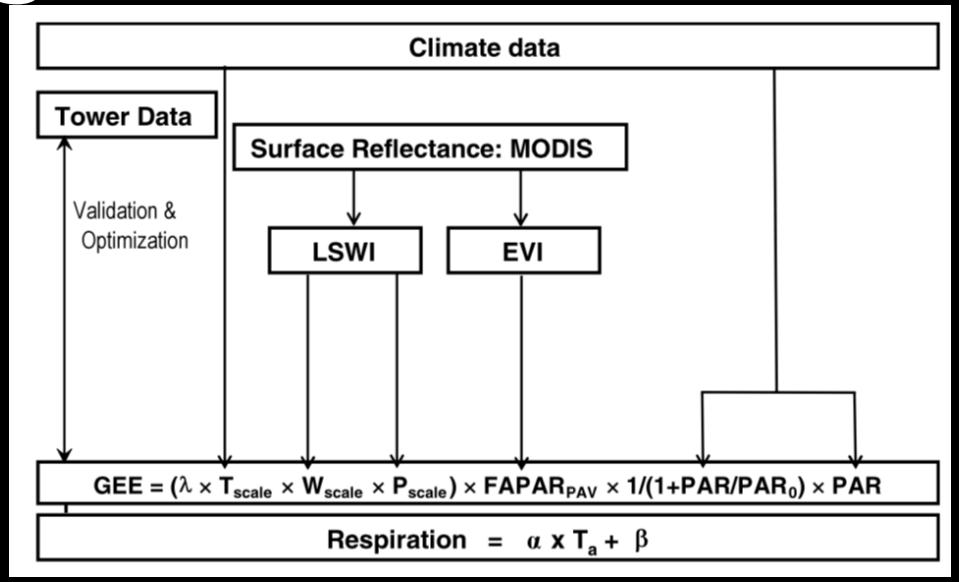
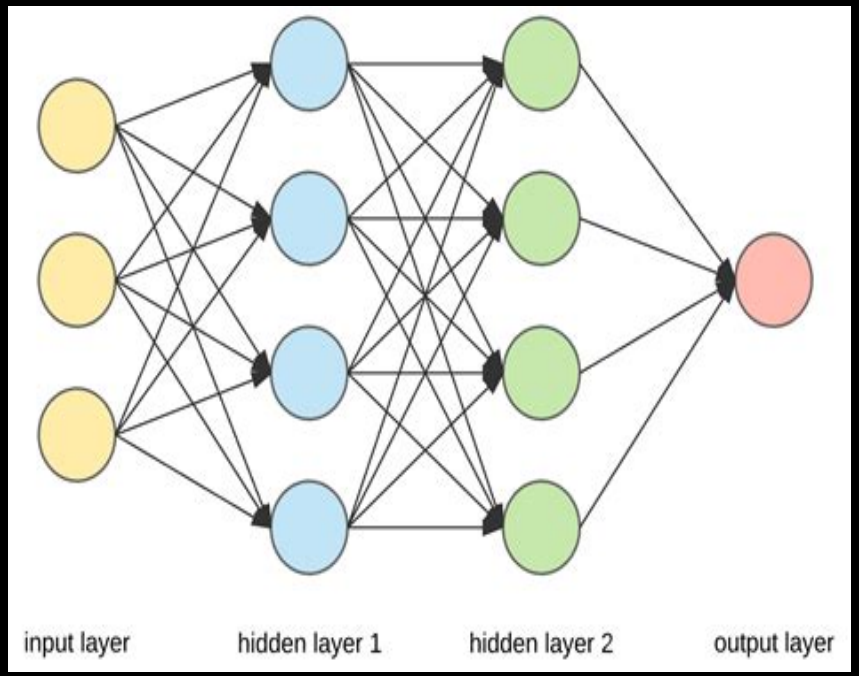
Modeling Carbon Uptake by the Harvard Forest

