

Seasonal weather outlook for SAARC region

(Dec-Feb, 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 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 Dec 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°) latitude by longitude

2. Synoptic situation

1. 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 dec over northern of Afghanistan. Below normal strength of jet stream over west of the region.
2. A ridge at 500 hPa is expected to be over northern parts of the country. Slightly below normal trend is expected over northern and eastern parts of the region.
3. Surface temperatures are expected to be on lower side than normal all over the Pakistan However higher than normal surface temperature over western states of India.
4. North Atlantic Oscillation (NAO) is in negative phase (0.68) and in increasing trend. 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>
5. During November 2014, sea surface temperature (SST) anomalies increased across the central and eastern equatorial Pacific. At the end of the month, the weekly Niño indices ranged from +0.4°C in the Niño-1+2 region to +1.0°C in the Niño-3.4 region. The subsurface heat content anomalies (averaged between 180°-100°W) also increased during November as a downwelling oceanic Kelvin wave increased subsurface temperatures in the central and eastern Pacific. However, the overall atmospheric circulation has yet to show a clear coupling to the anomalously warm waters. The monthly equatorial low-level winds were largely near average, although weak anomalous westerlies appeared in a portion of the eastern tropical Pacific. Upper level easterly anomalies emerged in the central and eastern tropical Pacific during the month. The Southern Oscillation Index has been somewhat negative, but the equatorial Southern Oscillation Index has been near zero. Also, rainfall continued to be below average near the Date Line and over Indonesia, and near average east of the Date Line. Although the SST anomalies alone might imply weak El Niño conditions, the patterns of wind and rainfall anomalies generally do not clearly indicate a coupling of the atmosphere to the ocean. Therefore, despite movement toward El Niño from one month ago, the combined atmospheric and oceanic state remains ENSO-neutral.

Similar to last month, most models predict SST anomalies to be at weak El Niño levels during November-January 2014-15 and to continue above the El Niño threshold into early 2015. Assuming that El Niño fully emerges, the forecaster consensus favors a weak event. In summary, there is an approximately 65% chance of El Niño conditions during the Northern Hemisphere winter, which are expected to last into the Northern Hemisphere spring 2015 (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update)

Seasonal weather outlook (Dec-Feb, 2015)

Probability outlook: La Nina (0%), Neutral (36%) and El Nino (64 %) during Dec-Jan-Feb, 2015 season

6. Arabian Sea Surface Temperatures are expected to be normal near western coastal belt of Pakistan.
7. Caspian Sea surface temperatures expected to be slightly above normal over southern half and below normal over upper half.
8. Mediterranean Sea surface temperatures are normal to slightly above normal.
9. Bay of Bengal Sea Surface Temperatures are close to normal.

3. Weather outlook Summary

“Average to below average precipitation is expected during the season (DJF)”

Synthesis of the latest model forecasts for Sep-Nov 2014 (SON), current synoptic situation and regional weather expert’s judgment indicates that average to below average precipitation is expected during the predicted season with normal during January. Above normal minimum temperature will persist over all SAARC member countries during December while below normal during January.

Seasonal weather outlook (Dec-Feb, 2015):

As a whole, average to below average precipitation is likely to all over the region during the predicted season with average during January and below average during December and February. Below average precipitation is expected over Bangladesh and above average over Afghanistan while average precipitation is expected over rest of the region.

Afghanistan, northern parts of Pakistan Sri Lanka and northern eastern states of India will receive good precipitation during the season. South eastern Coastal belt of India, Sri Lanka and Kashmir (India) will receive significantly below average rainfall.

December, 2014: Below average rainfall is expected in SAARC member countries as a whole with significantly below average over Bangladesh and Bhutan, below average over India and Nepal, and average over Pakistan, Afghanistan and Sri Lanka. Rainy spells will be focused over southern states of India and Sri Lanka and northern parts of Afghanistan. Most parts of SAARC region will receive average precipitation except Sri Lanka and southeastern coastal belt of India.

Slightly above normal night temperature will be expected all over central India extended from north to south covering some northern parts of Pakistan and Afghanistan. Highest above normal night temperature will be expected over Madhya Pradesh ($> 1.5^{\circ}\text{C}$) and surroundings. However below normal night temperature will be expected over southern west parts of Pakistan, western parts of Afghanistan and Arunachal Pradesh of Indian states.

Seasonal weather outlook (Dec-Feb, 2015)

January, 2015: Average precipitation is expected during January all over SAARC region. Below average precipitation is expected over Sri Lanka, average over Nepal, Bhutan, Pakistan, Bangladesh and Afghanistan, and above average over India. Intensity of precipitation will be higher over western belt of the region including Afghanistan, northern parts of Pakistan, Nepal and Bihar state of India and its surroundings. Below normal precipitation is expected over Sri Lanka, northern parts of India including Kashmir. Rest of the region will receive normal rainfall during the month.

Night temperature will be below normal all over whole region with higher values over central parts with maximum ($> 2^{\circ}\text{C}$) over central Pakistan including Rajasthan of India.

February, 2015: Below average precipitation is expected during February all over SAARC region with below average over Bangladesh (-22%), average over Nepal and Bhutan, and above normal over Pakistan, India, Afghanistan and Sri Lanka. Intensity of precipitation will be higher over western belt of the region including Afghanistan, northern parts of Pakistan and eastern coastal belt of India and its surroundings. Below average precipitation is expected over northern parts of India including Kashmir.

Night temperature will be on higher than normal during February all over the region.

Country wise Seasonal prediction (December-February, 2014):

Afghanistan: 1) Weak precipitation spells with light rain at isolated places is expected during December; 2) light to moderate precipitatio spells with moderate precipitatio at scattered places is expected and 3) moderate to heavy precipitation is expected over widespread areas of Afghanistan.

Bangladesh: Rainy spell with same intensity will continue till end of January while it become increase from start of February. December will be considered as dry month and February will be wet month.

Bhutan: Rainy spell with same intensity will continue till mid of January in the country. Afer that intensity of rainy spell will increase and become wet from February.

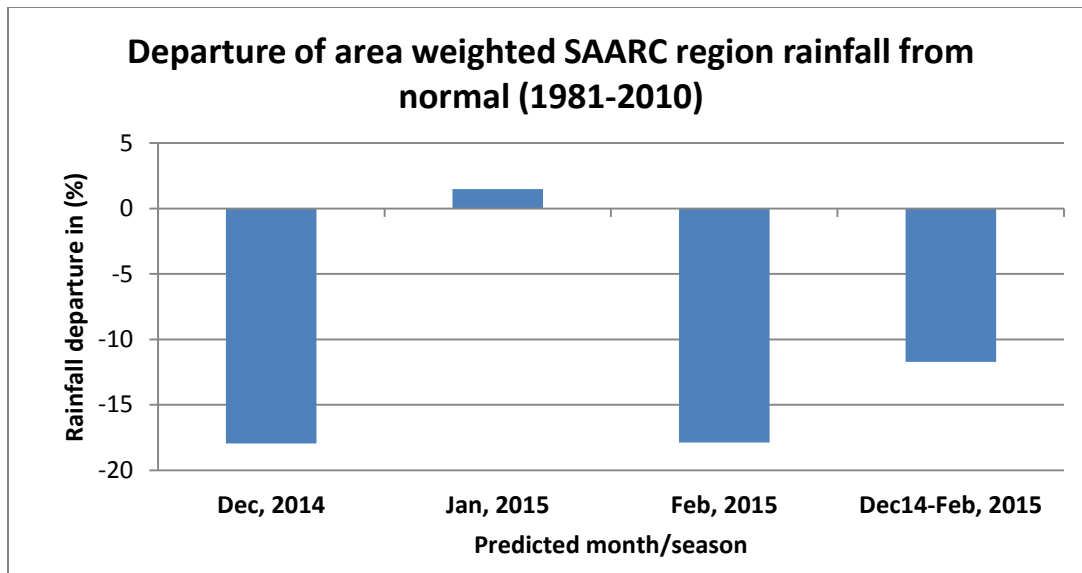
India: Rainy spell will same intensity will continue till end of December. Moderate rainy spells are expected from 1ST week of January and same pace will be continuing till end of February. February will be considered wet month during the winter season.

Nepal: light precipitation spells are expected during December while moderate precipitation will occur in January and February.

Pakistan: Precipitation will start from 1st week of January over upper half of the country. February will be expected good rainy month while December is considered as dry month.

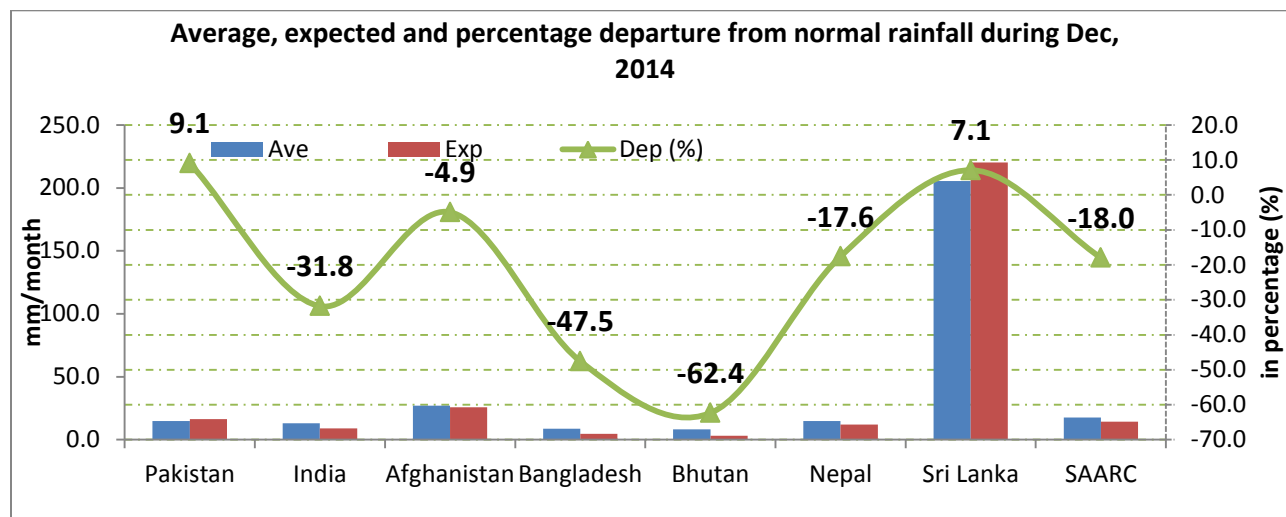
Seasonal weather outlook (Dec-Feb, 2015)

Sri Lanka: Good rainy spells are expected in December till mid of January. Then in February less rains are expected over the country.

