The sensitivity to WRF shortwave radiation parameterizations in prediction of global horizontal irradiance for investigating interactions of atmosphere with croplands

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The present study intends to evaluate the Advanced Research Weather Research Forecating (ARW) model performance in representing the observed global horizontal irradiance (GHI) measurements while using different shortwave radiation (SWR) parameterization schemes. Two cases are considered, first case is 'clear sky condition' which includes model simulation of a clear/ cloudless day and second case is 'all sky condition' which includes model simulations of a cloudy and a rainy day. The above two cases are formulated on the basis that amount of incoming SWR will be different in each case owing to the differences in atmospheric conditions.
For the mentioned instances dates of 23rd February, 9th January and 12th March of 2016, which are clear, cloudy and rainy days respectively, are chosen for WRF model simulation. The shortwave radiation schemes that were evaluated are: Dudhia, Community Atmosphere Model (CAM), the updated Rapid Radiative Transfer Model (RRTMG), the updated Goddard and the Goddard Fluid Dynamics Laboratory (GFDL) schemes. The model generated predictions are verified against the GHI measurements at weather station of Indian Agriculture Research Institute (IARI), New Delhi.
All schemes perform better under 'clear sky condition' i.e. for clear/cloudless day. For both the cases Dudhia scheme performs best with Mean Bias (MB) of 62.84 Wm^{-2} for clear day, 86.44 Wm^{-2} for cloudy day and 89.44 Wm^{-2} for rainy day. All-inclusive, the model derived predictions are over estimated in all the schemes.

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