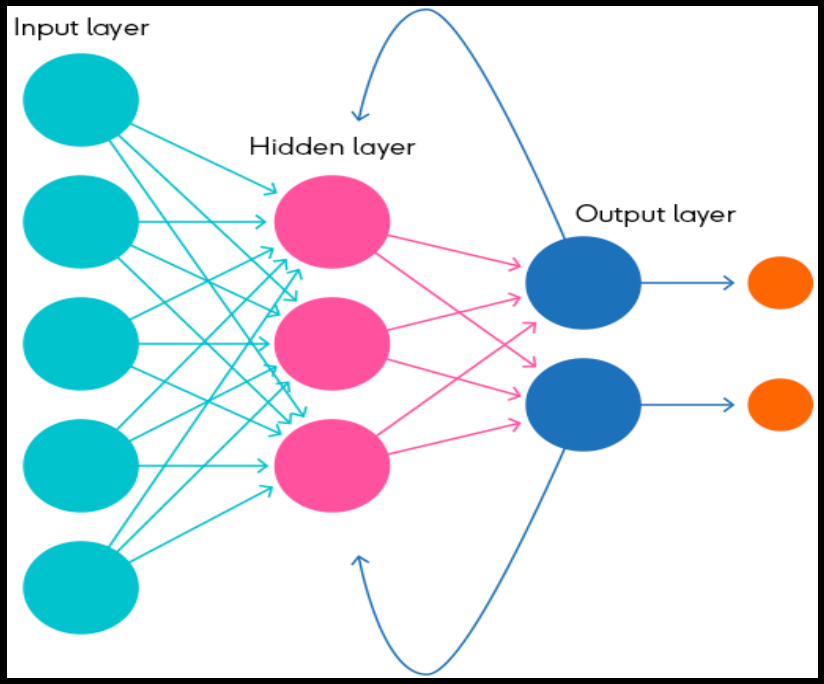
Ethan Manninen

4/l0/19

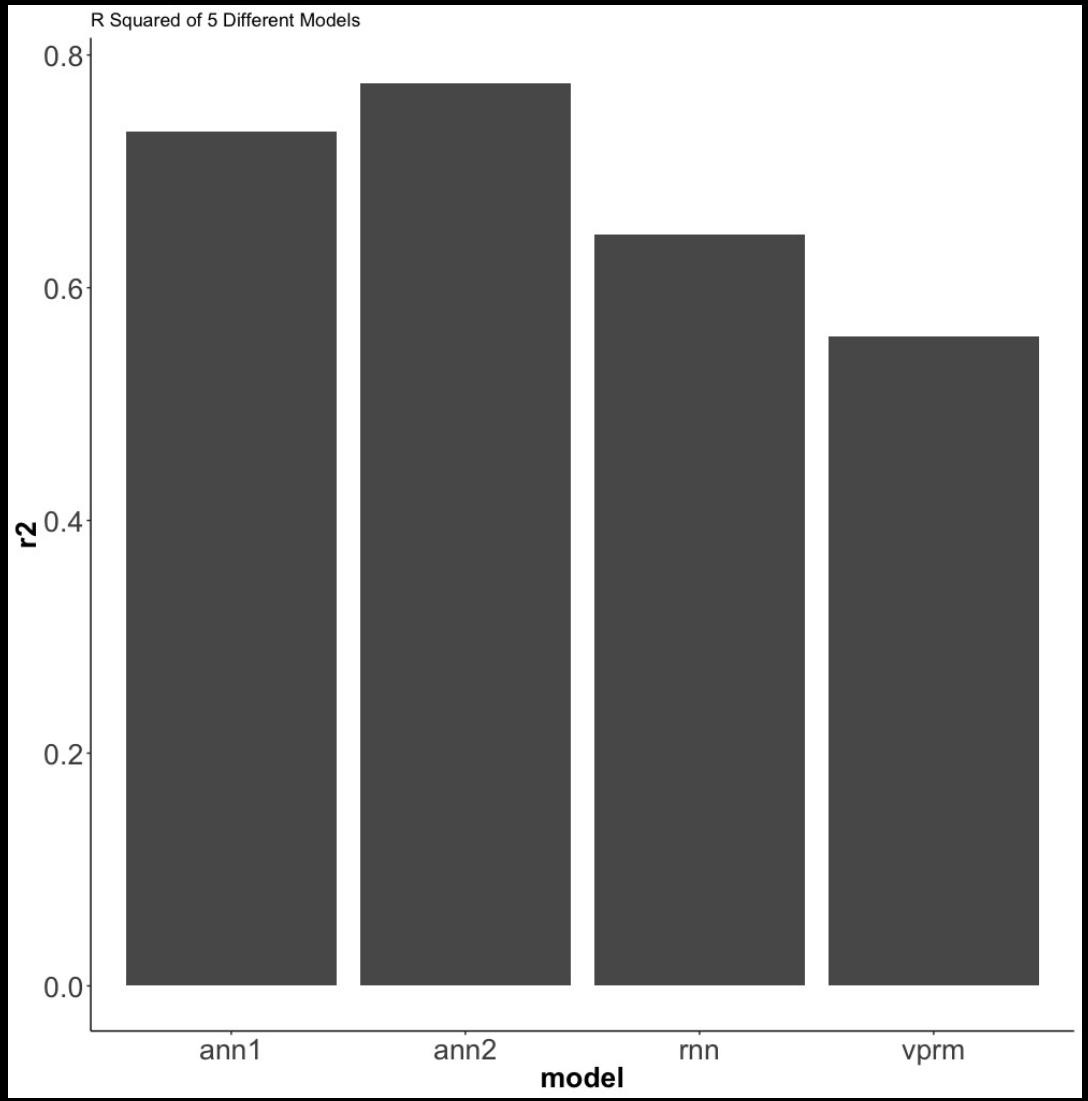
Background: Three Models







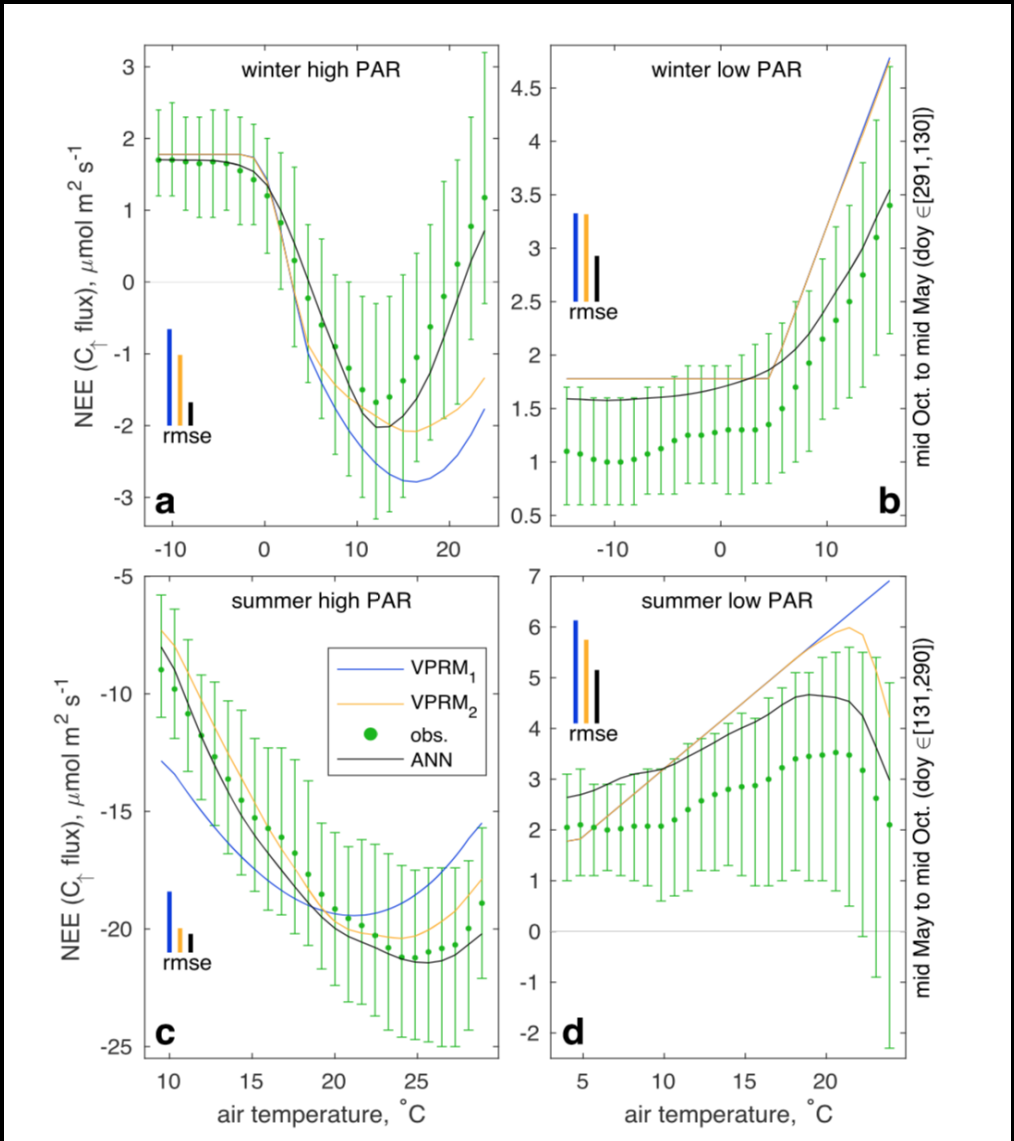