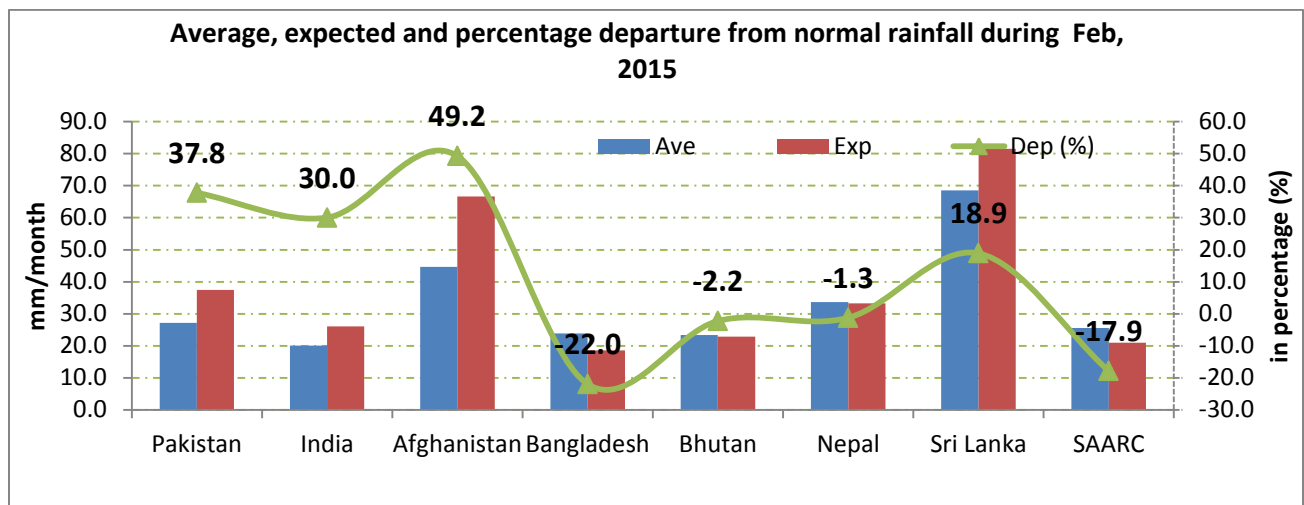
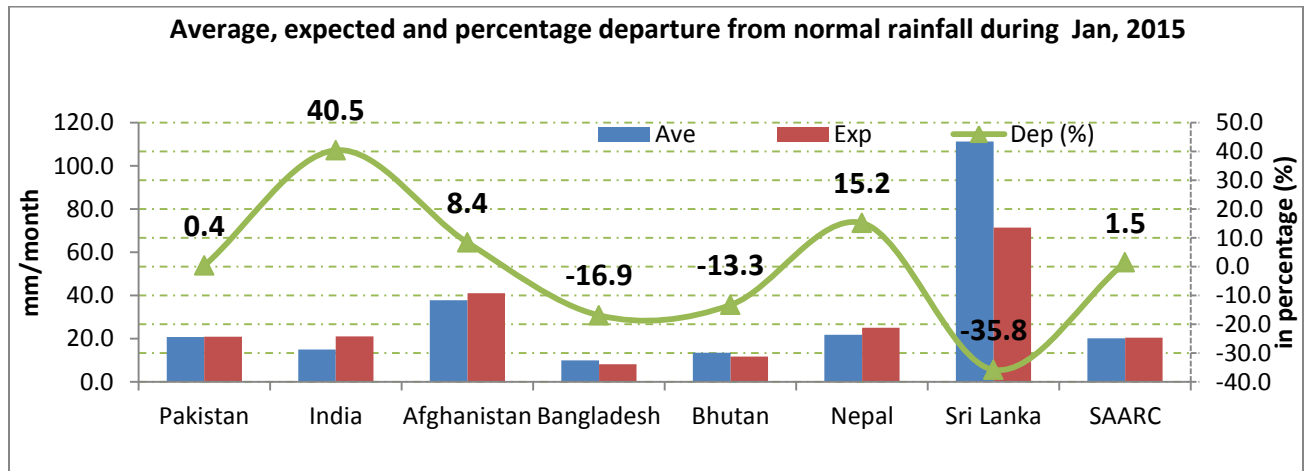


Note: Departure of Area-weighted rainfall of SAARC region has been computed by subtracting Climatology rainfall of the month from ECHAM predicted monthly/seasonally rainfall of corresponding month/season.

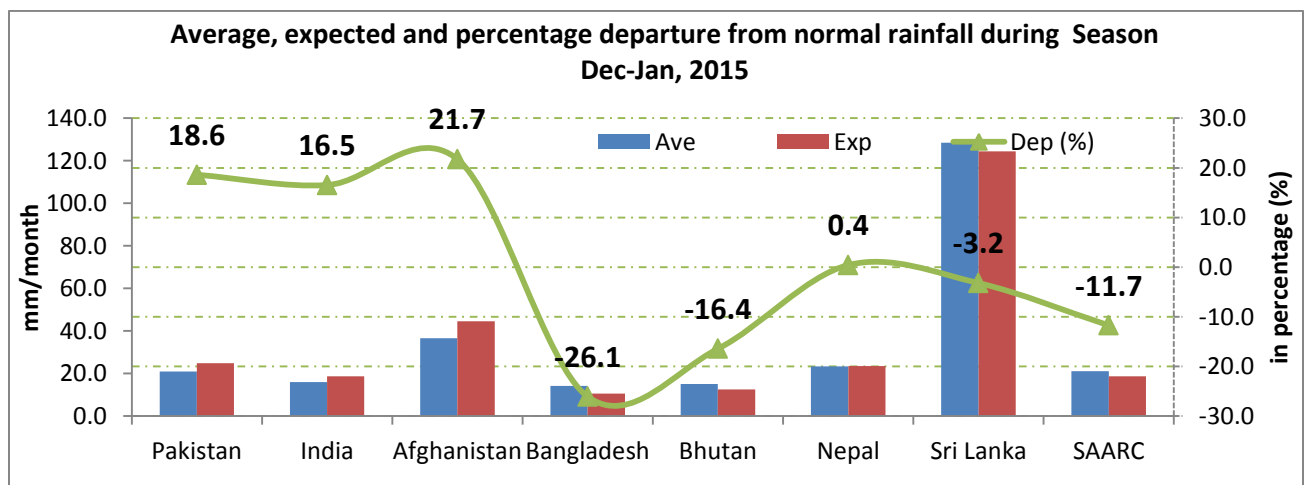
4. Country wise monthly and seasonal quantitative outlook along with departure of precipitation from normal



Seasonal weather outlook (Dec-Feb, 2015)



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.

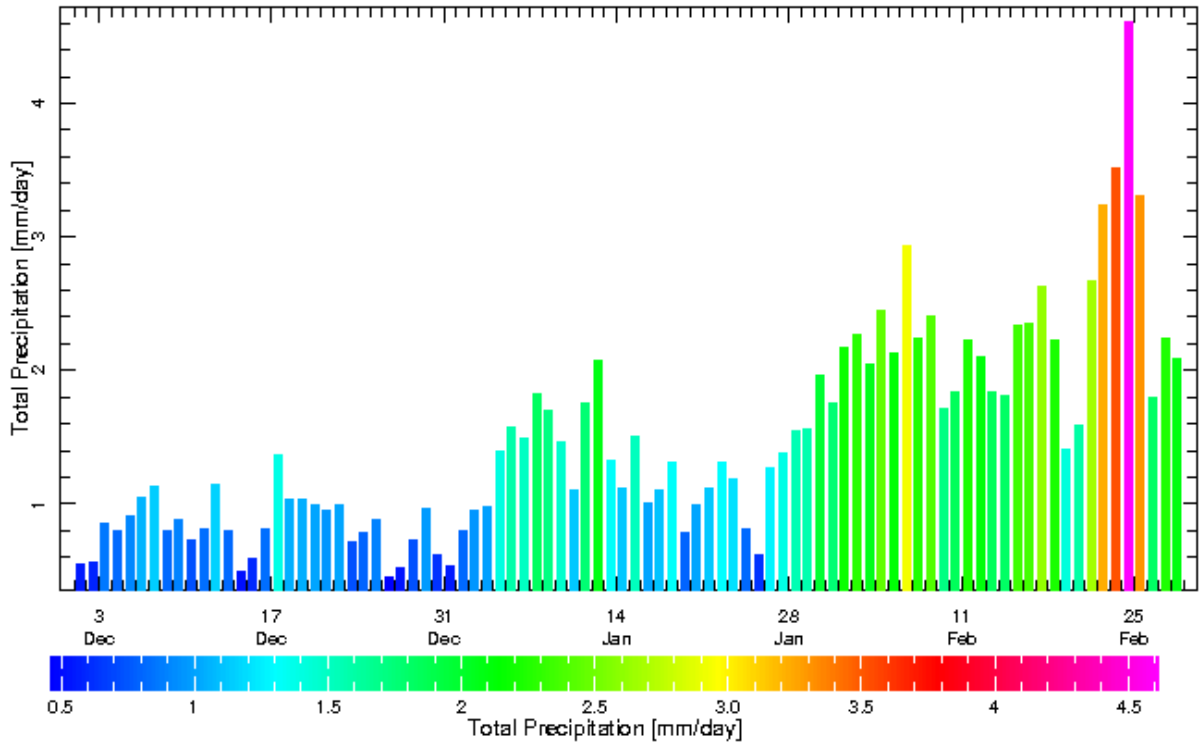


Seasonal weather outlook (Dec-Feb, 2015)

