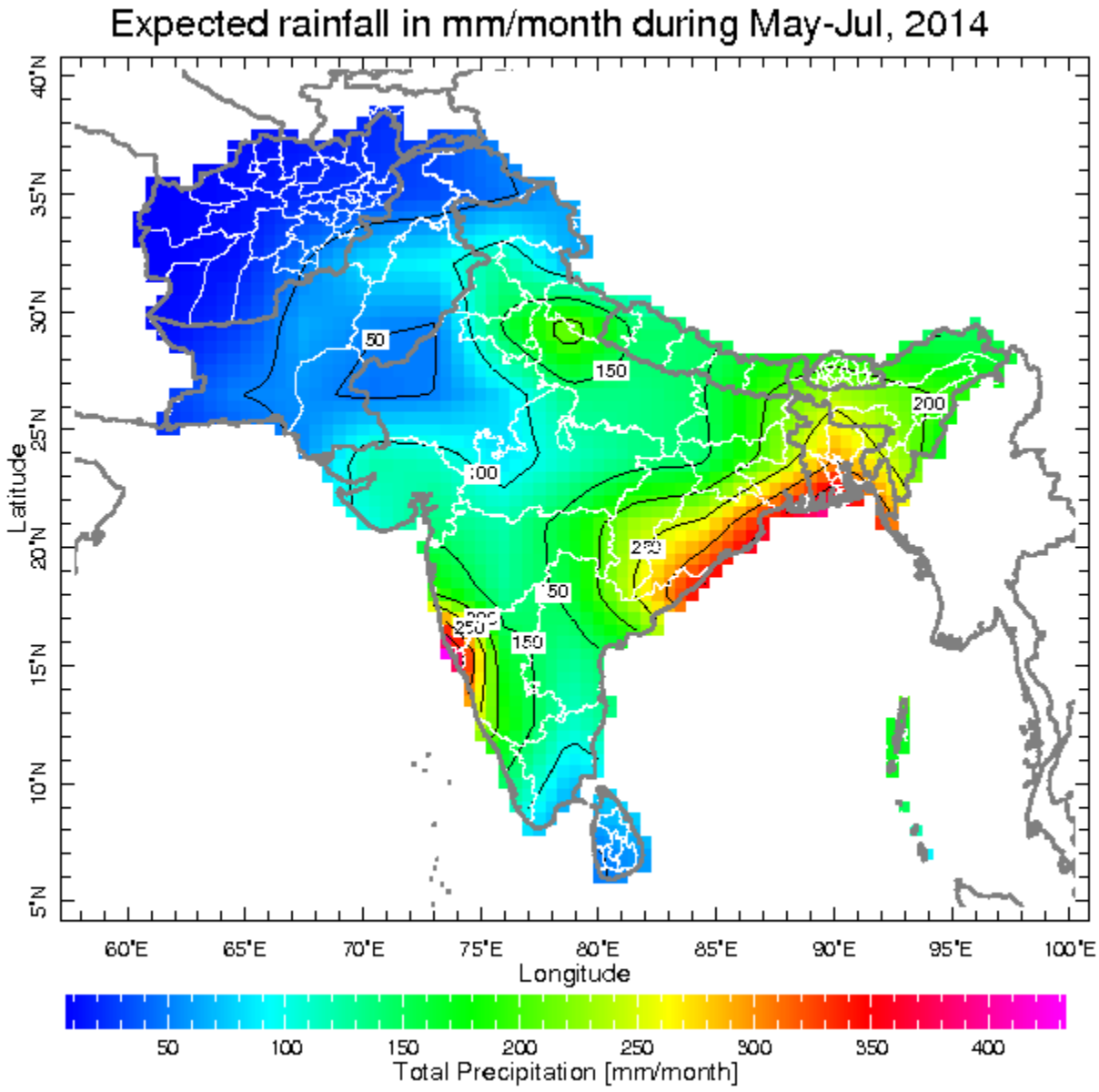

Daily expected Precipitation (Sri Lanka) for May-Aug, 2014
Total Precipitation [mm/day]
1
2
3
4
5
7 May
21 May
4 Jun
18 Jun
2 Jul
16 Jul
30 Jul
13 Aug
27 Aug
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4
4.8
5.2
5.6
Total Precipitation [mm/day]

