Short term Precipitation Forecast System in Heterogeneous Urban Landscape in Delhi City using Weather Radar

Anjaneyulu Akkimi
a.anjaneyulu@iitg.ac.in
Research Scholar, Department of Civil Engineering, IIT Guwahati, Assam-781039, India
***Subashisa Dutta**
subashisa@iitg.ac.in
Professor, Department of Civil Engineering, IIT Guwahati, Assam-781039, India.
Kamaljit Ray
raykamaljit@gmail.com
Scientist-G, Atmospheric Sciences Division, Ministry of Earth Sciences, New Delhi, India

Urban landscape is one of the sensitive ecosystem on the earth. Throughout our civilizations urban settlements were established proximate to water bodies, its plains, hills and valleys, developing urban ecosystem in economical developing countries. The developing urban ecosystem affects each component of meteorological and hydrological processes in both local and regional scales. Storm characteristics, one such component mostly effected in this landscape, are responsible for short-term flash floods. The nowcast of precipitation is still a challenging task even though high-end weather forecast models are developed. The existing models needs large initial assimilation dataset in terms of meteorological parameters.

This research work presents a methodology for short-term precipitation forecast with Weather Radar over urban landscape by considering historical ensemble characteristic of storm and with minimum initial assimilation dataset. The Delhi city, the capital of India was considered for this study and also has two eco-climatological zones surround by Aravalli Mountains in its south-west, Eastern Himalayas in north-east, desert land in north-west, and Yamuna River passing through the city. Every year two wind branches namely Arabian-sea and Bay of Bengal branch meet and forms monsoon trough.

The short-term precipitation forecast approach is developed with C-band weather radar. Initially the reflectivity-hyetographs were extracted from historical weather radar reflectivity datsets. Each reflectivity-hyetograph was split into two components namely atmospheric and turbulent waves. Each wave patterns were statistically fitted using Maxwell probability approximation and the model parameters were quantified. The model parameters such has wave lifts and fitted parameters were analyzed with a probability distribution functions and Cholesky decomposition. The model was evaluated by statistical parameters such as RMSE, NSE and other error matrices. The error matrices indicated the propped ensemble approach is reliable. Then finally, the precipitation has been nowcasted using initial 30min assimilation window and model parameters using proposed approach.