5. Daily country wise precipitation prediction for coming months (Jul-Sep, 2014)

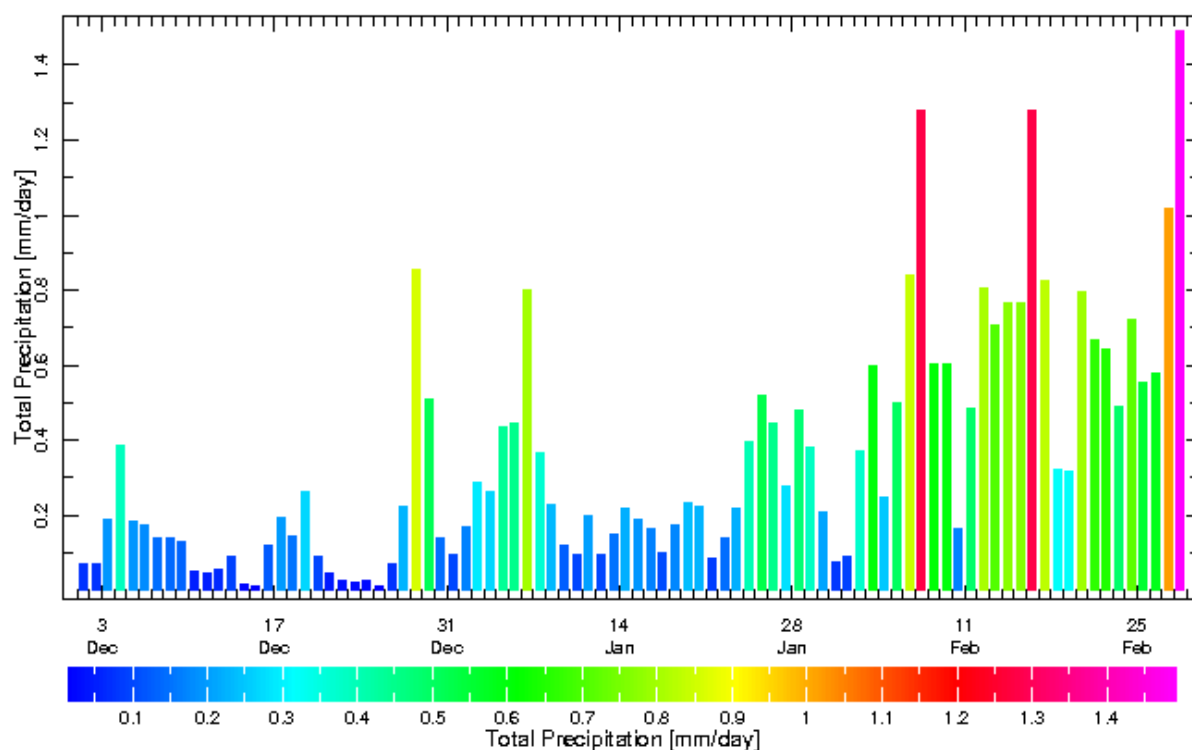
Note for daily weather prediction: It is ECHAM climate model prediction. The numbers of spell can be predicted from above graph. However, the exact data of start or end of spell can be varied and this can be in advance or delayed from the actual observation over the region.

Daily expected Rainfall of Afghanistan for Dec-Feb, 2015

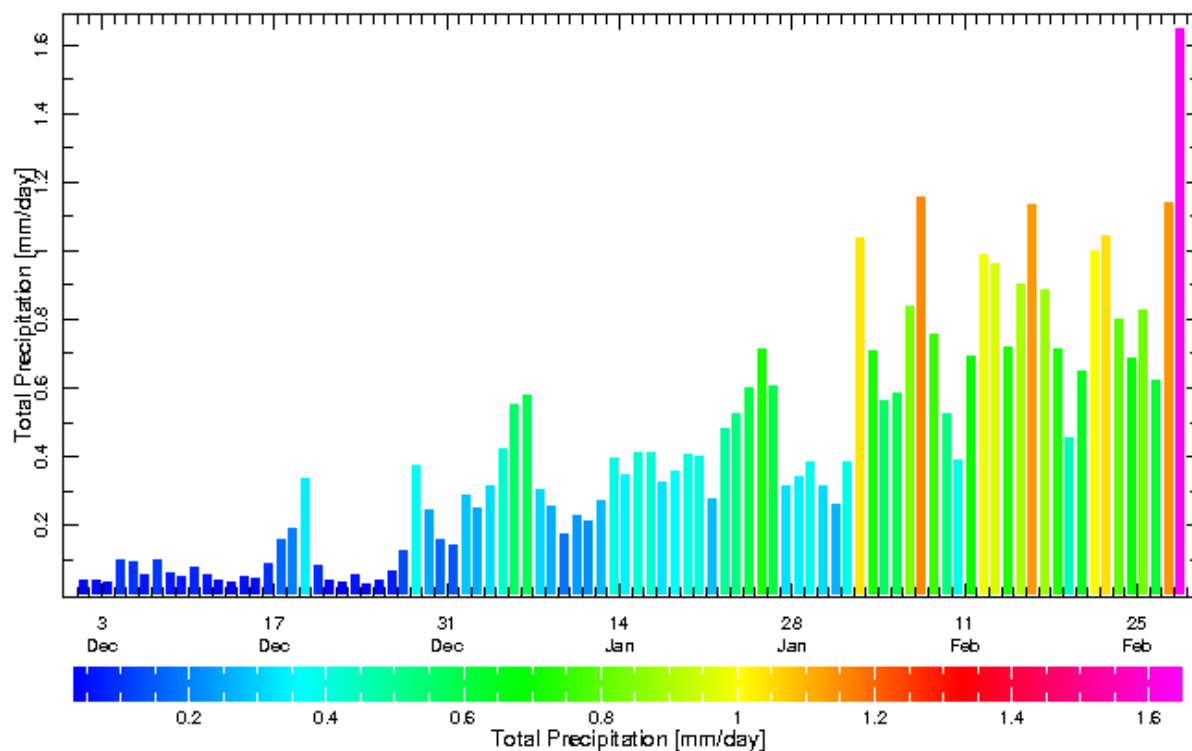


Seasonal weather outlook (Dec-Feb, 2015)

