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Assessment of CHIRPS Precipitation Data over Nepal

Background

Spatial distribution of precipitation is the key input for hydro-meteorological assessment. Many global gridded precipitation data exist; viz GPCP, GPM, TRMM, GSMAP, APHRODITE, CHIRPS. The applicability of these dataset need to be assessed before their application. This study is focused to assess the applicability of Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) dataset over Nepal.

Materials and Methods

CHIRPS version 2.0 precipitation data is used in this study which is a 35+ year quasi-global rainfall dataset ranging from 1981 to near-present at about 5 km spatial resolution. Monthly data from 1981 to 2019 are used. http://iridl.ldeo.columbia.edu/SOURCES/.UCSB/.CHIRPS/.v2p0/.monthly/.global/.precipitation/dods. The Grid Analysis and Display System (GrADS) tool is used to process the dataset. Observed point station data are obtained from Department of Hydrology and Meteorology (DHM). Monthly climatological analysis between CHIRPS and DHM data is carried out to assess the accuracy and bias in CHIRPS dataset.

Results

Figure 1: Spatial distribution of monthly climatology (1981-2019) of CHIRPS precipitation data in mm

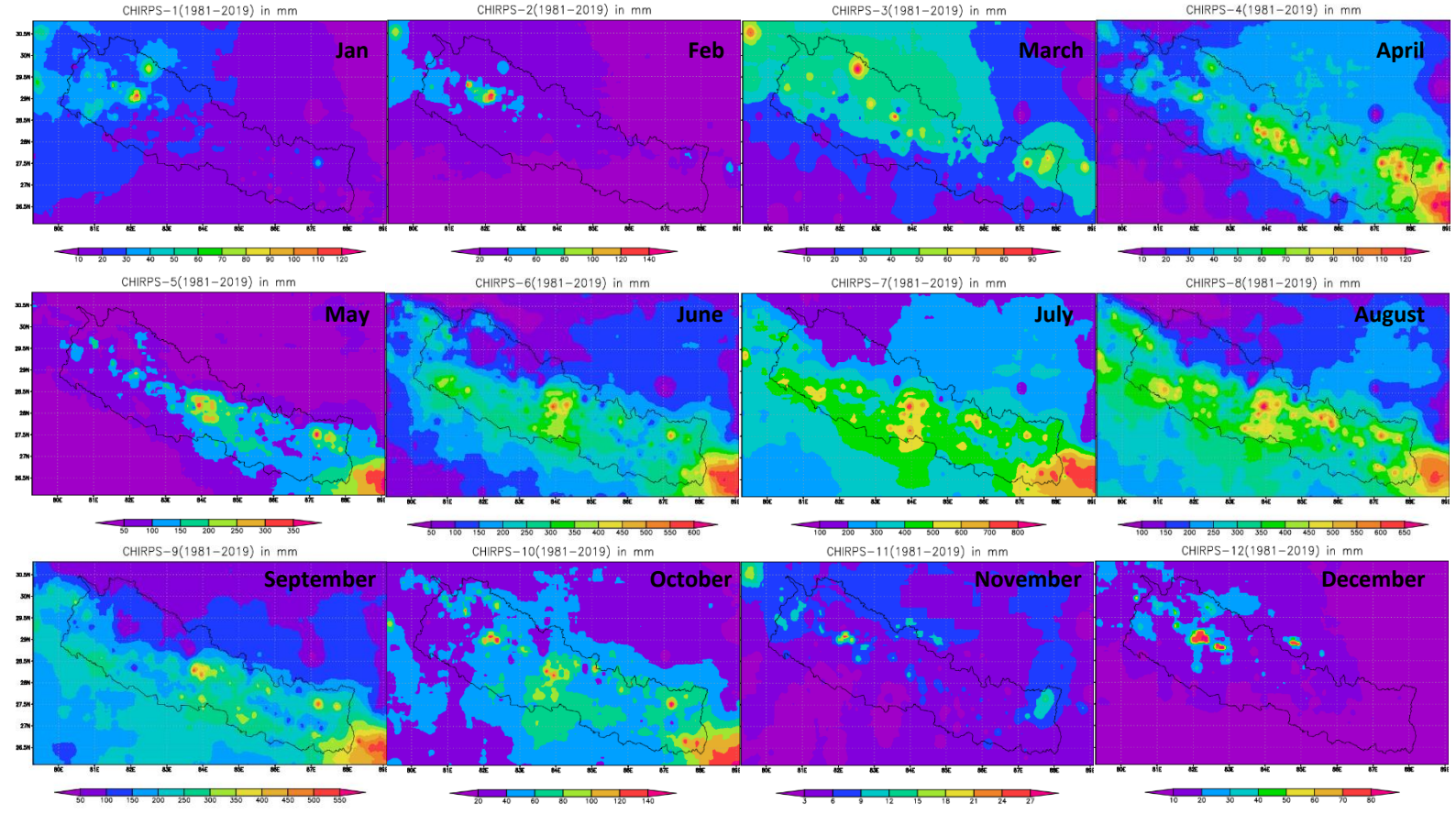


Figure 2: Spatial distribution of seasonal climatology (1981-2019) of CHIRPS precipitation data in mm
DJF – December to Febraury, MAM – March to May, JJAS – June to September, ON-October to November

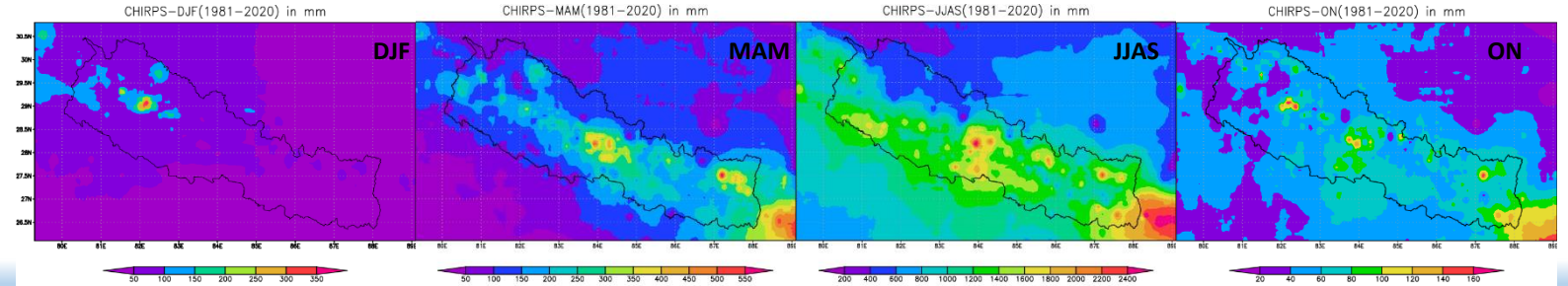
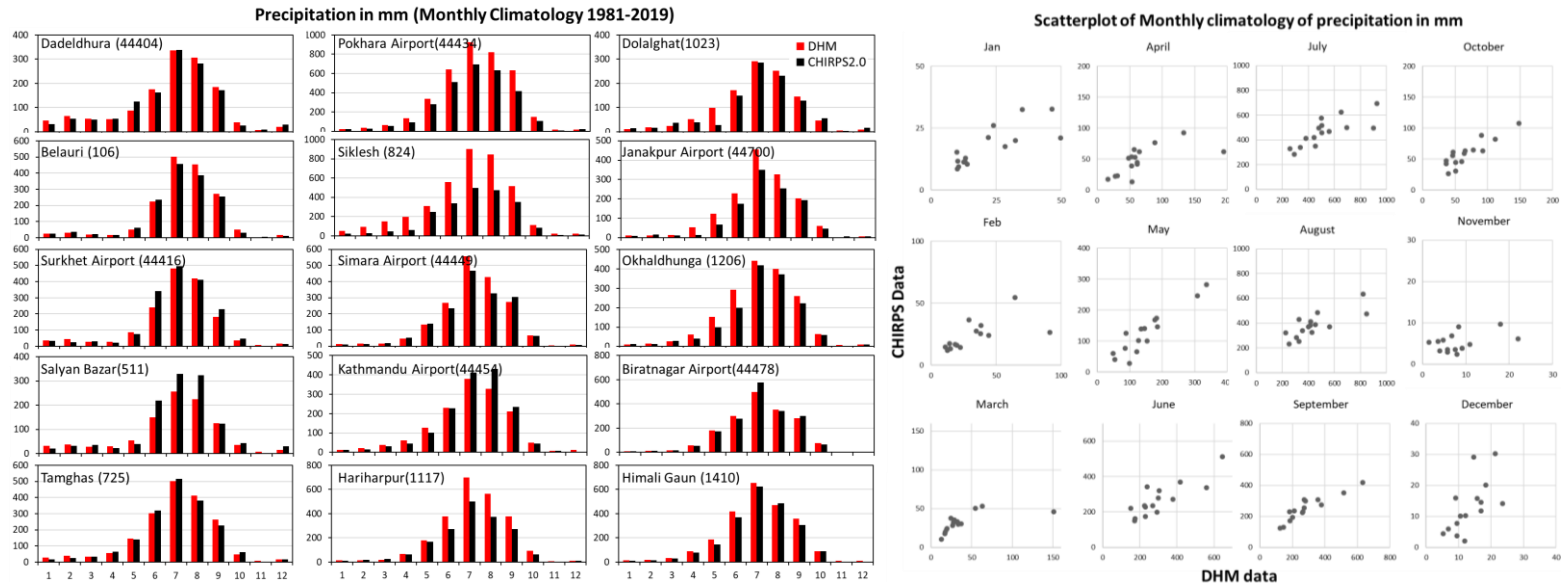