5. Spatial distribution of expected precipitation during coming season (GCM-ECHAM)

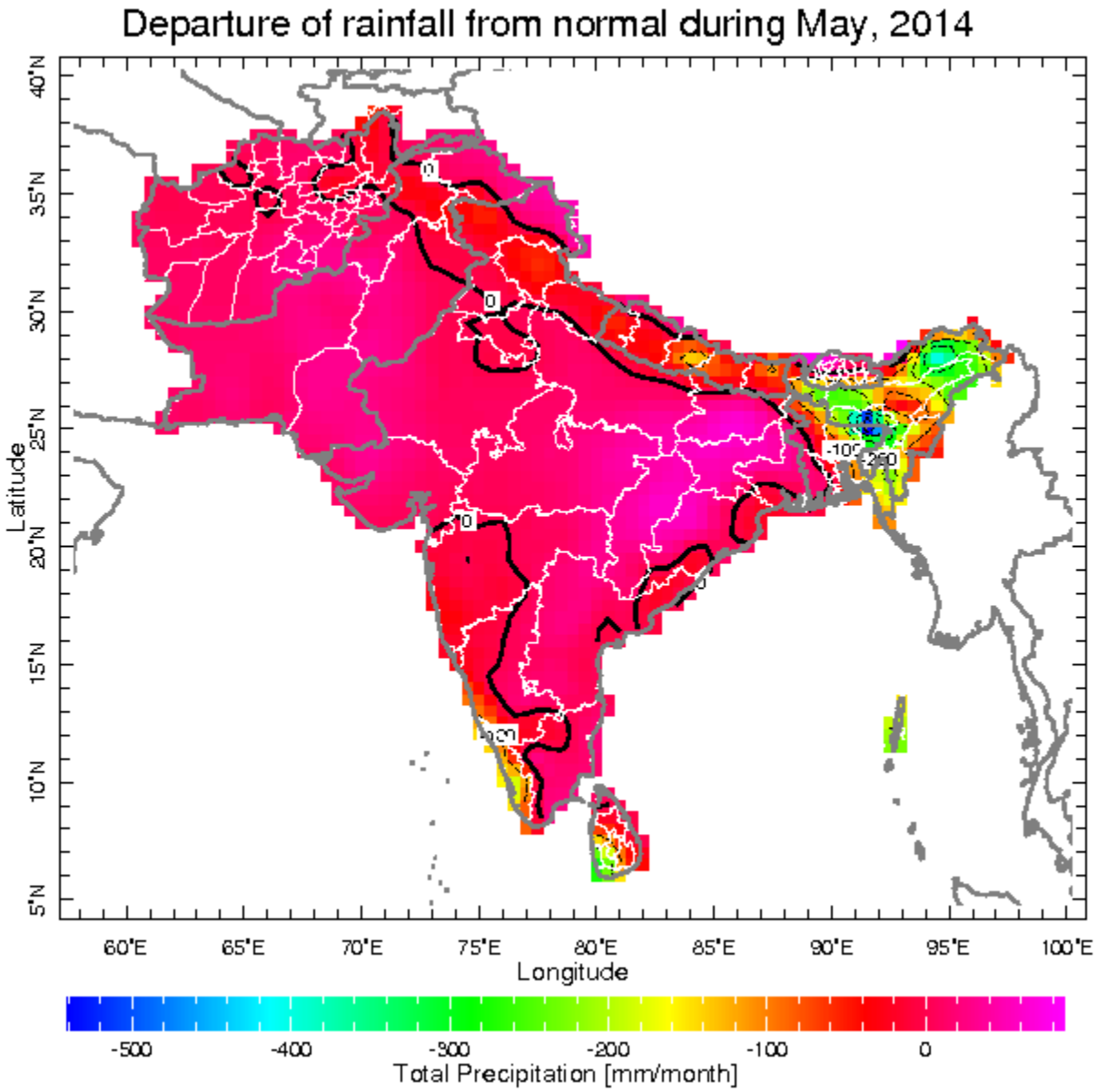


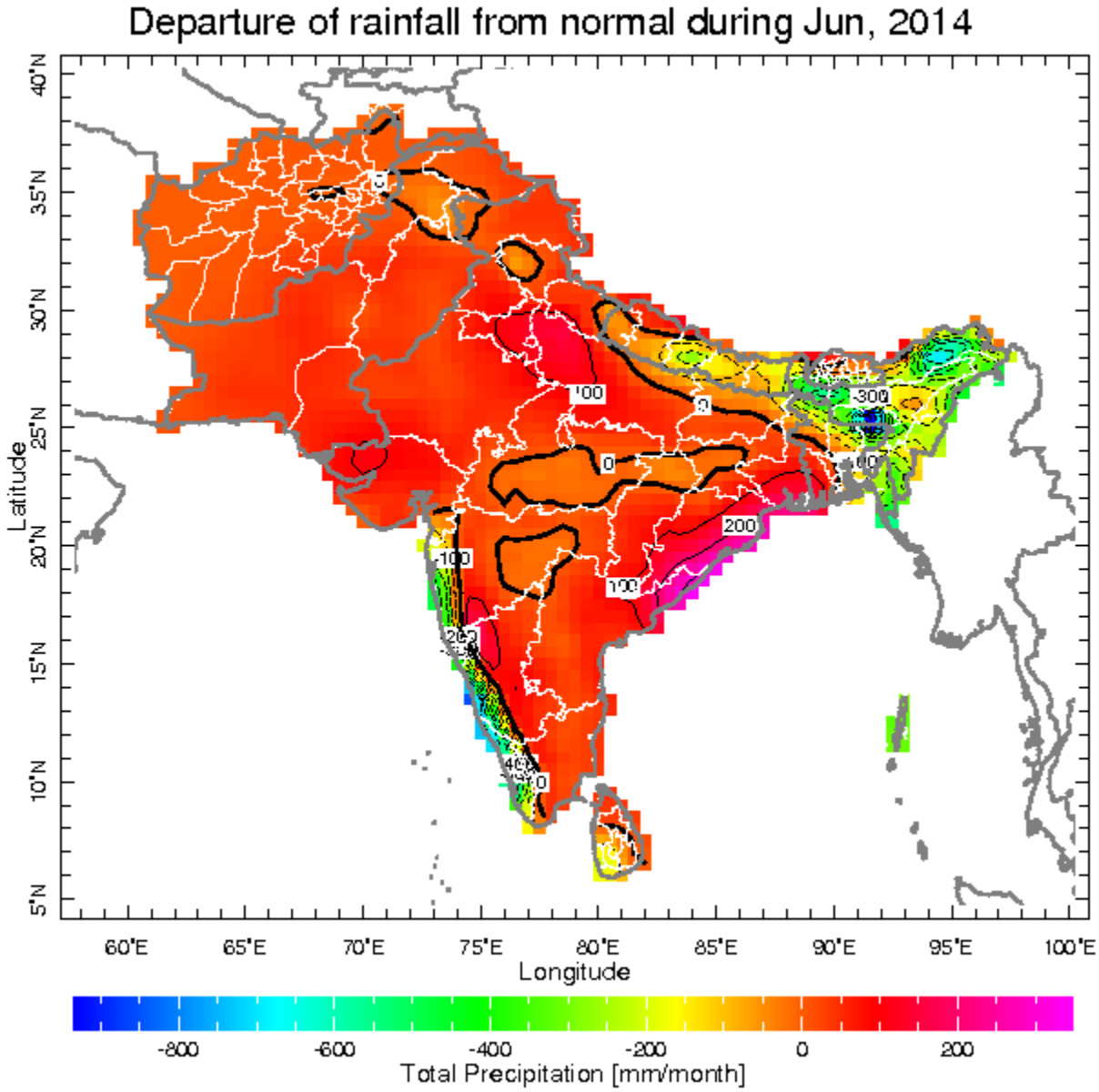

Expected rainfall in mm/month during Jun, 2014
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
Latitude
50
100
150
200
250
300
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
40
80
120
160
200
240
280
320
360
400
440
480
520
Total Precipitation [mm/month]

