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Understanding atmospheric turbulence results from numerical weather prediction models

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With the growing increase in computational power the grid resolution of numerical weather prediction (NWP) models has continued to decrease. This decrease enables large regions to be modelled with fine-scale horizontal grid spacing (i.e., less than 4km). With this finer grid resolution small scale atmospheric processes can be simulated, however the results still rely on model parameterizations that were developed for idealized atmospheric conditions and/or intended for use with larger grid resolutions. While atmospheric models are able to capture the synoptic scale atmospheric processes, the models do not adequately simulate the micro-scale processes near the earth's surface. Therefore impacting predictions of surface-atmosphere exchange, including the turbulent mixing and accumulation of pollutants in the atmospheric boundary layer. This presentation will present NWP results from the Weather Research and Forecasting (WRF) model where a sensitivity analysis for two case studies was designed to compare simulated surface fluxes to turbulence measurements. Hourly momentum, latent heat, and sensible heat fluxes from WRF are evaluated using surface observations. Different land surface models (land-atmosphere interactions) and planetary boundary layer (vertical mixing) parameterizations significantly impact the WRF surface flux results but have less of a difference on estimates of surface wind speed, temperature, and water vapor mixing ratio.

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