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# Preparation for the assimilation of the upcoming Meteosat Third Generation Lightning Imager data in AROME

Total lightning (inter/intra-cloud + cloud-to-ground) is a proven marker of deep convection. Total lightning activity can be documented from low Earth orbit platforms (e. g. the Lightning Imaging Sensor on the Tropical Rainfall Measuring Mission satellite and the International Space Station) and from ground-based lightning locating systems (LLSs). With the advent of optical imagers on geostationary orbit such as the Geostationary Lightning Mapper (GLM) on the Geostationary Operational Environmental Satellite (GOES) 16 and GOES 17 or the future Lightning Imager (LI) on the Meteosat Third Generation (MTG) imaging mission satellites, total lightning can be efficiently and continuously mapped over large areas of the Earth, including seas and other areas not well covered by ground-based instruments sensitive to thunderstorms such as radars.

Research is underway to prepare the assimilation of future LI data into the AROME numerical prediction system. To do this, the LI data are simulated from the Météorage ground-based LLS, using a transfer function developed from the National Lightning Detection Network and GLM data over the United States. The transfer function has been designed using machine learning methods on a large amount of coincident flash data. The similar measurement techniques of both ground-based (NLDN and Météorage) and geostationary (GLM and MTG-LI) instruments allow for this approach. The physical quantity assimilated is the flash extent density (FED). It is diagnosed from model fields in a statistical way. Since the current AROME three-dimensional variational (3DVar) assimilation system does not allow the assimilation of deep convection variables such as hydrometeor contents or vertical velocity, FED is assimilated using the one-dimensional Bayesian retrieval followed by three-dimensional variational (1DBay+3DVar) data assimilation method originally designed to assimilate radar reflectivity.

The presentation will report on the latest progress made in the assimilation of synthetic LI data in AROME.

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