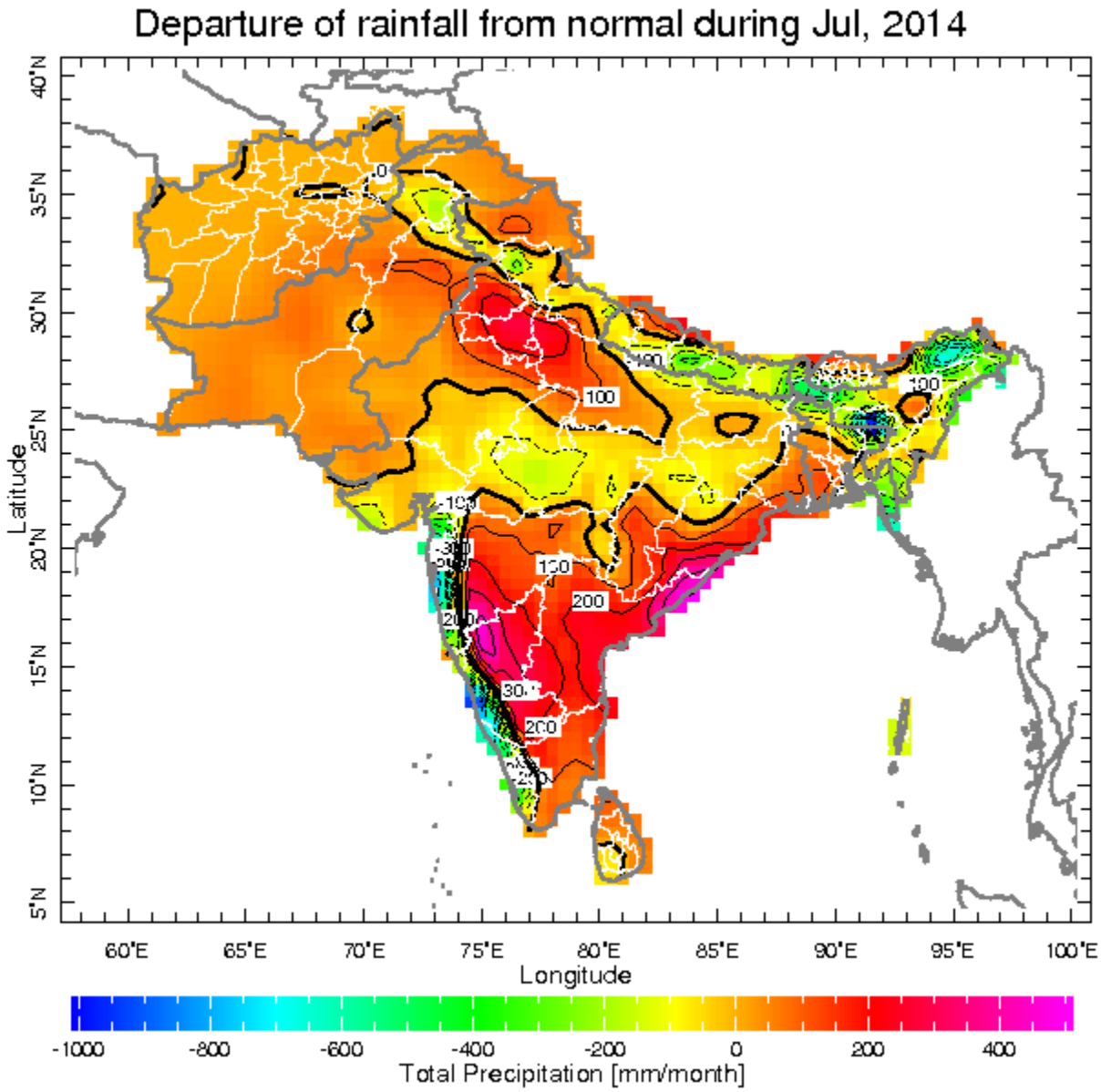

Expected rainfall in mm/month during Jul, 2014
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
Latitude
200
400
400
600
600
400
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
200
400
600
800
1000
1200
Total Precipitation [mm/month]

