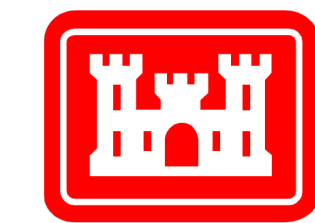


Improving Earth System Model Selection Methodologies for Projecting Hydroclimatic Change: Case Study in the Pacific Northwest



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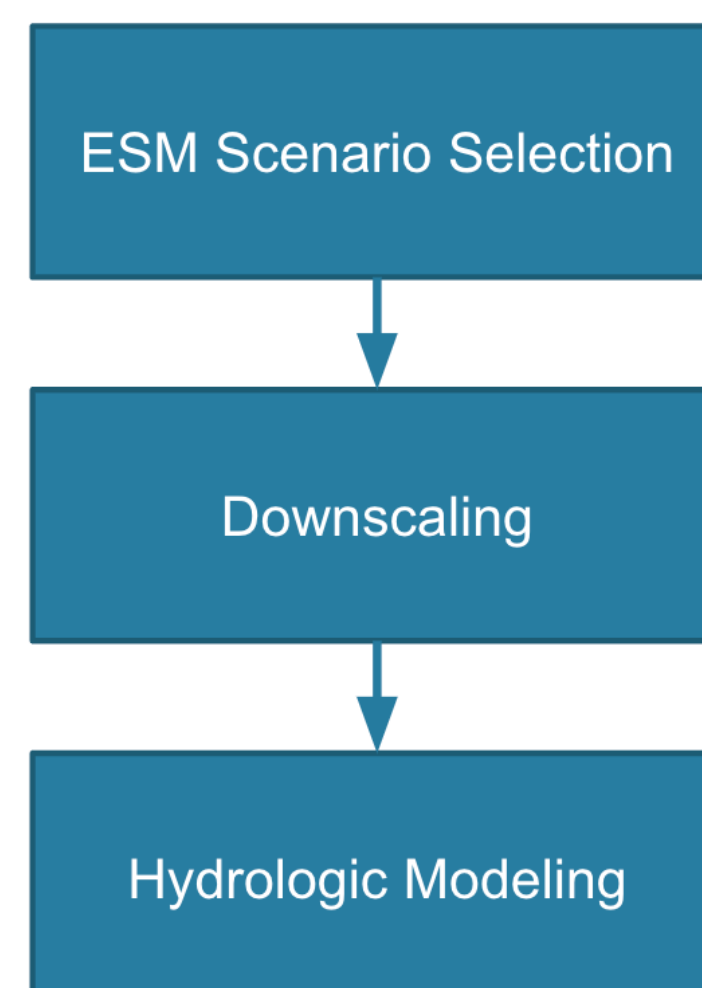
MOTIVATION AND OBJECTIVES

Motivation

- Projecting climate change reliably is a difficult problem that requires analysis of prohibitively large amounts of data.
- Decisionmakers have an interest in determining which climate models are most reliable and whether reducing ensemble size can be done in an objective way and how that method might affect projections of water availability.

Objectives

- Assess and scrutinize methods of reducing ensemble size for stakeholders with limited time or computational resources.
- Determine which models have best representation of processes relevant to PNW water availability forecasting for downstream downscaling and impact modeling.
- Develop flexible framework for ESM assessment applicable to a variety of potential locations.



