



Dynamical evaluation of the error representation in the generative AI nowcasting model LDCast

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The variability in ensemble forecasts can either be generated dynamically - as is usually done with Numerical Weather Prediction (NWP) models -, stochastically or by using new approaches such as AI generative techniques. As these approaches are in their infancy for geophysical applications, the properties of the ensembles of generative models are still far from clear, especially if those models are to be used in operational activities. This aspect is investigated here for nowcasting models.

This work provides a predictability analysis over Belgium for the generative AI nowcasting model LDCast [1], as well as for the stochastic STEPS nowcasting algorithm (pysteps implementation [2]). Both models correctly estimate the error at almost all scales by means of their ensemble spread (i.e. good spread/error relationship), and they adapt the morphology of their ensembles depending on whether the event dynamics is convective or stratiform. Surrogate ensembles are also derived from the ensembles of STEPS and LDCast, and used as benchmarks with which to compare the spatial scores of the models. This reveals that both STEPS and LDCast ensembles struggle to provide added value for the spatial localization of the uncertainty associated with the growth and decay of rainfall. Therefore, STEPS and LDCast ensembles seem to be accurate statistically but not dynamically.

[1] Leinonen, J., et al. (2023). Latent diffusion models for generative precipitation nowcasting with accurate uncertainty quantification. arXiv preprint arXiv:2304.12891.

[2] Pulkkinen, S., et al. (2019). Pysteps: an open-source python library for probabilistic precipitation nowcasting (v1.0). GMD, 12(10):4185–4219.