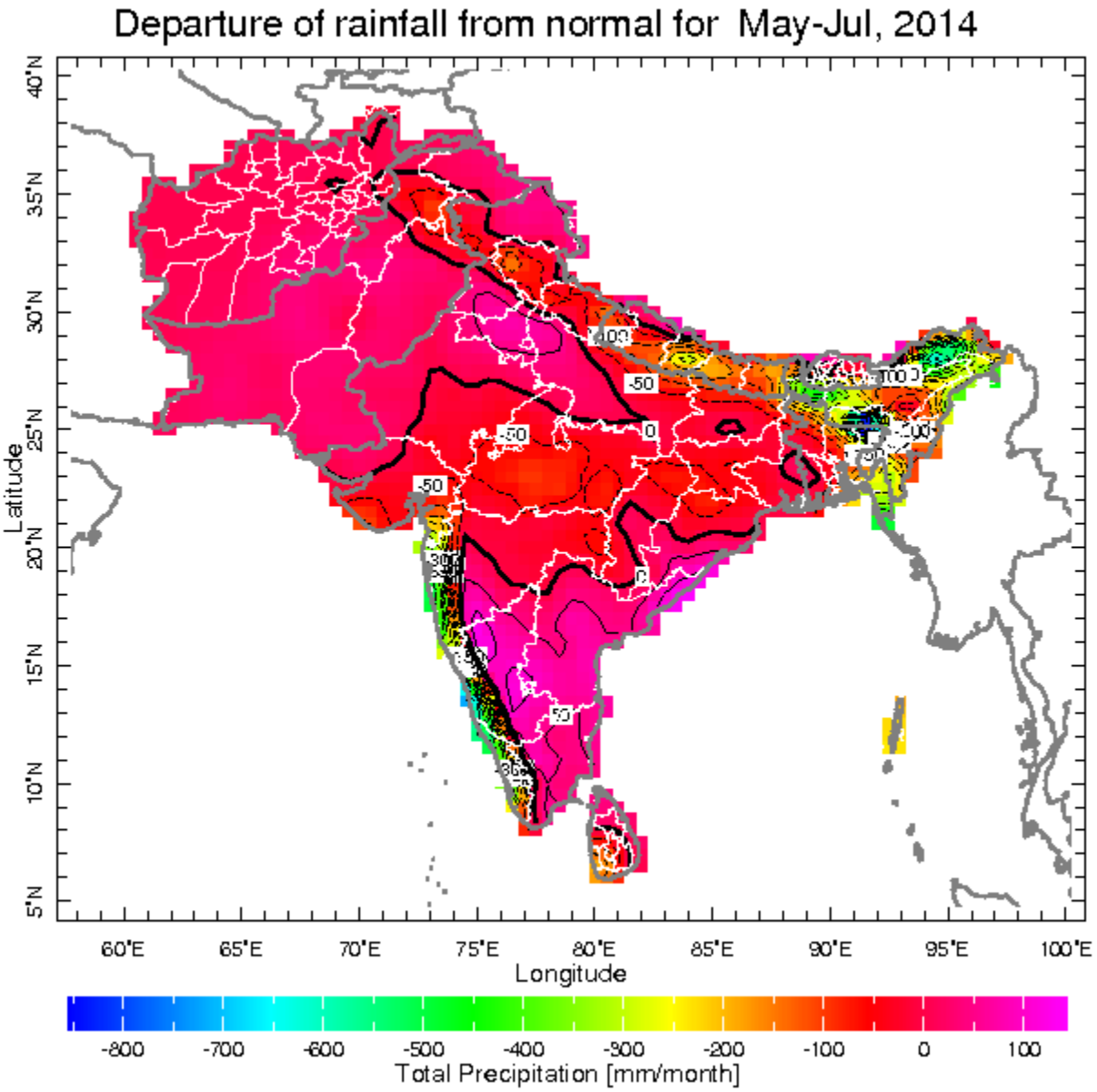

Expected rainfall in mm/month during May-Jul, 2014
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
Latitude
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
50
150
200
50
150
50
100
150
200
250
300
350
400
Total Precipitation [mm/month]

