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Prediction of lightning flash density with the WRF model

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Abstract. The Lightning Potential Index (LPI) is a measure of the potential for charge generation and separation that leads to lightning flashes in convective thunderstorms. It is calculated from model simulated updraft and microphysical fields. It was designed to predict the potential of lightning occurrence in operational weather forecasting models, but could possibly be used to improve short-range forecasts of heavy rain. The index is modified here to be model grid-scale transparent between 1 and 4 km (the approximate upper limit of explicit microphysical weather forecasts). Two case studies show that the modification appears to work quite well, and that LPI can be calculated on both an extremely high resolution research-grid (i.e., 1.33 km) and high resolution (i.e., 4 km) operationally compatible forecast grid. Analytical expressions are presented to use the LPI to predict the hourly lightning flash density.

Full Article in PDF (PDF, 1141 KB)

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