DATA AND METHODS

CMIP6 Models

- CMIP6 models are included in this study

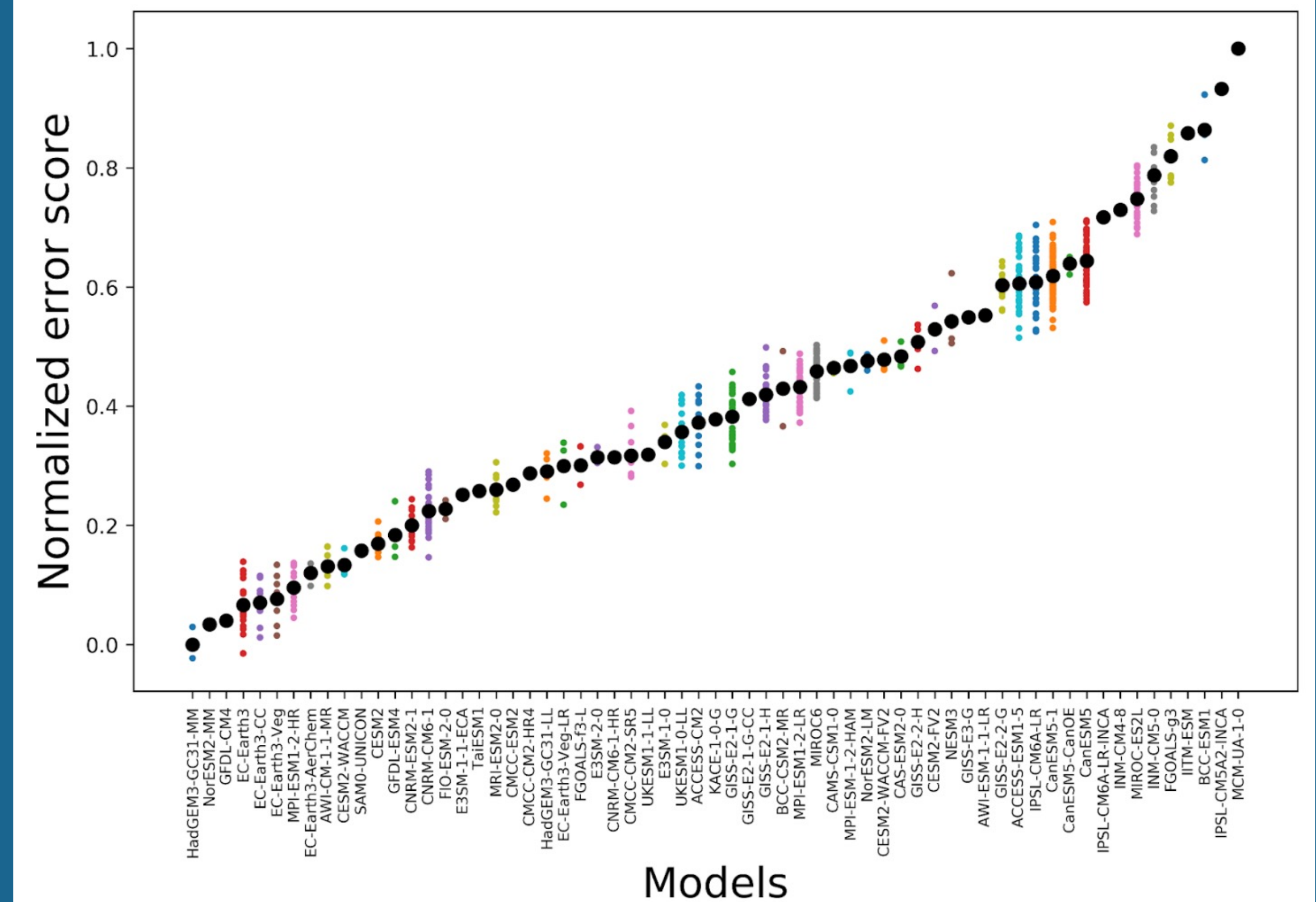
Observational Verification

- 6 datasets representing observations used for verification over CONUS (3 for global metrics)
 - CRU*, ERA-5*, GMET, UDel*, Livneh, PRISM

