Geophysical Research Abstracts
Vol. 20, EGU2018-3181, 2018
EGU General Assembly 2018

Impact of automatic weather station observations on short-term forecasts over the Taiwan strait in the WRF-3DVAR model

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This study evaluates the impact of high-density automatic weather station (AWS) data assimilation, as well as the influence of AWS network density, on short-range forecasts of non-precipitation parameters and 24-h accumulated precipitation over the Taiwan strait using the Weather Research and Forecasting (WRF) model with a three-dimensional variational (3DVAR) data assimilation scheme. Results suggest that assimilation of high-density AWS data has a generally positive impact on the 12–72 h forecasts of non-precipitation variables in the middle and upper troposphere with the forecast error reduced by up to 12%, but reduces the forecasting accuracy of the 0–12 h forecasts in the lower atmosphere. The spatial density of the AWS network also has an obvious impact on the simulation of non-precipitation parameters. The higher the spatial density, the smaller is the forecast error. In addition, AWS data assimilation at higher spatial density reduces overprediction of light or moderate rain, although it increases underprediction of heavy rain. High-density AWS data assimilation gives significant improvements in the rainfall positional accuracy for light or moderate rain forecasts but not for heavy rain forecasts.