Daily expected Rainfall of Bangladesh for Dec-Feb, 2015

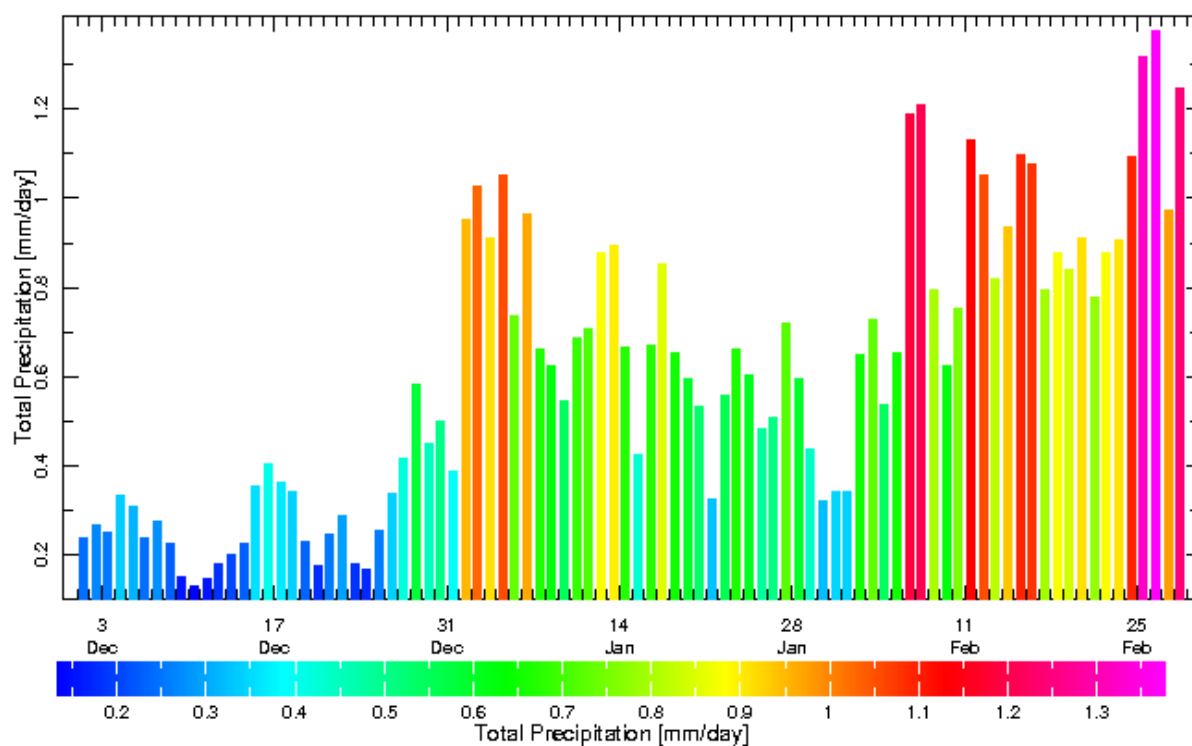


Daily expected Rainfall of Bhutan for Dec-Feb, 2015

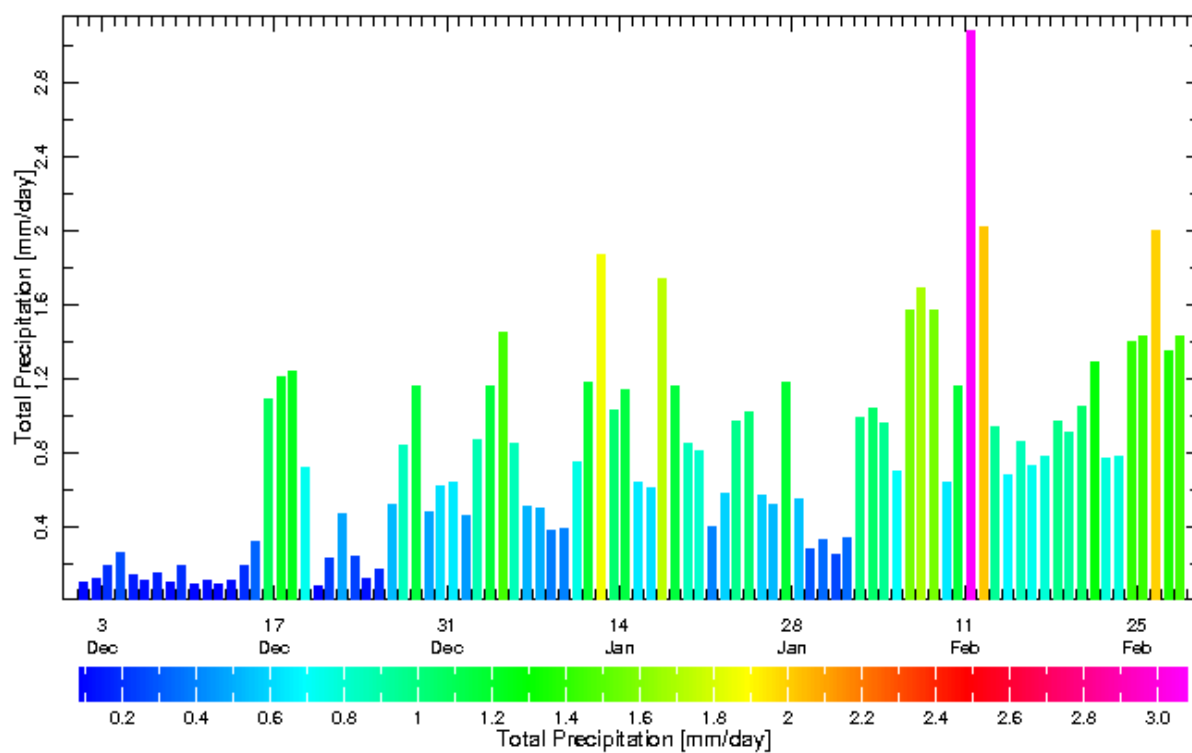


Seasonal weather outlook (Dec-Feb, 2015)

Daily expected Rainfall of India for Dec-Feb, 2015

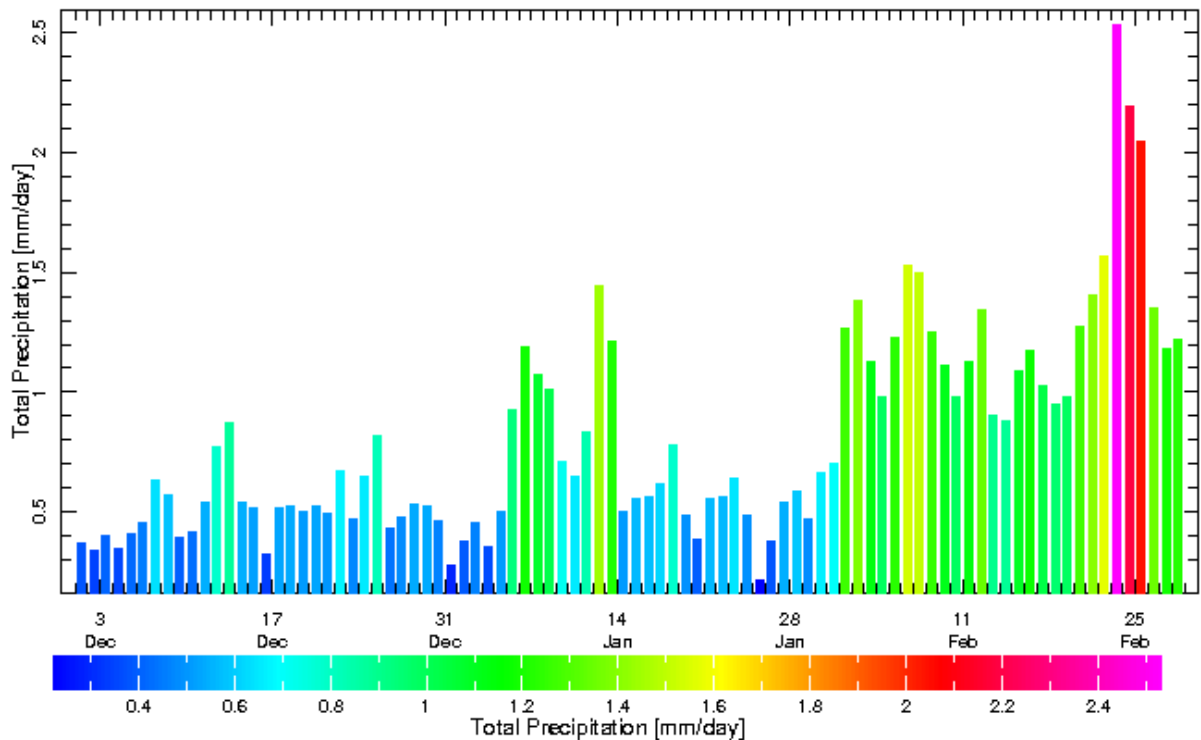


Daily expected Rainfall of Nepal for Dec-Feb, 2015

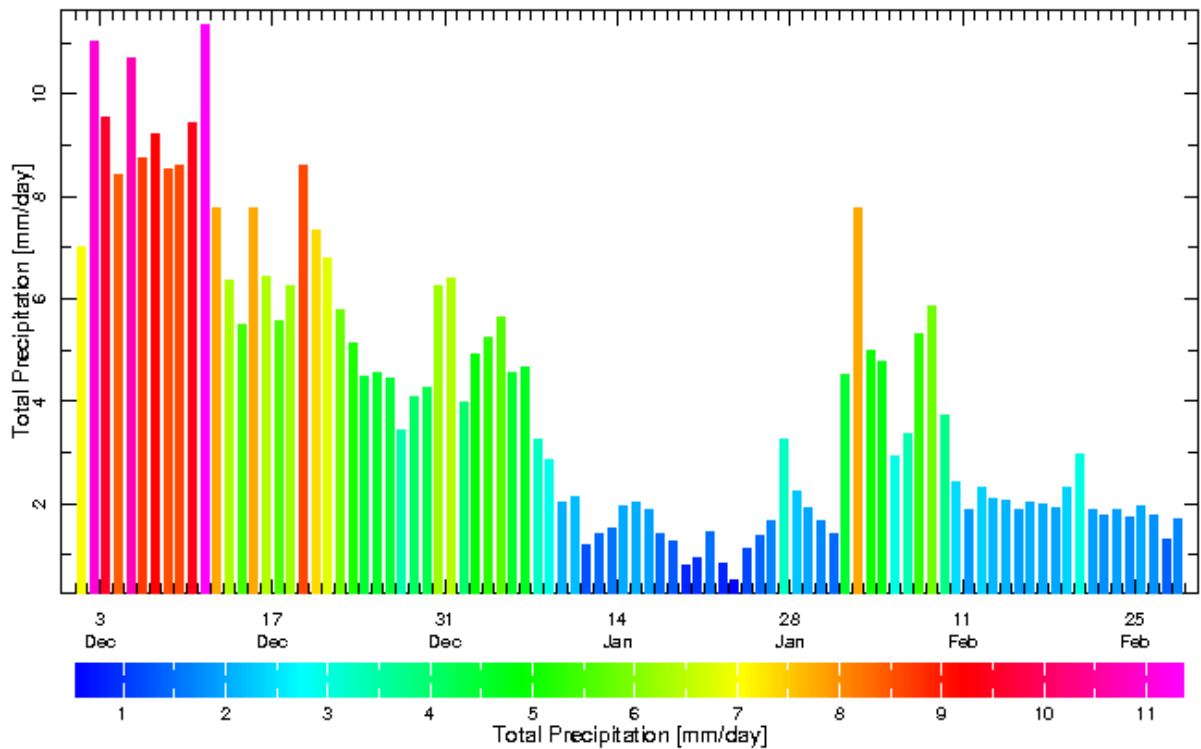


Seasonal weather outlook (Dec-Feb, 2015)