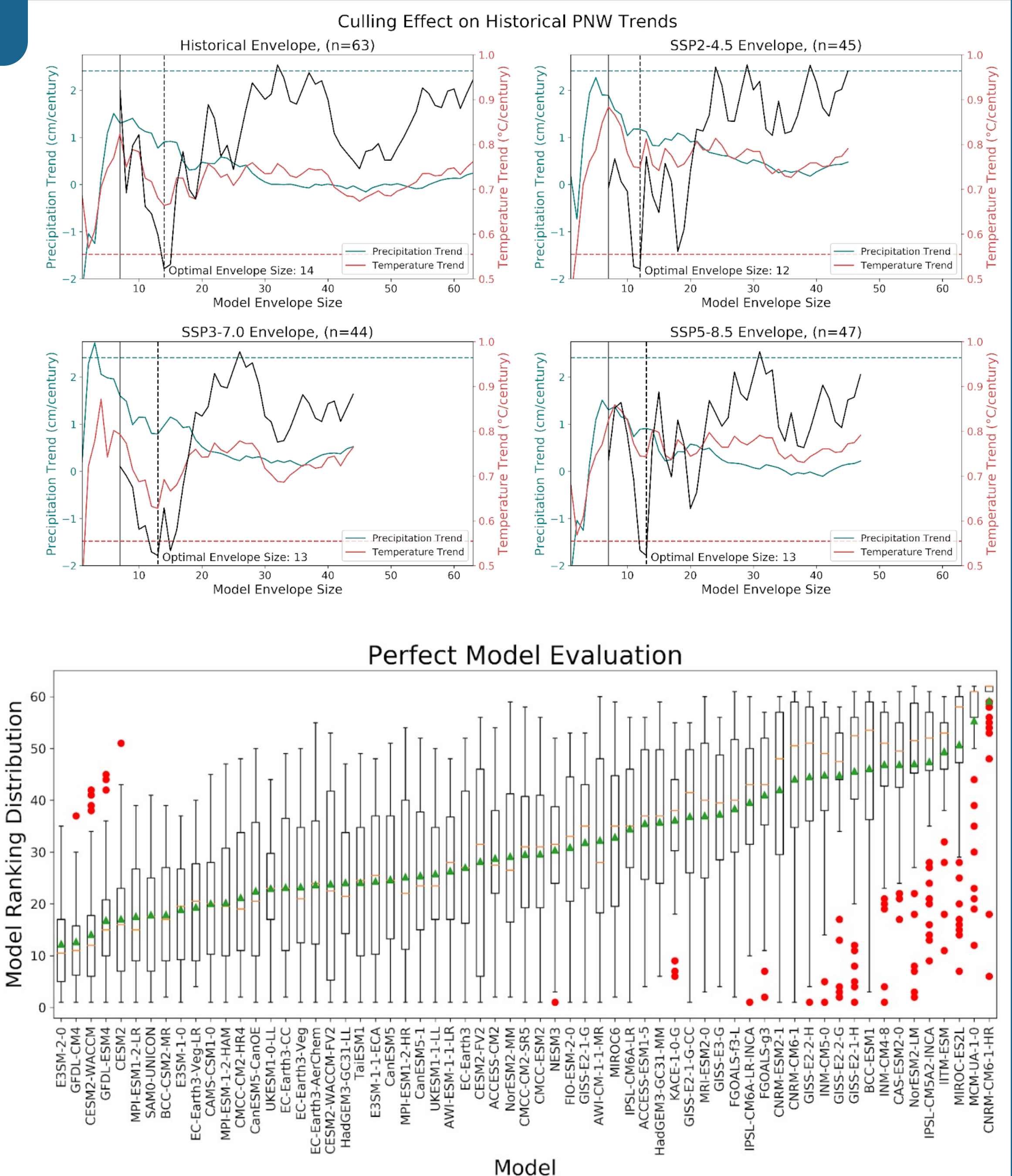
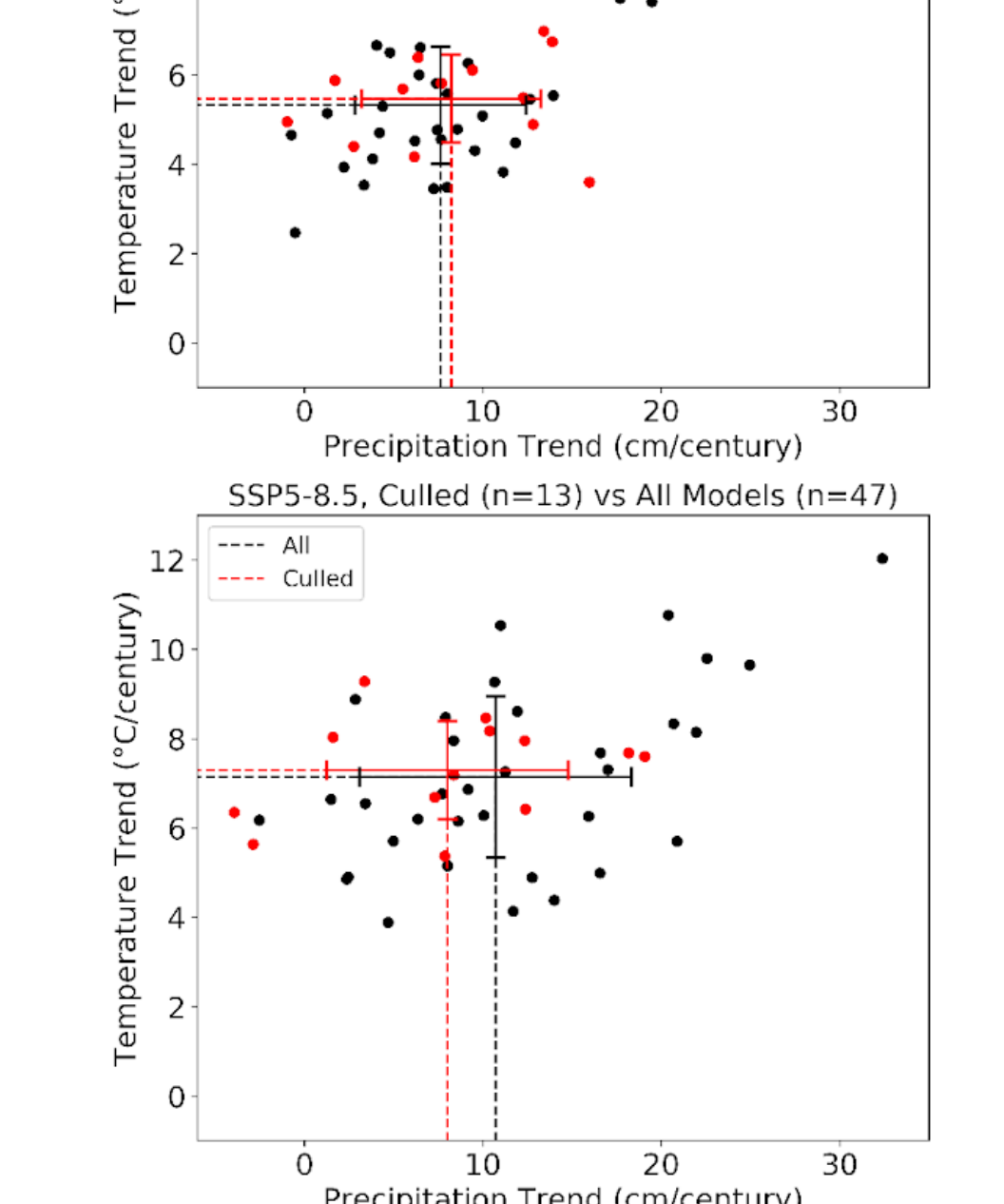
