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Background

- Adequate and efficient precipitation data is a major concern *due to its spatiotemporal variability*
- Satellite-based products: alternative for a reliable precipitation in complex topography and diverse climate zones region
- Limited number of studies on the spatial connections of precipitation using network theory

Methodology- Complex Network Theory



Study area and datasets

- Ganga river basin (India)
- Two datasets: TRMM and IMD (daily precipitation data for 22 years i.e. from 1998 to 2019)

1. Network characteristics of Ganga river basin

- To investigate the influence of similarity measure, correlation threshold on spatial connection

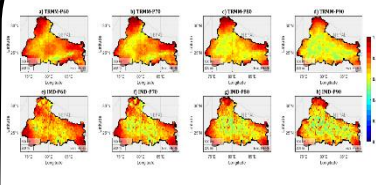


Figure 1:
Clustering coefficient (CC):
- Ratio between the actual no. of links that exists between k_i nodes to the total no. of possible connections.

Figure 2:
Degree (k_i):
- Total number of links connecting the node to its nearest neighbour

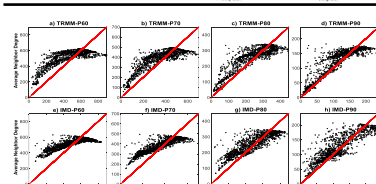
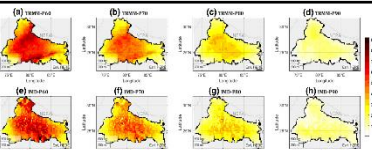


Figure 3:
Relationship between degree and average neighbour degree:
- Average neighbour degree of any node is the neighbour's average degree

2. Network architecture

- To assess the small-world characteristics of precipitation network

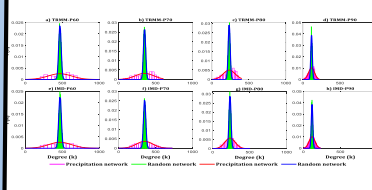
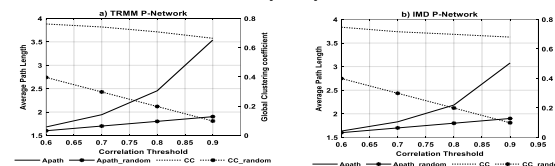


Figure 4:
Degree distribution, $p(k)$ for random networks and precipitation network:
 $p(k)$ gives the probability of randomly selected node having exactly k links

Figure 5: Comparison of average path length and global CC between random network and precipitation network



3. Weighted degree betweenness (WDB)

- To quantify the node's importance and rank the influential nodes

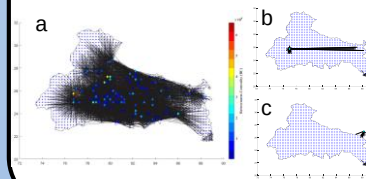


Figure 6:
- WDB is the combination of two network measures, degree and betweenness centrality and it is used to rank the nodes in the network

- WDB suggests that time series at that grid cells located in the centre and near the basin's periphery contains unique information in the network

- A network is small-world, if $CC \gg CC_{random}$ and $A_{path} \geq A_{path_random}$,
- Precipitation networks satisfy the criterion of small-world network properties

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Reference: Gadhave et al. (2021), EPJST
<https://doi.org/10.1140/epjst/s11734-021-00017-z>