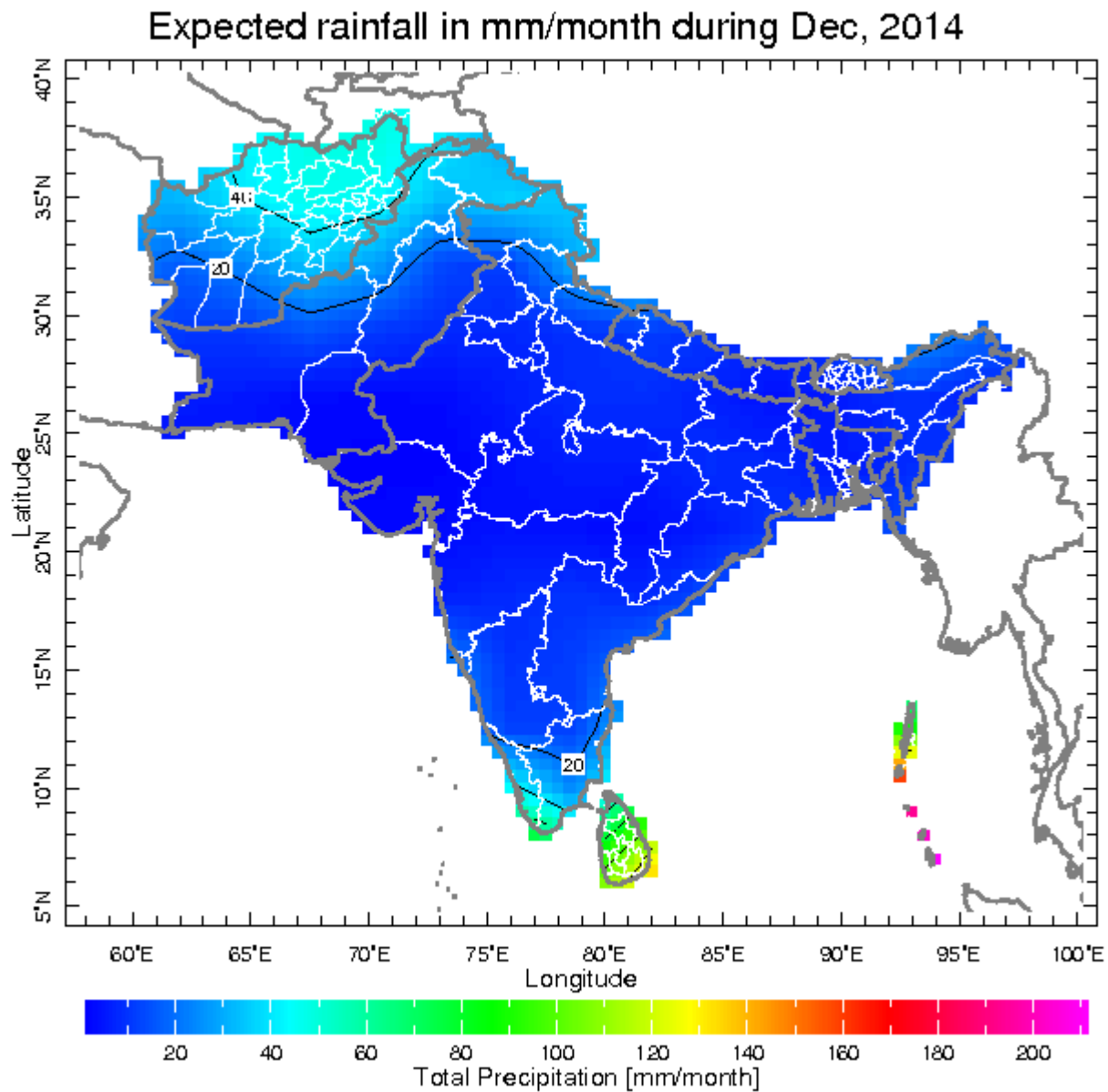
Daily expected Rainfall of Pakistan for Dec-Feb, 2015



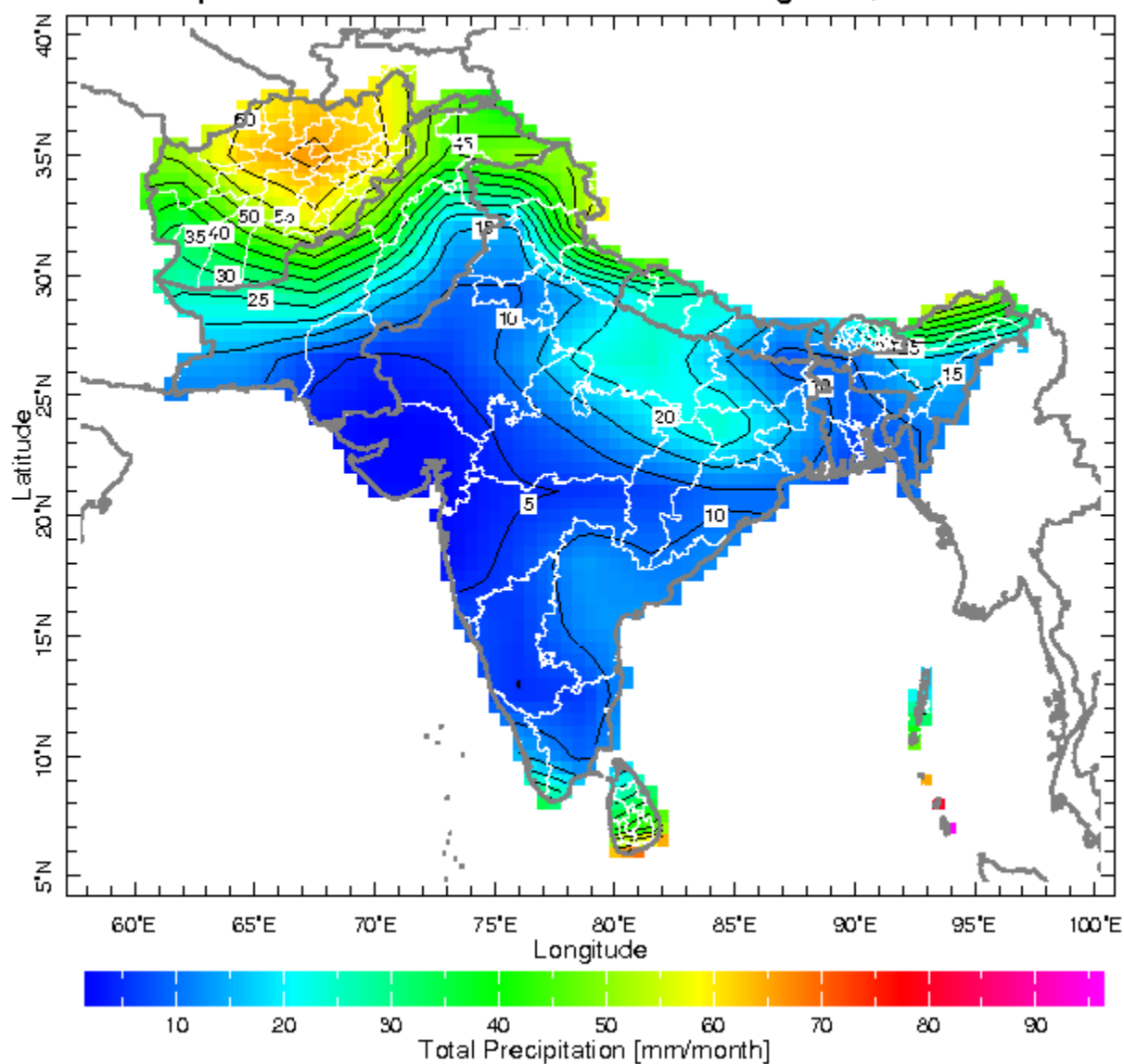
Daily expected Rainfall of Sri Lanka for Dec-Feb, 2015



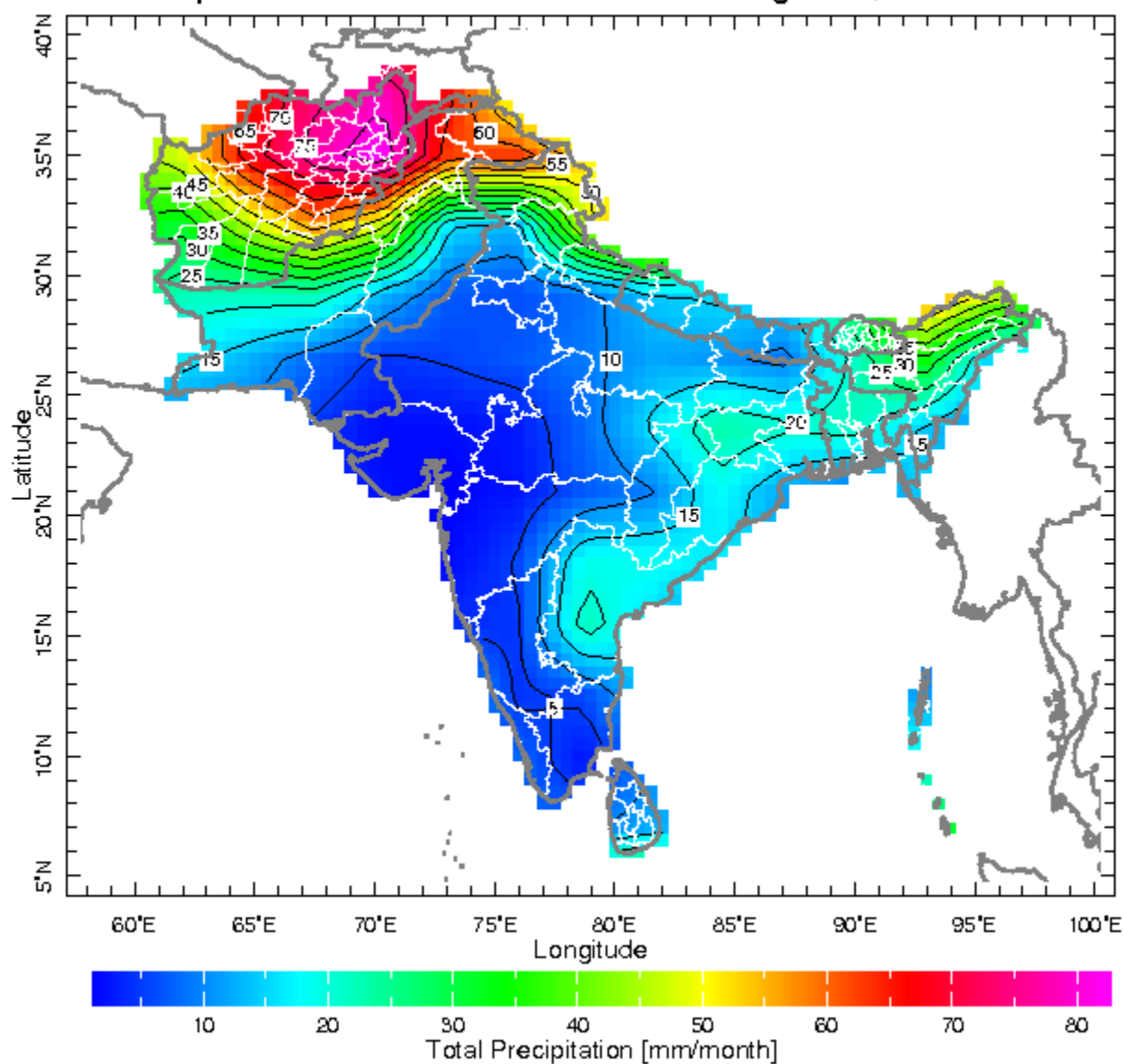
6. Spatial distribution of expected precipitation during coming season (GCM-ECHAM)

