WRF-Solar Use Case

Compiled Mar. 2022 by Model Data RCN team

Summary
Weighted rubric score - 60
Category - Preserve selected simulation workflow outputs

- Use Case Description
 - High-level overview of the use case
 - The objective of the project was to create a probabilistic NWP model tailored for solar energy applications, the WRF-Solar EPS model.
 - Science goals and basic workflow
 - Contribute to the WRF configuration for more accurate modeling of solar based experiments
 - Provide (for first time) probabilistic forecast specifically tailored for solar energy applications in the WRF model
 - Run different model members with stochastic perturbations in selected variables
 - Identify which parameterizations were most important, and which variables are most relevant for cloud and radiation simulations
 - Evaluate WRF-Solar over the whole US using satellite-based irradiance data as the comparison
 - Provide users with a reference configuration for WRF-Solar
 - Published journal link:
 - https://doi.org/10.1175/JAMC-D-21-0090.1
 - Data repository link
 - https://doi.org/10.5065/yvdr-pa90
- What use-case specific additional materials were preserved and shared?
 - Data
 - Inputs to model
 - This is a WRF-Solar regional model, so some other model is needed to generate boundary conditions. For this project, forecasts from the Global Forecast System (GFS) run by the National Centers for Environmental Prediction (NCEP) were used to generate the initial and boundary conditions necessary to run WRF-Solar
 - Standard WRF initialization datasets were used as inputs.
 - Not included in published journal articles due inadequate space, and lack of interest in these details by the journal.
 The data can be downloaded from the WRF website
 - Reference Configuration is described on the WRF-Solar web site

Raw model output

- The dataset consists of global horizontal irradiance from several WRF-Solar simulations over the contiguous U.S. spanning the year of 2018, and collocated satellite retrievals for the same year. Files consist of outputs with 30 minute time intervals.
- What is archived in the repository is all of the data included in the paper, to support replication of the paper.
- The researcher also includes files from a run that is meant to serve as a reference configuration for the WRF-Solar model.
- There are eight files within the NCAR repository.
 - Total to 121.8 GB file size within the repository.
 - Max: One file at 41.4 GB
 - o Min: Two files at 5.79 GB
 - o Mean: 15.2 GB
 - Files: One is observation, one is model (files in pairs)
 - Files provide a standardized solar reference configuration for users. Some files include specific, refined configuration options for comparisons.

Processed model output

- Some of the model runs were initially done at 3 km resolution, but were interpolated to 9km for the archived files.
- Total data volume not preserved in a repository?
 - The project was much larger than what is included in the NCAR repository. What is included in the database is relevant to replication of results in a peer reviewed publication. Many other simulations run within the project were not included

Software

- Model configuration
 - Described on the WRF-Solar web site.
- Preprocessing code
 - Standard WRF preprocessing code (WPS)
- Model code
 - Publicly available
- Postprocessing code
 - The data were processed after the model runs. The raw model output time slices were combined into each file.

Other

Documentation

 This project is a product of a larger research project, at which the larger project and other resulting projects from it also contain data which this project references. The researcher notes this research data from the larger project was not included in the repository or data holding for this specific project.

- Visualizations or images
 - N/A
- Why were these things preserved and shared?
 - General
 - To support the journal article
 - To provide a reference configuration of WRF-Solar for reproducibility and others to use
 - To provide solar irradiance observational data in a gridded format
 - Reasons why the things listed above are important
 - Expected/intended audience and what they expect/need
 - Are there specific people who will be using the data downstream?
 - Not discussed
 - Possible/aspirational users?
 - Not discussed
 - Note any temporal considerations, such as particular products that become more/less useful over time
 - If they improve the model in the future, they may release a new version of this reference configuration. Older versions would be less useful in this case.
 - On the flip side, if new releases are made researchers may need updated configuration data, and this release of WRF could be used to help compare with the updated configurations.
- Broader Impacts:
 - o How will output from this project be used by stakeholders?
 - Not discussed
 - How were stakeholders involved in the data curation decision-making?
 - Not discussed
 - How will stakeholders be compensated for their participation in the data curation decision-making process?
 - Not discussed
- Do you have any concerns about misuse of your data or software? If so, what concerns
 do you have, and what are the reasons for those concerns?
 - Nothing specific.
 - Could be concerns about use of older versions down the road if new versions are produced. People may not know that there is a better version available. He would want to work with the repository to make it clear what versions are available, and which is newest/best.