R^2 To Differentiate Models of NEE

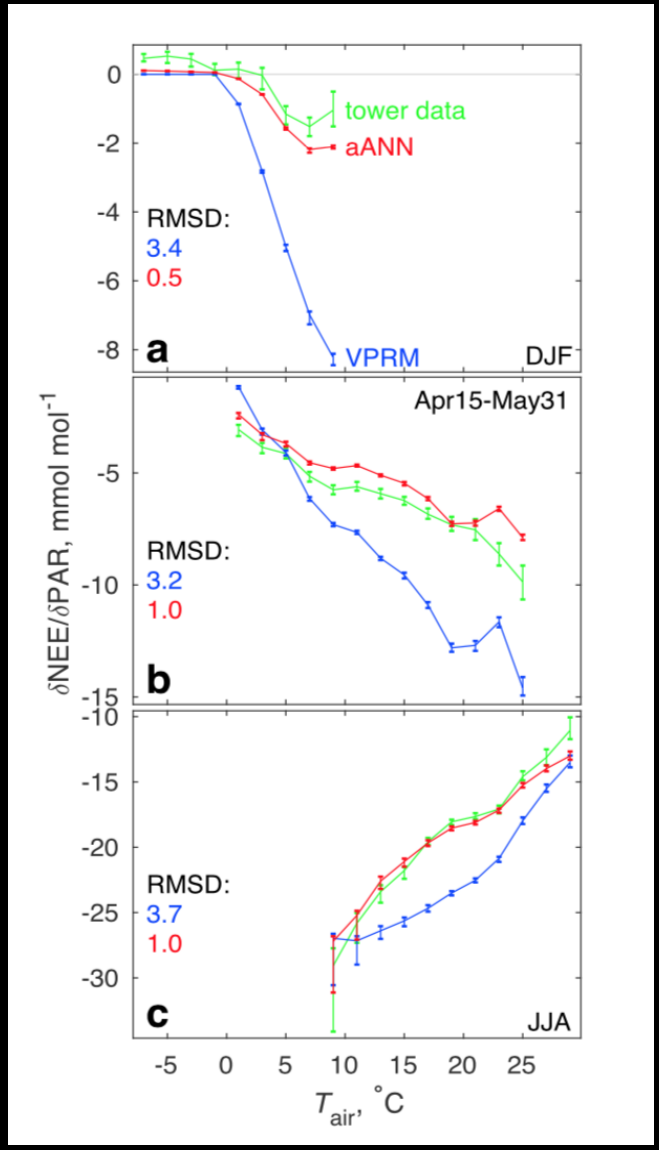


RNN discarded:

1) “Base model” does not offer an advantage over ANN in return for increase in required resources
2) RNN would need to train on minimum of a full year of data, out of ~15

Neural Networks Can Attribute VPRM Error to Cov(T, PAR)





