Geophysical Research Abstracts
Vol. 17, EGU2015-2124, 2015
EGU General Assembly 2015

Implementation of a lightning data assimilation technique in the Weather Research and Forecasting (WRF) model for improving precipitation prediction

Theodore Giannaros, Vassiliki Kotroni, and Kostas Lagouvardos
National Observatory of Athens, Institute for Environmental Research, Penteli-Athens, Greece (lagouvar@meteo.noa.gr)

Lightning data assimilation has been recently attracting increasing attention as a technique implemented in numerical weather prediction (NWP) models for improving precipitation forecasts. In the frame of TALOS project, we implemented a robust lightning data assimilation technique in the Weather Research and Forecasting (WRF) model with the aim to improve the precipitation prediction in Greece. The assimilation scheme employs lightning as a proxy for the presence or absence of deep convection. In essence, flash data are ingested in WRF to control the Kain-Fritsch (KF) convective parameterization scheme (CPS). When lightning is observed, indicating the occurrence of convective activity, the CPS is forced to attempt to produce convection, whereas the CPS may be optionally be prevented from producing convection when no lightning is observed. Eight two-day precipitation events were selected for assessing the performance of the lightning data assimilation technique.

The ingestion of lightning in WRF was carried out during the first 6 h of each event and the evaluation focused on the consequent 24 h, constituting a realistic setup that could be used in operational weather forecasting applications. Results show that the implemented assimilation scheme can improve model performance in terms of precipitation prediction. Forecasts employing the assimilation of flash data were found to exhibit more skill than control simulations, particularly for the intense (>20 mm) 24 h rain accumulations. Analysis of results also revealed that the option not to suppress the KF scheme in the absence of observed lightning, leads to a generally better performance compared to the experiments employing the full control of the CPS' triggering. Overall, the implementation of the lightning data assimilation technique is found to improve the model's ability to represent convection, especially in situations when past convection has modified the mesoscale environment in ways that affect the occurrence and evolution of subsequent convection.