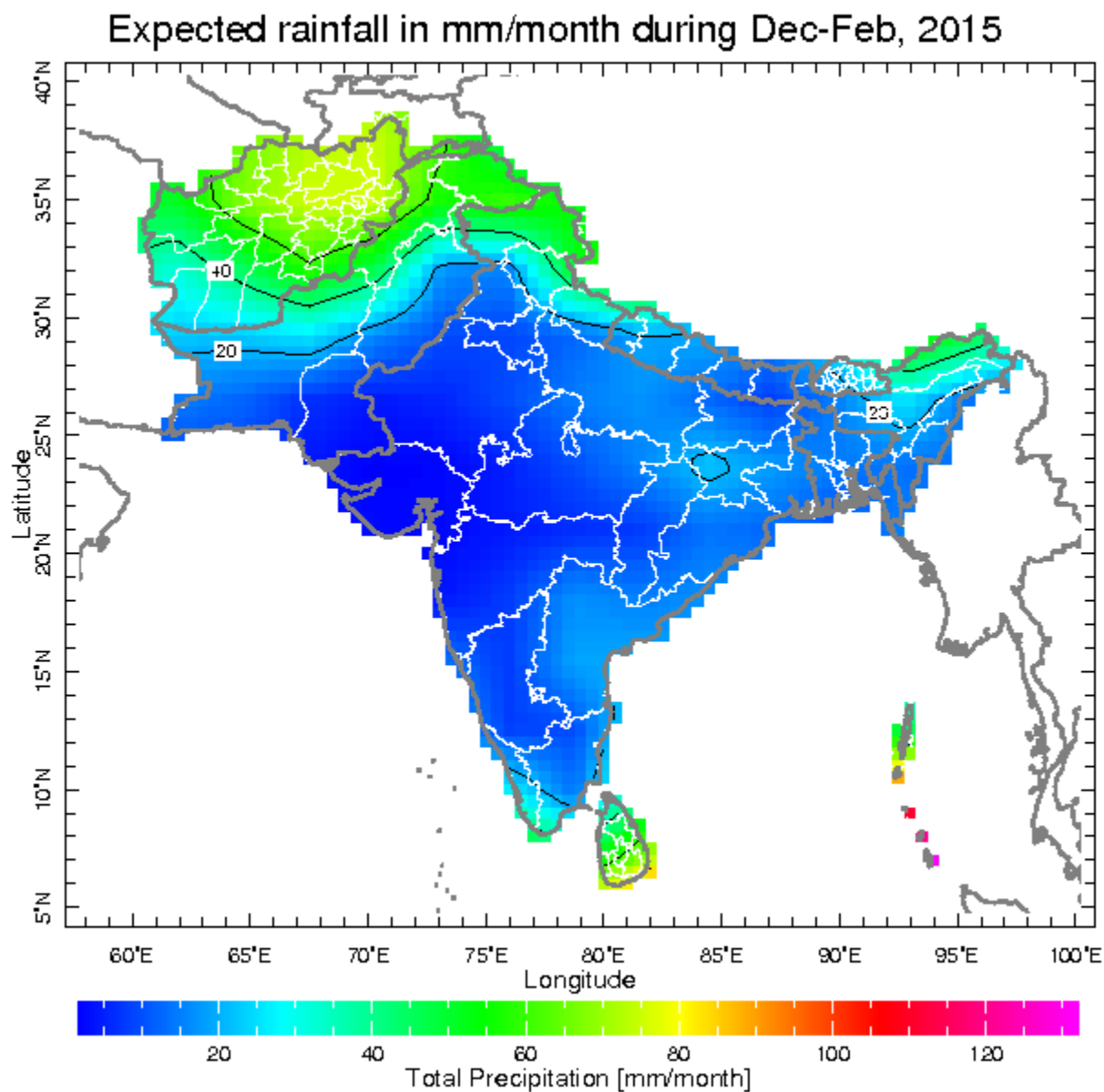


Expected rainfall in mm/month during Jan, 2015



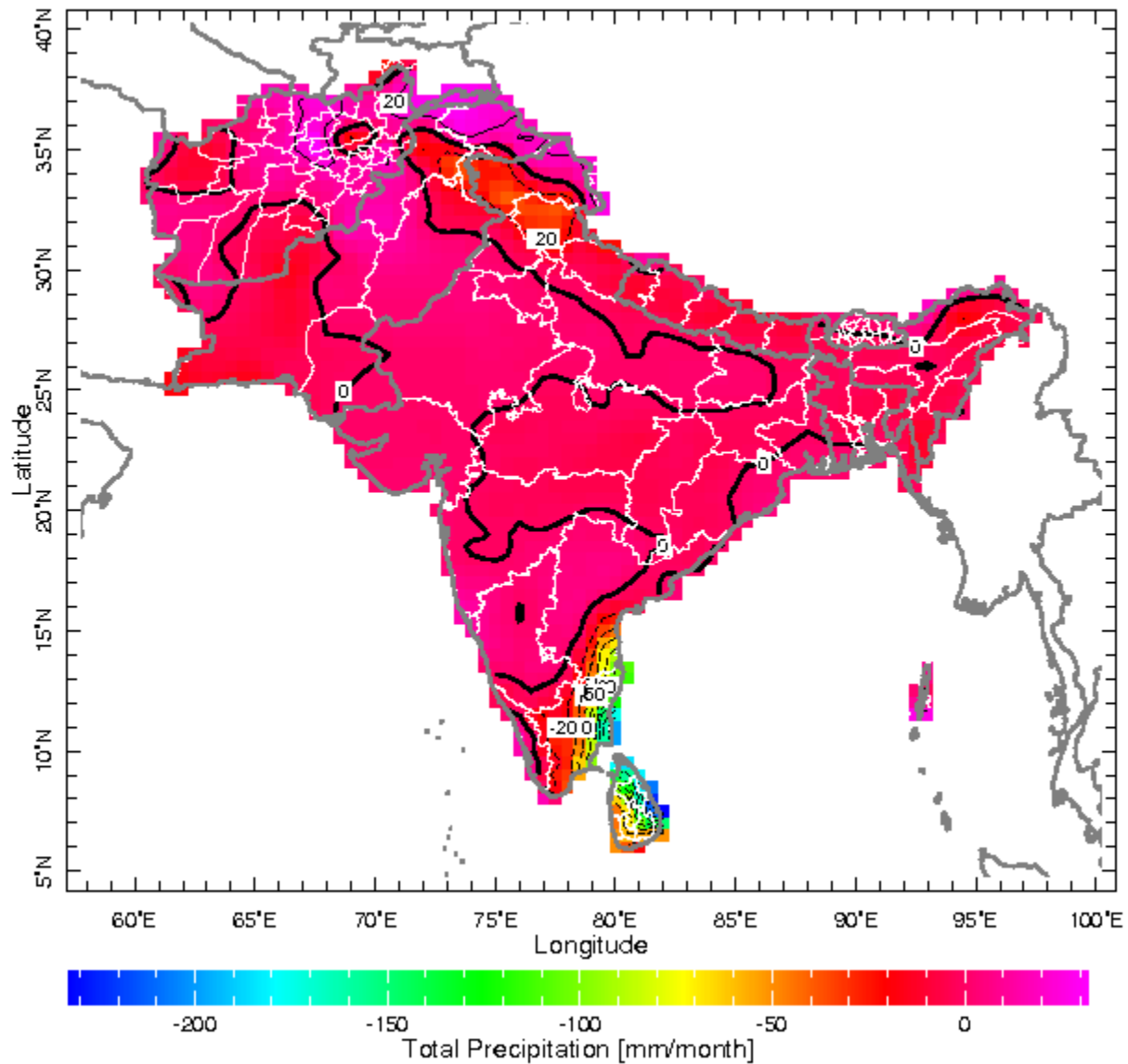
Expected rainfall in mm/month during Feb, 2015