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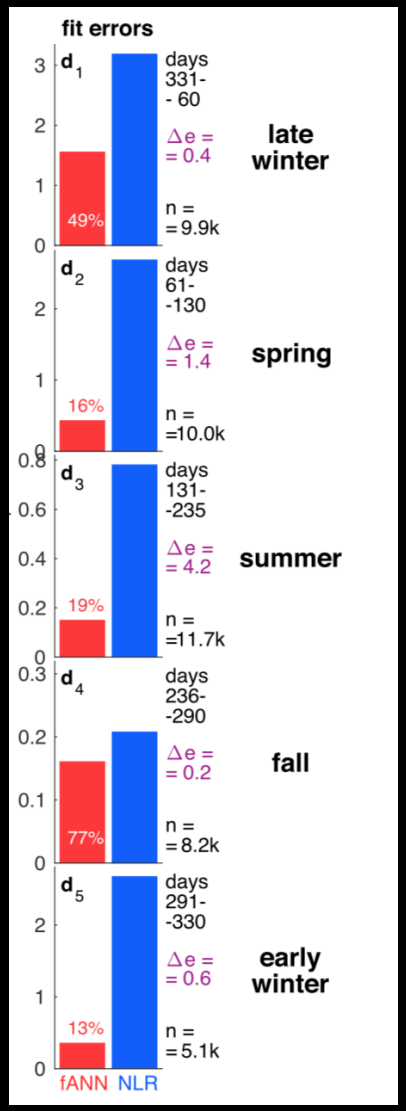
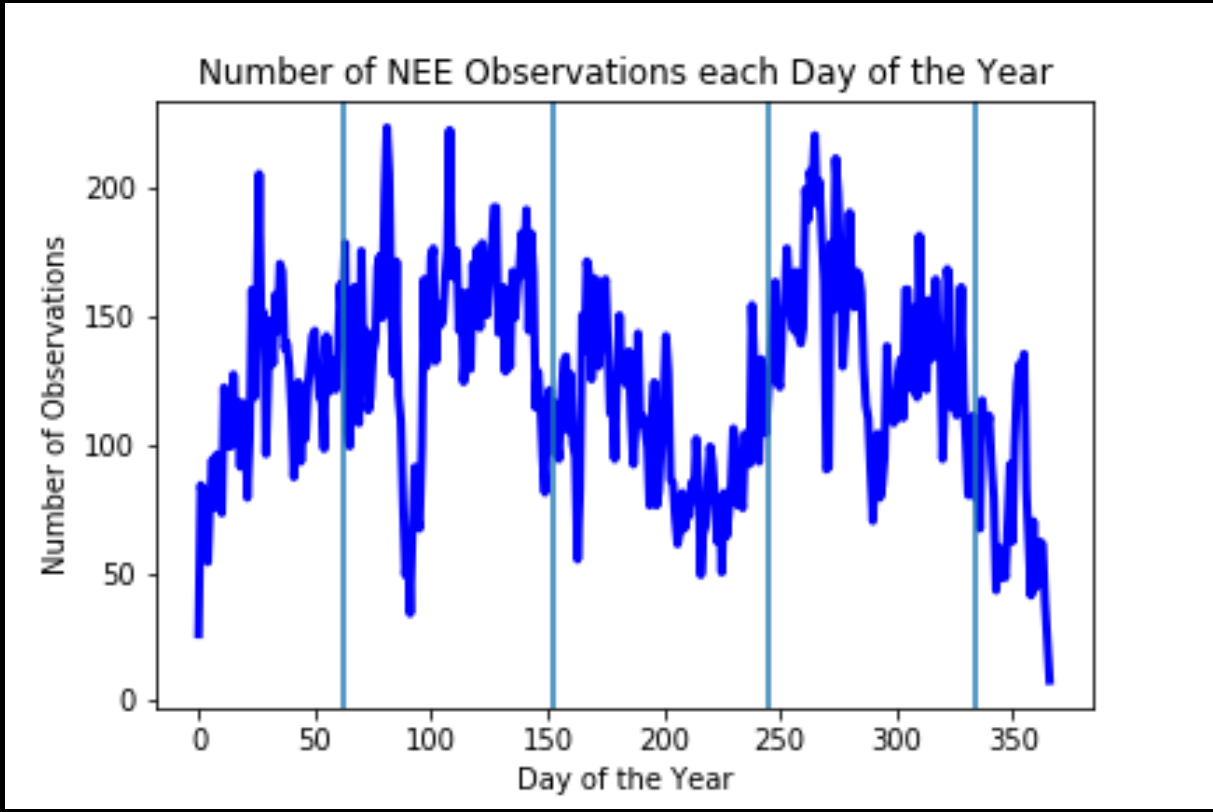
