EGU23-5822, updated on 27 Apr 2024
https://doi.org/10.5194/egusphere-egu23-5822
EGU General Assembly 2023

Analysis of Precipitation Extremes Using High Resolution Ensemble-based Dataset for India

Anagha Peringiyil[1] and Manabendra Saharia[2,3]
[1]IIT Delhi, Department of Civil Engineering, India (anagha.p@civil.iitd.ac.in)
[2]Indian Institute of Technology Delhi, Department of Civil Engineering, India (msaharia@civil.iitd.ac.in)
[3]Indian Institute of Technology Delhi, Yardi School of Artificial Intelligence, India (msaharia@civil.iitd.ac.in)

Grid-based meteorological estimates are indispensable in a wide variety of contexts. In India, most of the existing precipitation datasets are deterministic and have limitations when it comes to expressing the inherent uncertainties in data. Existing gridded datasets for India were created using a similar process, which comprised a multi-stage quality check, followed by methods such as Shepard's interpolation and probabilistic interpolation. This paper focus on the development of ensemble based gridded product for India named as, Indian Meteorological Ensemble Dataset (IMED) for 30 years. Additionally, this paper also discusses the analysis of precipitation extremes over Indian region. IMED (Indian Meteorological Ensemble Dataset) creates a daily ensemble precipitation product for the specified grid using gauge station readings as input, together with spatial variables such as latitude, longitude, elevation, and slope for the period of 30 years from 1991 to 2020. Daily, thirty distinct ensemble members are generated with a resolution of 0.25 degrees. IMD (Indian Meteorological Department) gridded precipitation data, CHIRPS gridded precipitation data and ERA5 land precipitation are compared with the mean of the developed ensemble members. In addition, a sensitivity analysis carried out to find out the possible combination of input parameters such as search radius, number of neighbouring stations to be considered, and number of ensembles to be used etc. and found that the combination 80, 25, 30 respectively gives better performance in terms of the quality of developed dataset as well as the time complexity. The generated ensemble has generally strong reliability and discrimination of events of different magnitudes and it is comparable to other widely used hydrometeorological datasets, although there are significant distinctions. The correlation coefficient between IMED and station precipitation data is 0.972, which is greater than the correlation coefficient between IMD gridded precipitation data and station precipitation data. Ensemble precipitation datasets are especially useful in places with substantial meteorological uncertainty, since practically all available deterministic datasets encounter formidable difficulties in obtaining reliable estimations.