EGU2020-17825
https://doi.org/10.5194/egusphere-egu2020-17825
EGU General Assembly 2020

Artificial Intelligence for Improvement of Convective System Tracking and Its Surface Effect Prediction

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Thanks to the geostationary meteorological satellites of METEOSAT (Europe), GOES (USA), and Himawari (Japan), the nowcast of convective systems (CS) can be performed in most of the world with a 5-15-minute observation time sampling and about 2.8-km spatial resolution (up to about 1-km for the new-generation satellites).

However, the CS forecast, including the prediction of their effects on the surface, is still a challenge due to the lack of high-resolution radar data and a deep understanding of this topic. Indeed, for now, most numerical weather prediction (NWP) models cannot deliver an accurate time and space estimation of surface wind patterns and wind gusts associated with the CS.

In the meantime, Synthetic Aperture Radar (SAR) and ASCAT (scatterometers) may be used for the detection of surface wind patterns potentially associated with the deep convective clouds that may be identified on METEOSAT images. Additionally, the intensity of wind patterns may be estimated from SAR and ASCAT data. Based on this result, Deep Learning (or Machine Learning) is proposed in an ongoing study for improving the predictions of wind gusts, based on the combination of several data sources such as SAR, ASCAT, METEOSAT. The obtained results of this step will be used to integrate into the current NWP models.