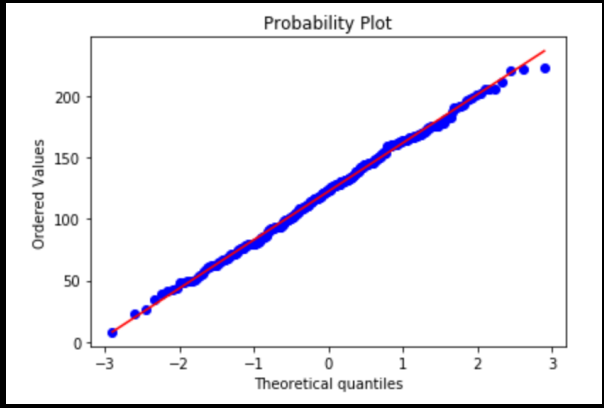
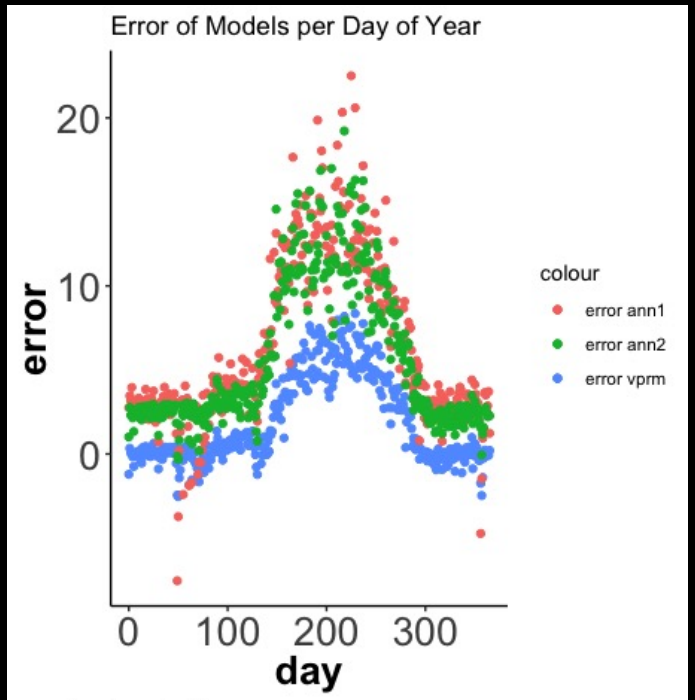
Error in ANN Partly Driven by n?

