EGU2020-240
https://doi.org/10.5194/egusphere-egu2020-240
EGU General Assembly 2020

A novel global AR identification algorithm

Mengqian Lu and Mengxin Pan
Department of Civil and Environmental Engineering, Hong Kong University of Science and Technology, Hong Kong SAR, China (cemlu@ust.hk)

Atmospheric river (AR), which is defined as long, narrow and transient corridor with enhanced moisture transport, received more and more scientific attention because of its crucial roles in the global water cycle, water resource management and hydrometeorological extremes. In recent years, dozens of AR identification algorithms are proposed to detect and quantify ARs. However, limitations still exist. In this study, a novel global AR identification algorithm is developed to address some limitations among all the state-of-the-art AR algorithms. First, in the AR pathway detection, a coupled quantile and Gaussian kernel smoothing technique is implemented to define the IVT threshold to make a balance in capturing the spatiotemporal variation of IVT climatology and avoiding largely biased estimation. Second, in spite of the variety of AR shape, orientation and curvature, more reliable AR metrics (e.g., length and width) can be determined based on the smooth AR trajectory, which is generated by modifying and integrating the concept of local regression and K-nearest-neighbors. Third, a robust and resilient criterion is developed to filter the tropical moisture swell. Four, an exquisite metric (turning angle series) is proposed, which is helpful to distinguish the tropical cyclone-like (TC-like) features and quantify the AR curvature which may bridge the ARs to the atmospheric circulation system. Last but not least, another novel metric () is developed to measure the localized IVT coherence on the AR pathway. For each grid, the is defined as the inter-decile range of the IVT direction of its neighbor grids. The IVT coherent/discordant segments on the AR pathway are extracted by an image segmentation algorithm according to their spatial pattern and values. The coherent segments are more likely to carry on long-distance moisture transport, governed by the persistent and large-scale circulation system and related to hydrometeorological extreme, while discordant segments are more likely to be corresponding to the localized turbulence, low pressure system or TC-like features. So, flagging the segments into different categories will be significant in the study of the climatic modulation of AR occurrence, intensity, spatial pattern and the associated rainfall predictability. We believe that this algorithm with various metric will facilitate further quantitative investigations by the AR research community in terms of water resource management, hydrometeorological extreme predictability and climate change projections.