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

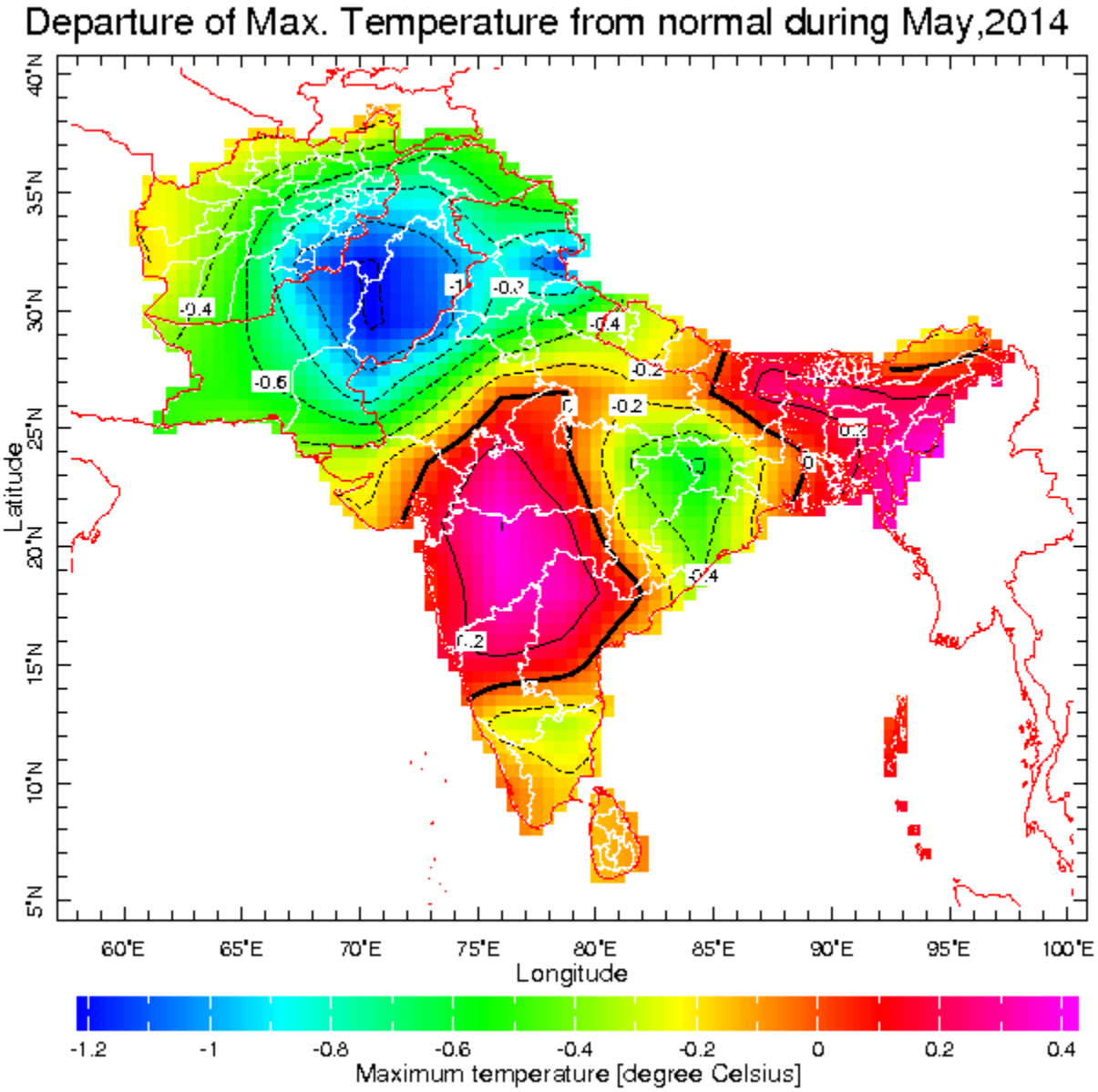


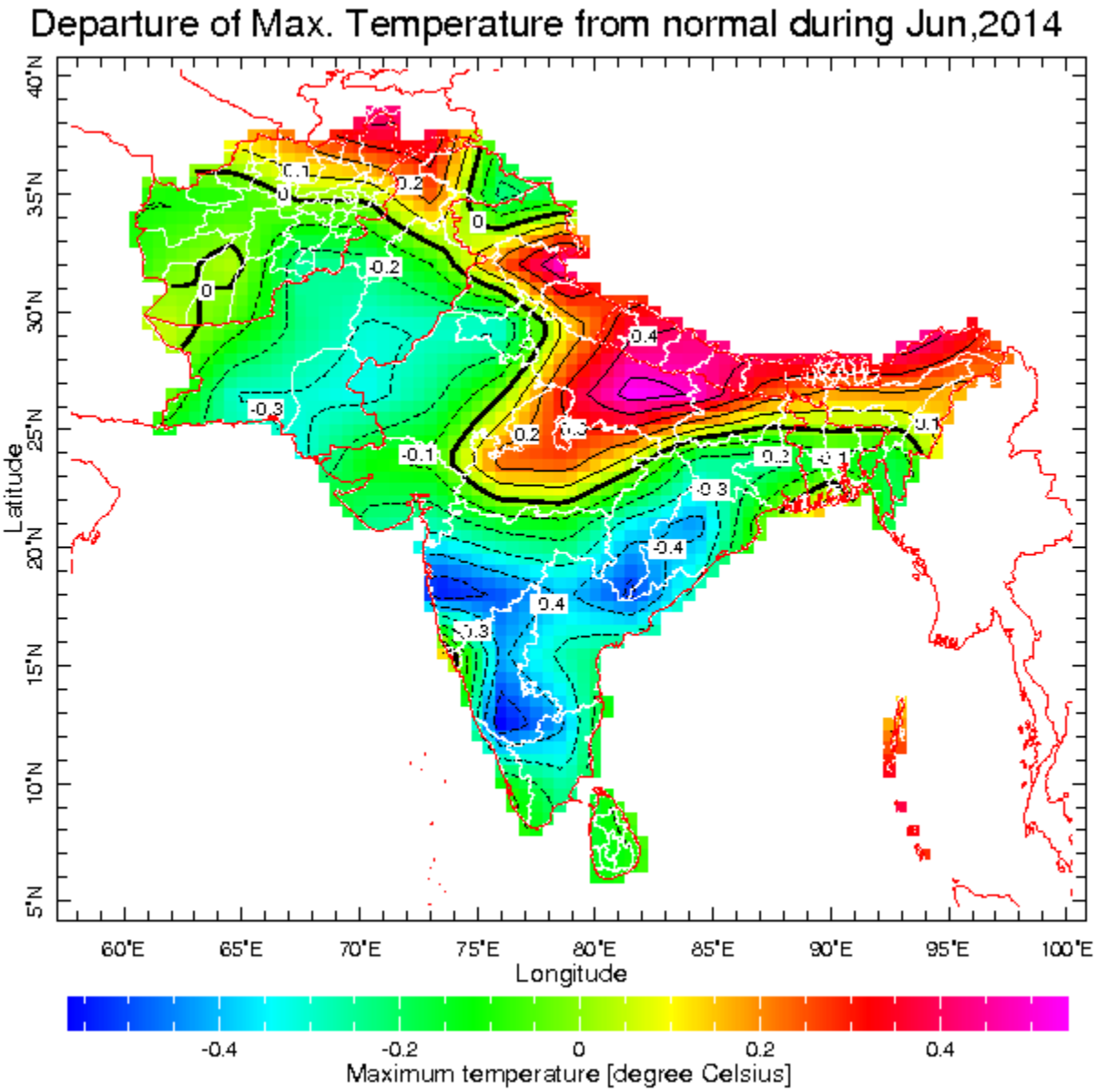

Departure of rainfall from normal during Jun, 2014
Latitude
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
-800
-600
-400
-200
0
200
Total Precipitation [mm/month]


Departure of rainfall from normal during Jul, 2014
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
Latitude
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
-1000
-800
-600
-400
-200
0
200
400
Total Precipitation [mm/month]


Departure of rainfall from normal for May-Jul, 2014
40°N
35°N
30°N
25°N
20°N
15°N
10°N
5°N
Latitude
60°E
65°E
70°E
75°E
80°E
85°E
90°E
95°E
100°E
Longitude
-800
-700
-600
-500
-400
-300
-200
-100
0
100
Total Precipitation [mm/month]

Departure of Maximum temperature from Normal during





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 for SAARC region will be 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/