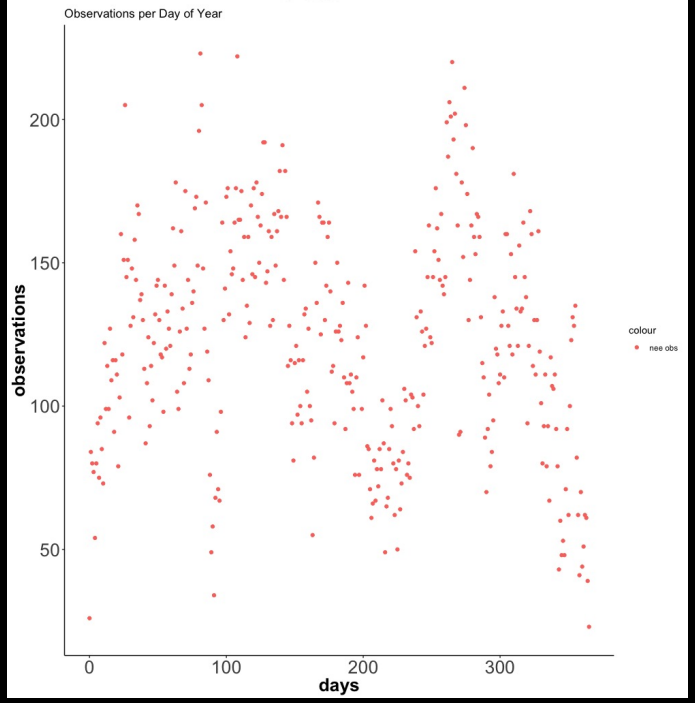


Seasonality of NEE Observation Availability





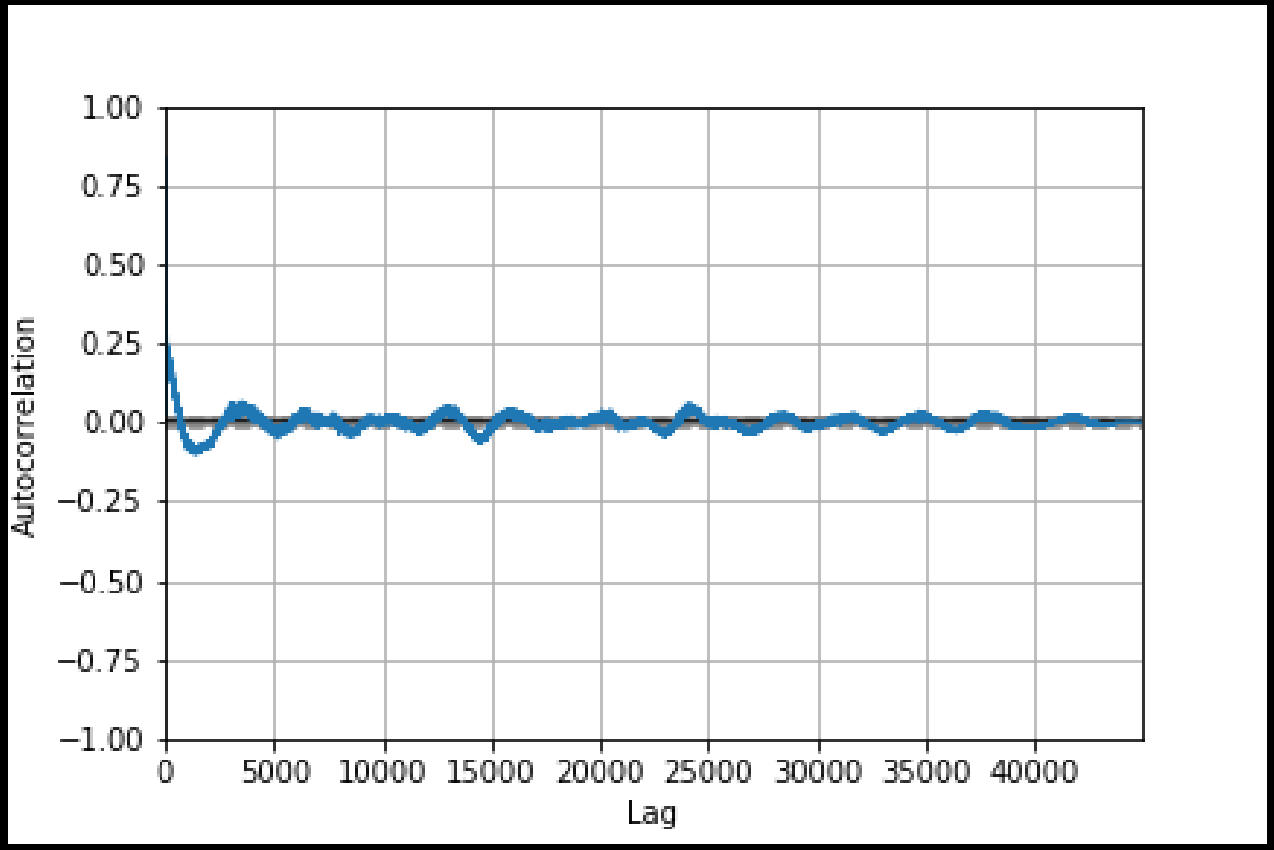




Models' Error Peaks Align with Summer Observation Dropoff, but not Winter

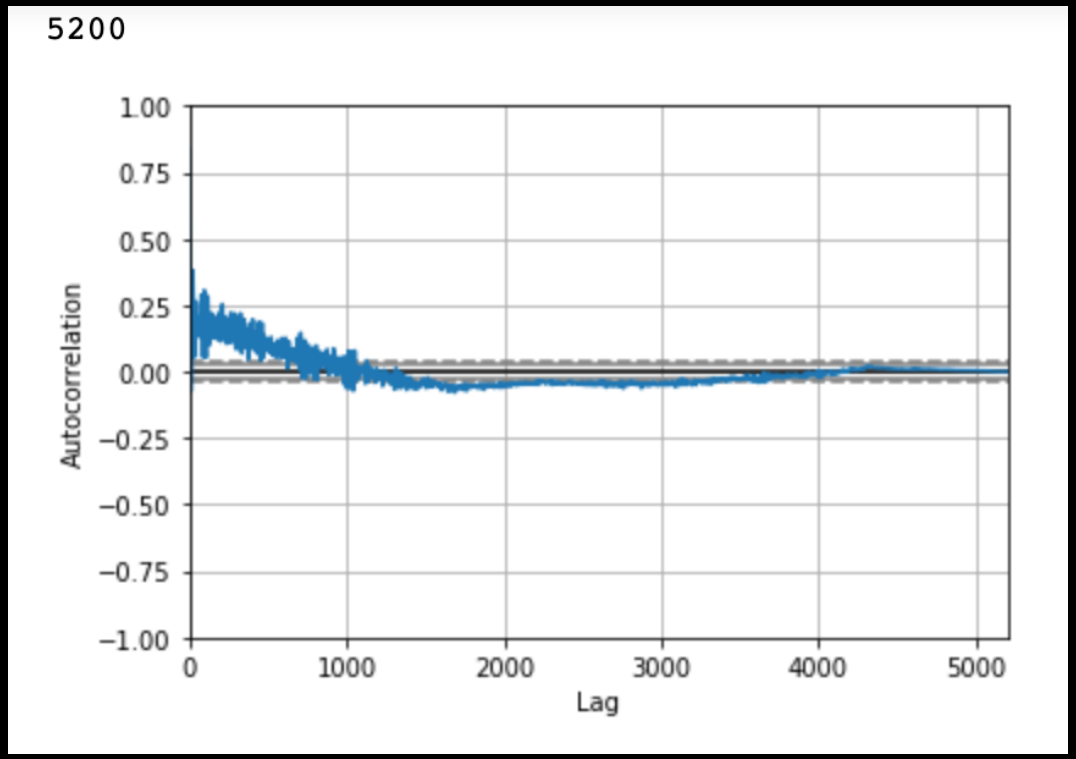
Why does the VPRM display less error, but lower R^2?

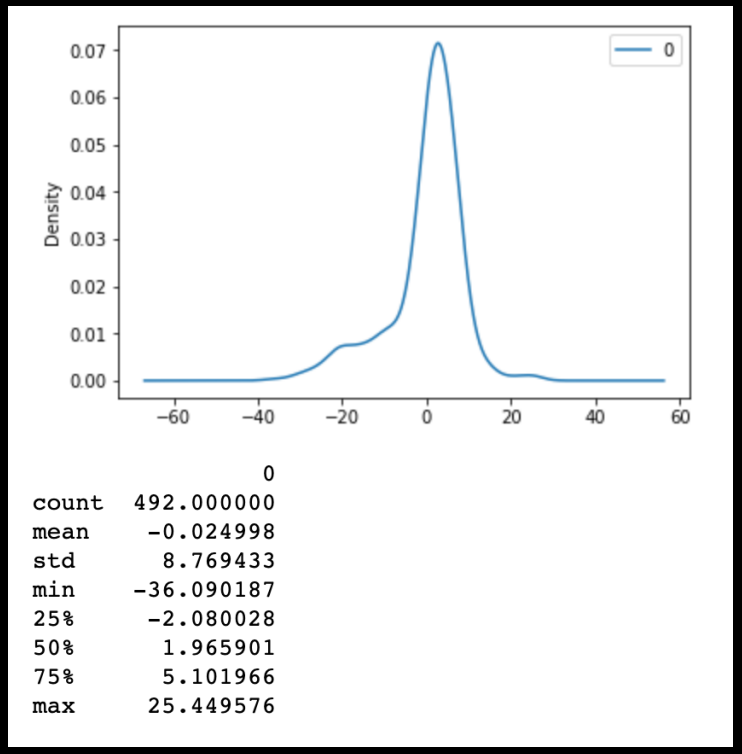
Autocorrelation to Determine ARIMA Parameters



Average Number Lags per year:
~2,600

Resource Constrained ARIMA





	0
count	492.000000
mean	-0.024998
std	8.769433
min	-36.090187
25%	-2.080028
50%	1.965901
75%	5.101966
max	25.449576

Conclusions, Future Directions, Limitations

- RNN likely does not offer significant advantage over recent ANN in predicting NEE in HF
- Potential link between seasonality of error and number of observations, needs rigorous treatment
- No Bootstraps
- ARIMA with sufficient resources to investigate Observation Seasonality and Model Error

Acknowledgements: Tianning Zhao, Prof. Wofsy, Prof. Tziperman