Figure 1 and 2 represents the spatial distribution of climatological average (1981-2019) in monthly and seasonal scale respectively. Seasonal pattern is well replicated. Observed data from DHM is used to assess the bias in CHIRPS data. Only the stations with full set of data are selected for comparison as shown in Figure 3. It is found that the biases are asymmetric across the country. In the Eastern region, CHIRPS precipitation is found to be underestimated in JJAS. Shrestha et al. (2019) revealed the same result; underestimation of CHIRPS precipitation in all seasons in Koshi basin. That bias is large in the Central region, except at Kathmandu Airport. In the western region, better agreement is seen except at Salyan Bazar and Surkhet Airport. In general, CHIRPS precipitation is found underestimated as seen in scatterplot diagram. Analysis of all the stations will reveal new insight during in-depth analysis.

Figure 4: Comparison of monthly climatology of CHIRPS against different stations (DHM)



Conclusion and Recommendation

Evaluation of monthly CHIRPS data against observed data (DHM) has been carried out for the time window of 1981-2019. In general, CHIRPS precipitation is found underestimated in comparison to observed data. Only 15 stations have been used for comparison. Other stations which has missing data could also be used for assessment of CHIRPS data for selective time window. Assessment of CHIRPS data in representing frequency distribution of high flow/low flow using daily data and in different time scale/window would be the future tasks to be carried out. Then, a methodology for correction of gridded CHIRPS would be formulated for its application in water resources development and management.

Reference

Shrestha, N., Qamer, F.M., Pedreros, D., Murthy, M., Wahid, S. and Shrestha, M., 2017. Evaluating the accuracy of Climate Hazard Group (CHG) satellite rainfall estimates for precipitation based drought monitoring in Koshi basin, Nepal. J. Hydrol. – Reg. Studies. 13. 138-151. 10.1016/j.ejrh.2017.08.004.

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