Impact of high-resolution land surface data assimilation on Fog: A case study from the WiFEX campaign

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Abstract

The High-resolution land data assimilation system (HRLDAS) based on the Noah-MP Land Surface Model (LSM) with 2 km horizontal resolution is used to develop high-resolution land surface products over the Indo Gangetic Plain (IGP) region. HRLDAS model was first integrated from January 2016 to January 2018, using a time step of 03 hours for integrating the Noah-MP LSM to evolve the improved land surface parameters. Output from the offline Noah-MP LSM was used to initialize the land surface fields in the Weather Research and Forecasting (WRF) model. In this study, we took a very dense fog (Visibility < 200m) event that occurred over IGP during 24-25 January 2018 as a case study to evaluate the impact of high-resolution soil moisture (SM) and soil temperature (ST) data assimilation products from HRLDAS in WRF model forecast. Various sensitivity experiments have been conducted to check the fidelity of the WRF model to simulate the fog life cycle (onset, vertical distribution of fog layer, radiation fluxes, and dissipation, etc.) over IGI Airport New Delhi. WRF model outputs were compared with a high-resolution ground-based observational dataset collected from the Winter Fog Experiment (WiFEX) observatory at IGI airport New Delhi. Results suggest that improved SM/ST has shown noticeable changes in fog onset, vertical distribution of fog layer, and night-time surface temperatures, ultimately improving fog prediction.

Keywords: Land data assimilation, Fog life cycle, Soil moisture, Soil temperature, WiFEX

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