

Soiling model accuracy mostly depends on parameter estimation. Site tuned soiling parameters can bring model estimates to be closer to site specific trends while the variance remains high.

The study illustrates that while existing models can produce similar trends in the soiling losses, the variance is quite high and increases the impact of model input parameters on the accuracy of these models. For the sites studied, the HSU appears to better follow the trends of onsite soiling data, likely through the integration of time-varying matter data



Figure 1: Daily dust soiling profile from the measured soiling experiment (green) and the results from the Kimber and HSU models (orange and blue, respectively).

Kimber and HSU dust soiling models are commonly used to calculate the losses to apply in the energy yield estimate. In this study, we evaluate these models against the soiling measurements in 10 locations of continental United States

- 1. Ideally, the model's soiling loss parameters are estimated based on years of soiling measurement data from the project location along with decades of precipitation data as using suggested default inputs can create large errors.
- 2. When year(s) of data is readily available, Kimber ramp rate parameters are found using RdTools [1] to fit the models against soiling kit data to produce a fair model comparison with site-specific parameter tuning
- 3. Onsite-data based model results compared against analysis completed with established HSU [2] and Kimber [3] default input parameters show smaller errors for HSU with defaults compared to onsite parameters

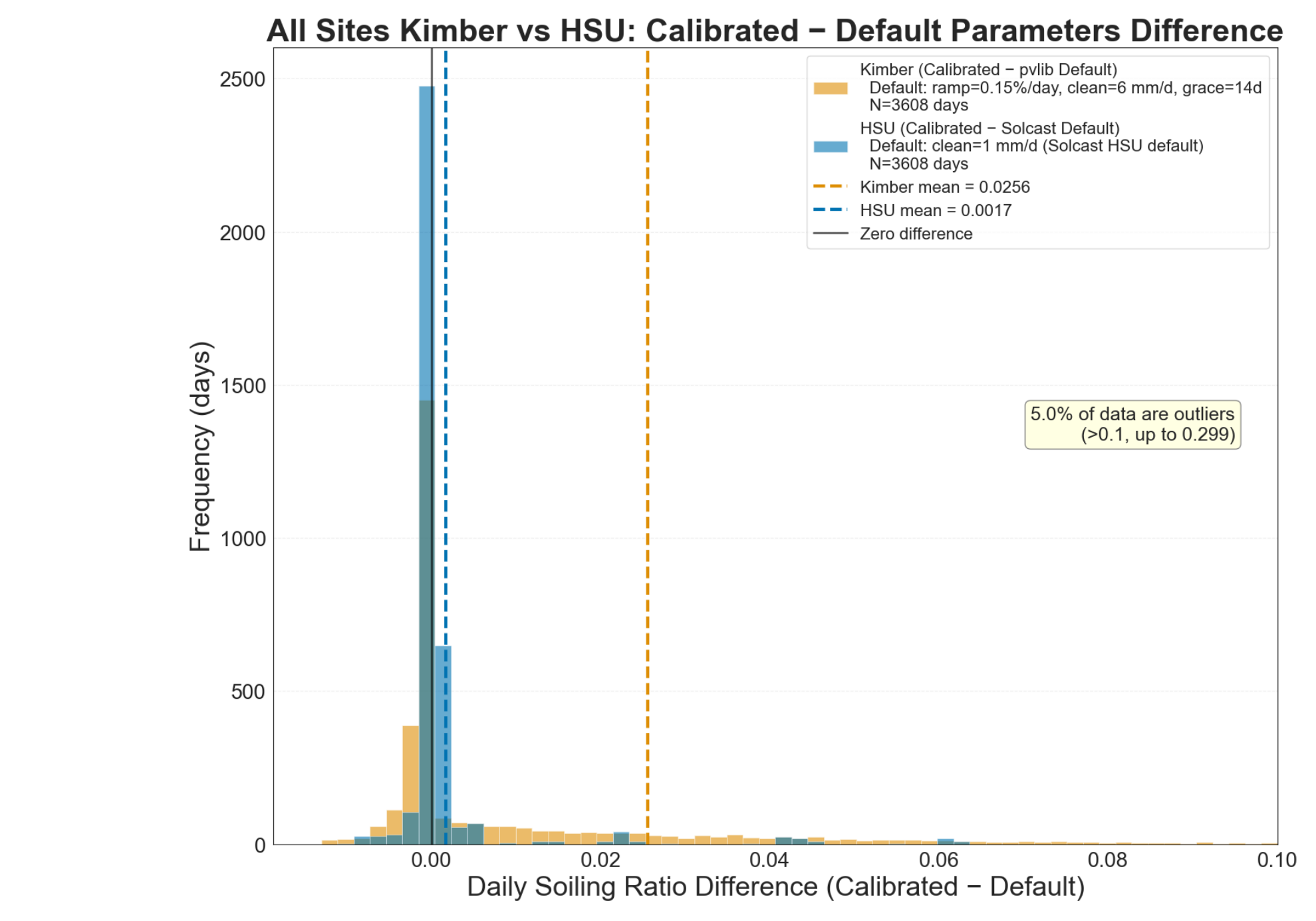


Figure 2: HSU and Kimber modeled daily soiling loss comparison using onsite vs default parameters



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[1] <https://rdtools.readthedocs.io/en/stable/index.html>
[2] M. Coello and L. Boyle, "Simple Model for Predicting Time Series Soiling of Photovoltaic Panels," in IEEE Journal of Photovoltaics, vol. 9, no. 5, pp. 1382-1387, Sept. 2019, doi: 10.1109/JPHOTOV.2019.2919628.
[3] <https://pvlib-python.readthedocs.io/en/latest/reference/generated/pvlib.soiling.kimber.html>