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Abstract: **Evaluation of GFS Cloud and Radiation using ARM Observation at Azore Site**

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Our study evaluates the National Centers for Environmental Prediction Global Forecast System (GFS) model simulated radiation and clouds against ground observations made by the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Program over the North Atlantic Azore site from 2009-2010. The primary objective of this study is to identify certain forecast error of GFS model. It is found that the model overestimated the daily maximum surface downward solar flux by 100 W m^{-2} and underestimated the upward solar flux by 60 W m^{-2}. The errors in SDSW were primarily caused by inaccurate forecasts of cloud properties. Model could capture the vertical distribution of cloud fraction, but underestimated the low clouds significant. Although the GFS updated the shallow convection scheme after 2010, the underestimation of low clouds still exists. Results from this study can be used as guidance for the further development of the GFS.