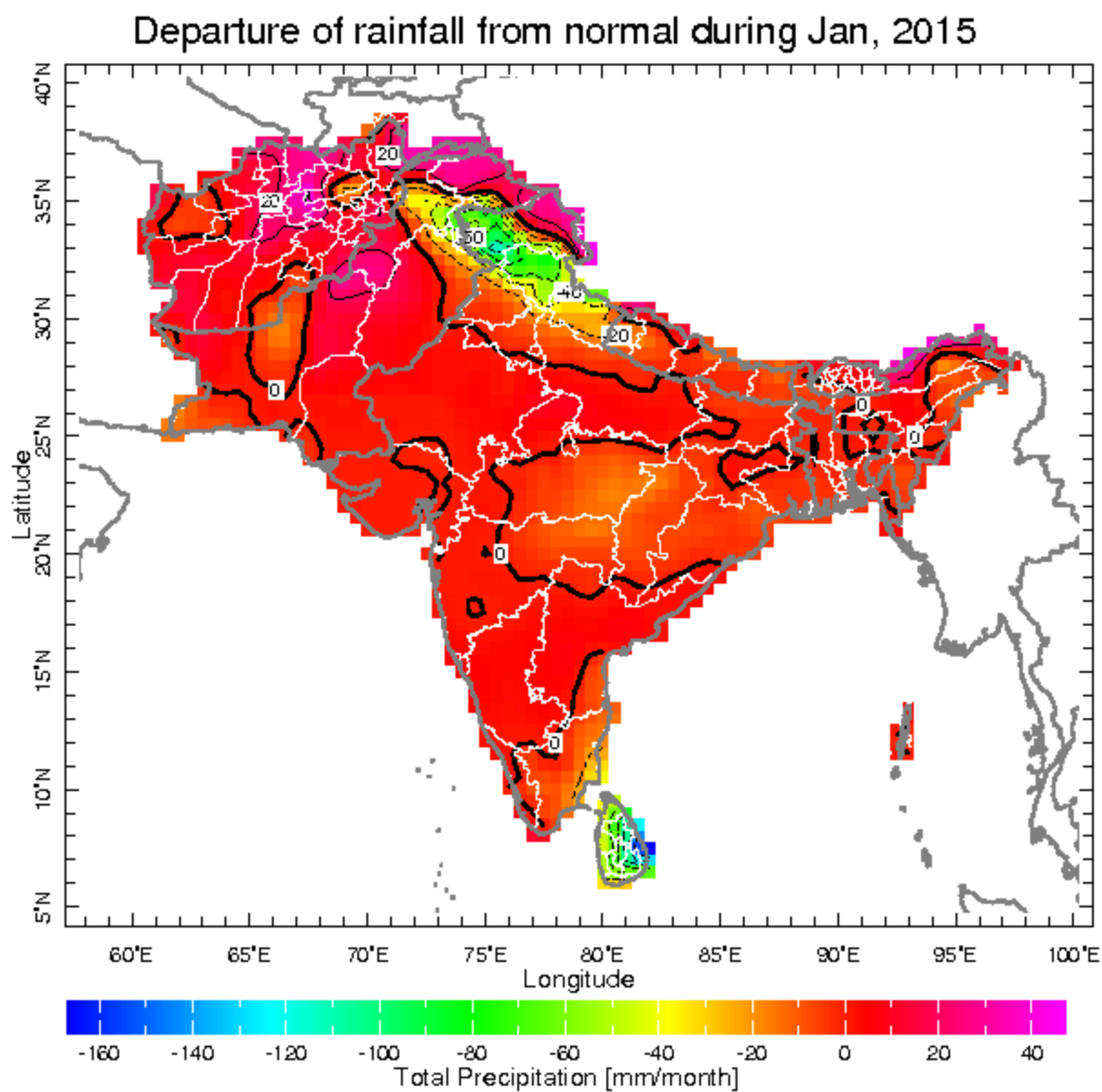




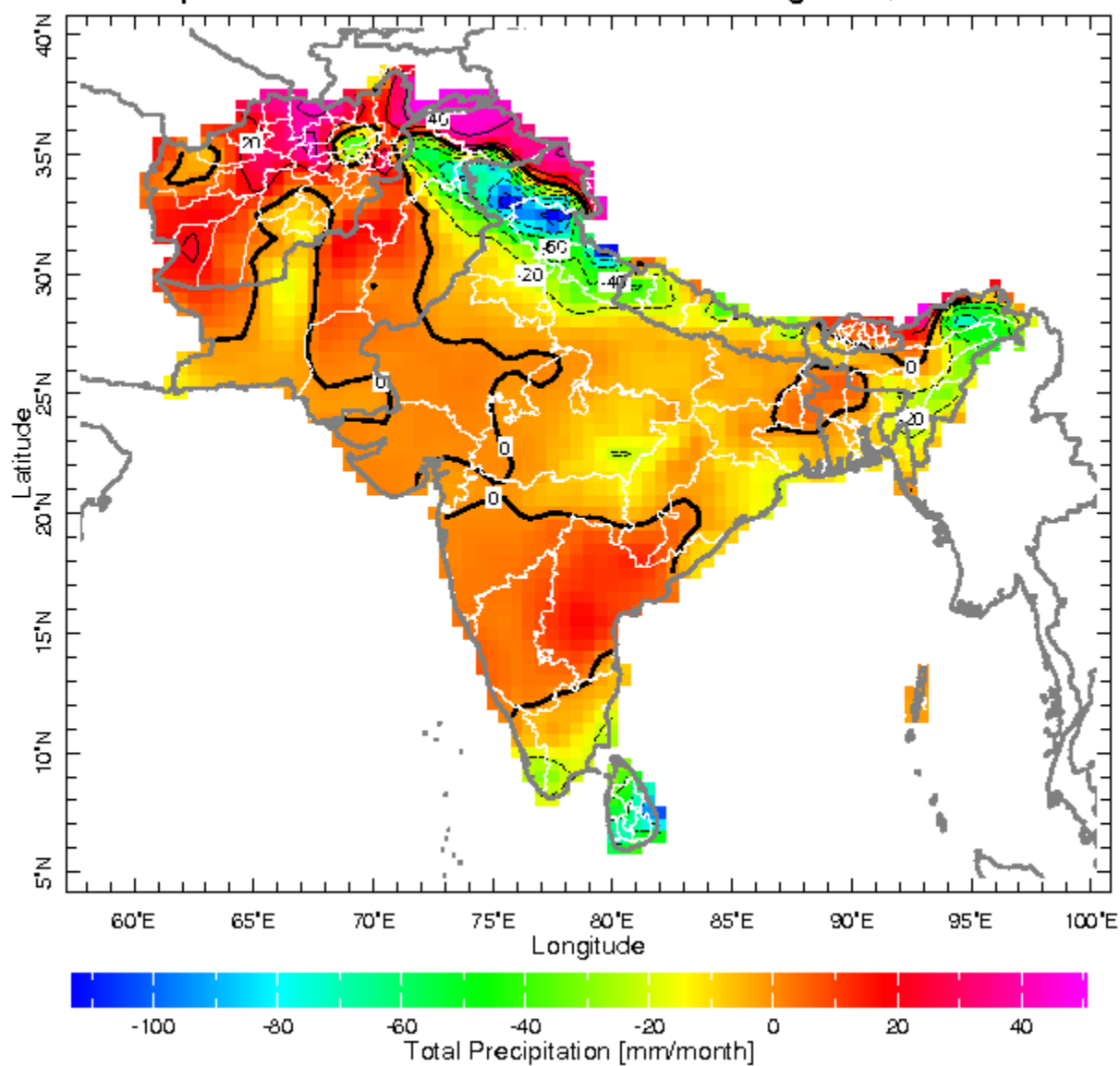
7. Monthly departure from normal (precipitation) during coming season

