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Complex network-based approach for identification of influential and expandable station across rainfall network

Ankit Agarwal (1,2,3), Norbert Marwan (2), Maheswaran Rathinasamy (2), Ugur Ozturk (1,2), Bruno Merz (1,3), Juergen Kurths (1,2)

(1) University of Potsdam, Germany, (2) Potsdam Institute for Climate Impact Research, Telegrafenberg, Potsdam, Germany, (3) GFZ German Research Centre for Geosciences, Section 5.4: Hydrology, Telegrafenberg, Potsdam, Germany

The complex network has gained significant momentum in last decades and has found application wide areas ranging from biological networks to climate networks. In analysing physical complex networks, identification of key influential nodes is l an important field of research. In this study, we propose a new effective node ranking method based on network measure degree and betweenness values. The proposed method is tested and compared to previously proposed node ranking methods on synthetic sample networks and then applied to a real-world raingauge network of 1229 stations from Germany to check its replicability and applicability. Raingauge networks play a vital role in providing information for making crucial decisions in water resources management and resources estimation. The network of operating raingauges should be set up optimally to provide as much and as accurate information as possible and at the same time cost-effective. The proposed method is evaluated using decline rate efficiency and kriging error. The results of the study show that the proposed method based on complex network theory for ranking the raingauges is robust and can be used for design and redesign the raingauge network. The method is very useful in identifying the highly influential station which needs high attention and expendable stations which either can be relocated, uninstalled or removed without much effect on the overall accuracy of the observations provided by the raingauge network.

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