ACHIEVEMENTS

New Algorithm Developed to Improve Short-Term Weather Forecasting in the UK

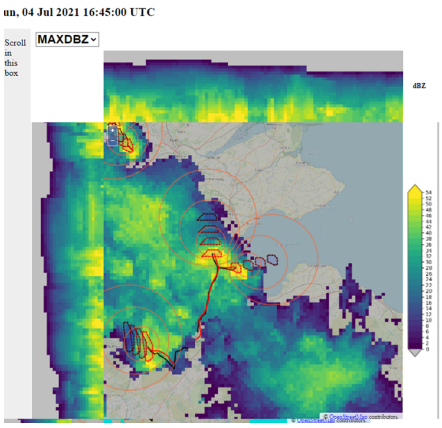
Recently, Assistant Professor Li-Pen Wang of NTU's Department of Civil Engineering collaborated with an international team of researchers from Imperial College London, KU Leuven, and a UK startup Rain++ to develop a new object-based radar rainfall nowcasting system for the UK Met Office. As the Scientific Lead of the project, Prof. Wang guided the team to develop and prototype the core nowcasting algorithms. The team has devised a new algorithm that can better isolate and associate convective rainfall entities and deliver reliable and detailed motion estimates. This system will be used by the UK Met office's forecasters in predicting the movement of convective rain cells in real time.

While on the one hand, Radar nowcasting is a widely-used technique to predict the precipitation fields and variation in rainfall within the following 0 to 6 hours, depending on the type of precipitation; on the other hand, object-based nowcasting is mainly used to predict the motion of convective storms due to their clustering nature, which usually constitutes two components: tracking and prediction. Tracking focuses on tracking the recent movements of the rain cells while the latter extrapolates the potential position of the rain cells in the following few hours via derived movements.

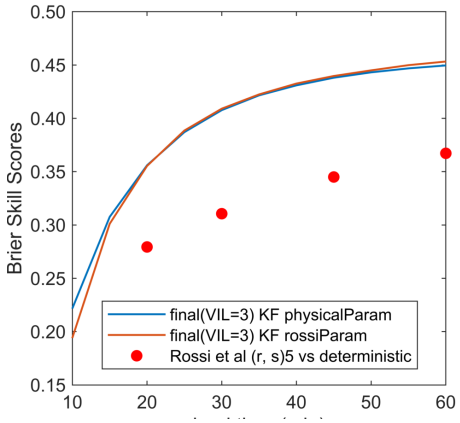
In the latest improved system, the new tracking component was implemented based on an innovative algorithm proposed by Prof. Wang and his colleagues from KU Leuven in 2018. The algorithm was selected for this project by the UK Met Office's scientists in view of its feasibility of real-time and real-world operation. Tracking accuracy was significantly improved thanks to new optical flow techniques incorporated in the rain cell tracking process and the algorithm was further adapted to make it compatible with the UK Met Offices' new 3D radar composite product.

The prediction component was developed using the Kalman filter-based method, and the key parameters were obtained via the analysis of historical rain cells and their development. Moreover, these parameters can adapt during nowcasting, leading to better and more informative prediction results.

Wang's new algorithm not only improves the accuracy of the Met Office's forecasts but serves as a basis for further applications such as storm nowcasting and long-term stochastic spatial and temporal rainfall generation.



Case study July 4, 2021 16:45 UTC – lead times 10, 20 and 30 min. A snapshot of the newly-developed object-based storm nowcasting system.



A comparison between the Brier skill scores (BSS) of the two Kalman filter models' parametrizations (lines) and the Rossi et al model's round markers from 2015.

Click or Scan the QR Code to read the 2018 algorithm in *Atmospheric Research*.

National Taiwan University

+886-2-3366-2577
No.1, Sec. 4, Roosevelt Road Taipei, 10617 Taiwan
ntuhighlights.ntu.edu.tw

National Taiwan University 國立臺灣大學