Departure of rainfall from normal during Dec, 2014

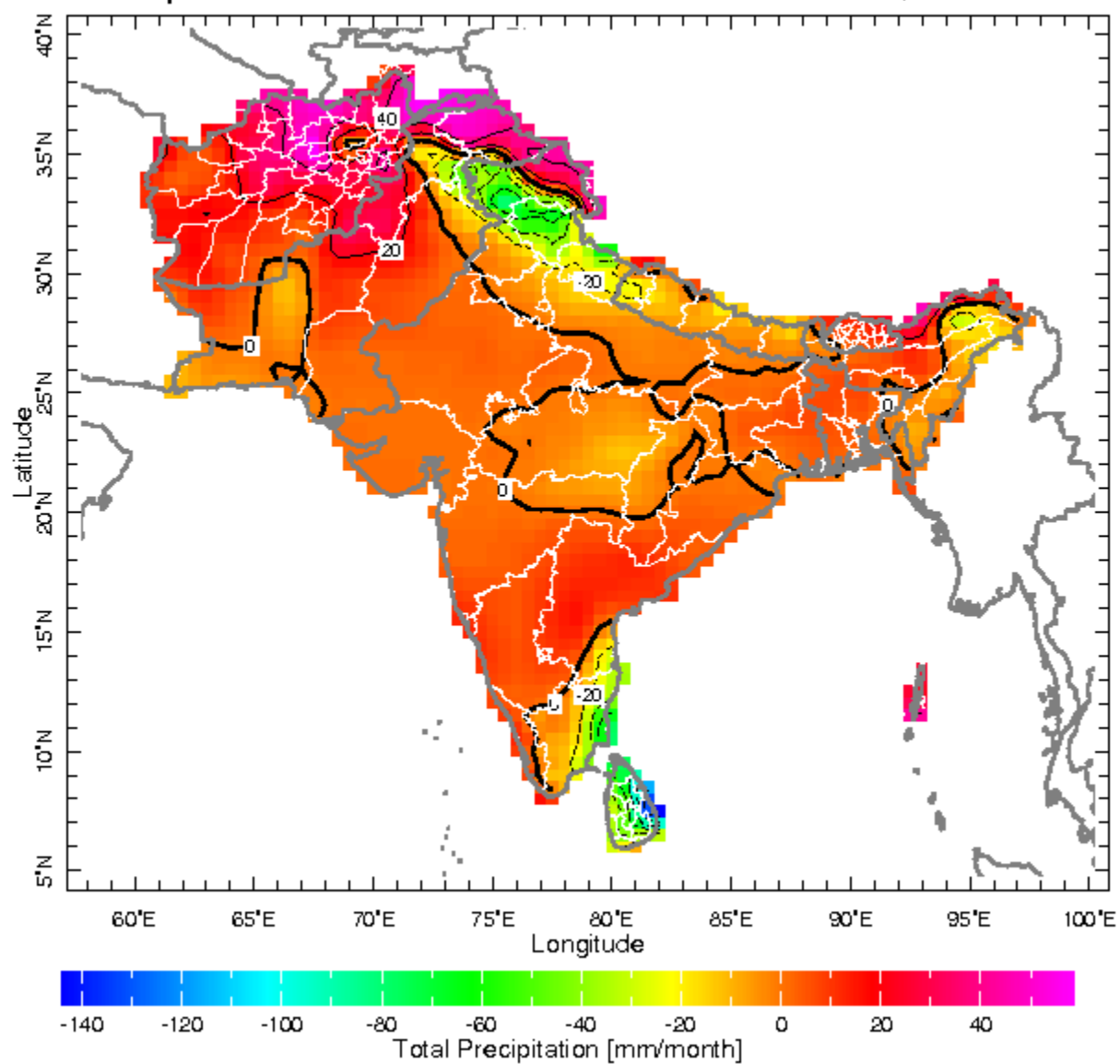




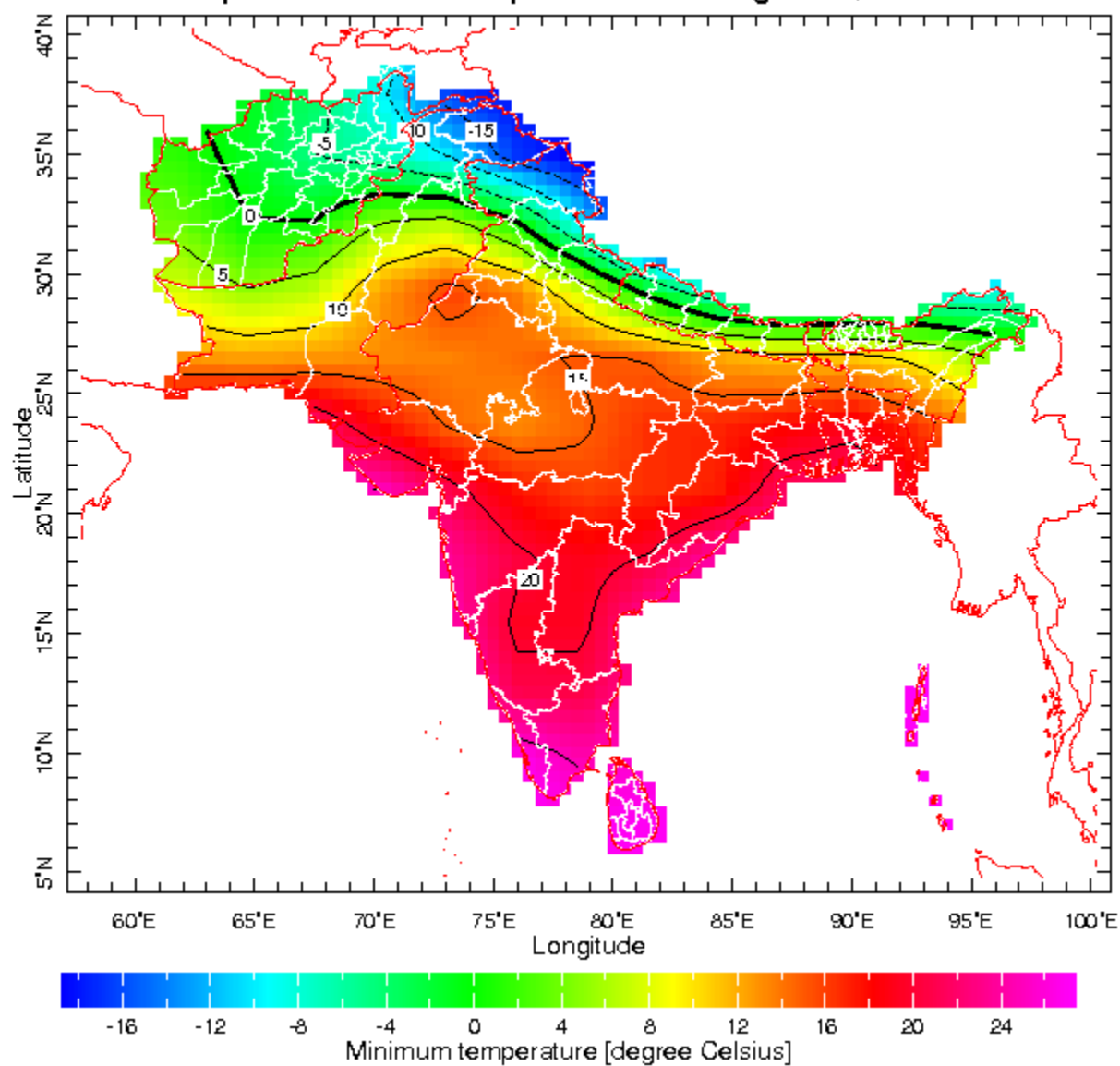
Departure of rainfall from normal during Feb, 2015



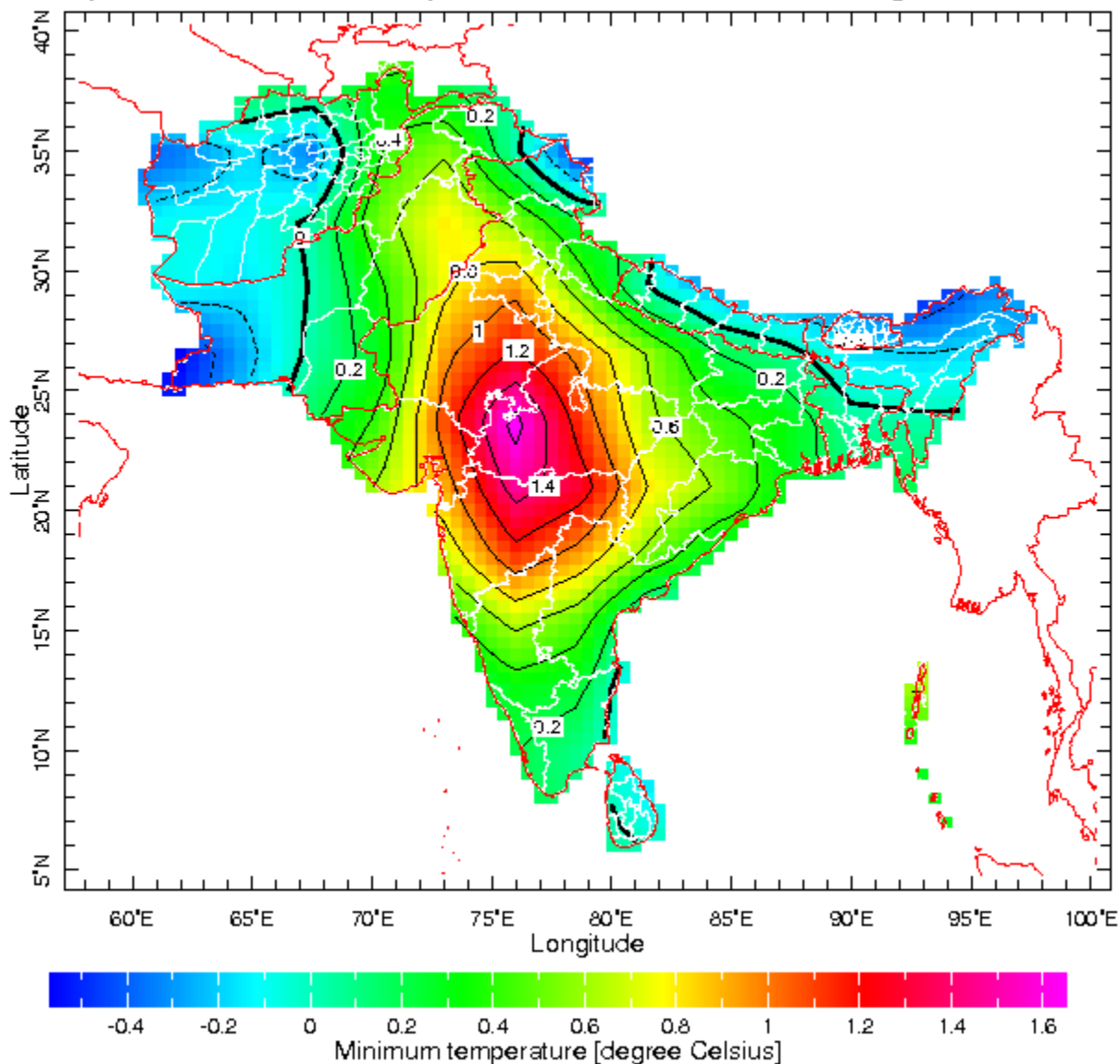
Departure of rainfall from normal for Dec-Feb, 2015



Expected Min. Temperature during Dec, 2014



Departure of Min. Temperature from normal during Dec,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 for SAARC region will be issued 10th of every month with three months in advance weather outlook. Latest seasonal weather summary can be download from NAMC web site mentioned below: <http://namc.pmd.gov.pk/>