EGU2020-11380
https://doi.org/10.5194/egusphere-egu2020-11380
EGU General Assembly 2020

An Integrated Nowcasting Approach with Machine Learning for Applying Global Sensing Datasets to Forecast Precipitation Extremes in Data-scarce Nile Delta

Chien-Nien Chen[1], Miguel Rico-Ramirez[1], Dawei Han[1], and Ahmed Abdelhalim[2]
[1]University of Bristol, Civil Engineering, Bristol, United Kingdom of Great Britain and Northern Ireland (otto.chen@bristol.ac.uk)
[2]Geology Department, Faculty of Science, Minia University, Egypt

This research is part of the ongoing research project Climate Change Adaptation to ManagE the Risks of Extreme HydrologicaL and Weather Events for Food Security in Vulnerable West Nile Delta (CAMEL). The study area−West Nile Delta−is an important region in Egypt in terms of agricultural and industrial productions, whilst it is a vulnerable area facing extreme weather and environmental crises (e.g. flooding, soil salinization, and sea level rise), as well as in socio-economic respect. In the latest decades, the region suffered more weather extremes due to climate change; the severe rainfall events resulted in flooding causing heavy casualties and economic loss. Therefore, the project aims to build an integrated flood early warning system for Egypt. However, in order to tackle the issue of data scarcity of ground observation, this research seeks to apply satellite precipitation observation and numerical weather prediction (NWP) as the substitution (i.e. GPM, MPE and ECMWF data) and to develop an approach with the integration of Nowcasting and NWP for precipitation forecasting.

Generally known that Nowcasting method and NWP both have limitations in performing local convective and formative precipitations, whilst in different reasons. The research seeks to improve this effect in Nowcasting as it has advantage in short term performance (i.e. a few hours) whilst NWP has advantage in long term performance (i.e. a few days). The findings from the vector field of Nowcasting indicate that the relativity between shift speed and shape changing speed of precipitation is the key for accurate prediction, which is the disadvantage of the optical flow approach of the Lagrangian method that Nowcasting applies as the main stream core. The research hence applies a machine learning approach−support vector machine (SVM)−to figure out the relativity aforementioned to identify disadvantage data that needs to be pre-treated prior to the Lagrangian Nowcasting. Meanwhile, by applying a phase-based frame interpolation method based on the Eulerian method to downscale the temporal resolution, it can improve these disadvantage data identified by machine learning so as to better perform in the Lagrangian Nowcasting. The integrated Nowcasting approach is expected to have better performance in forecasting and still retains low computational resource consumption.