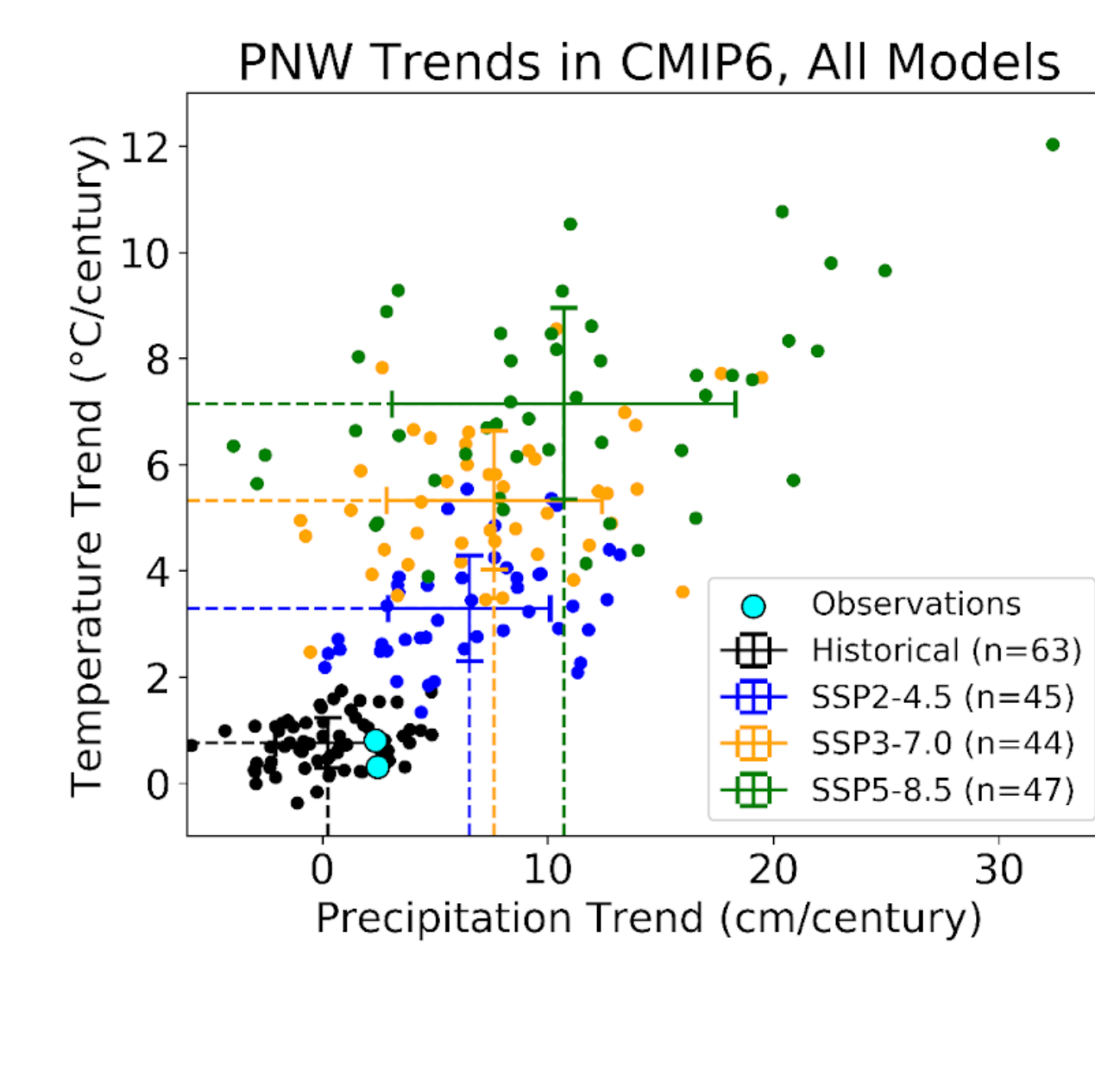
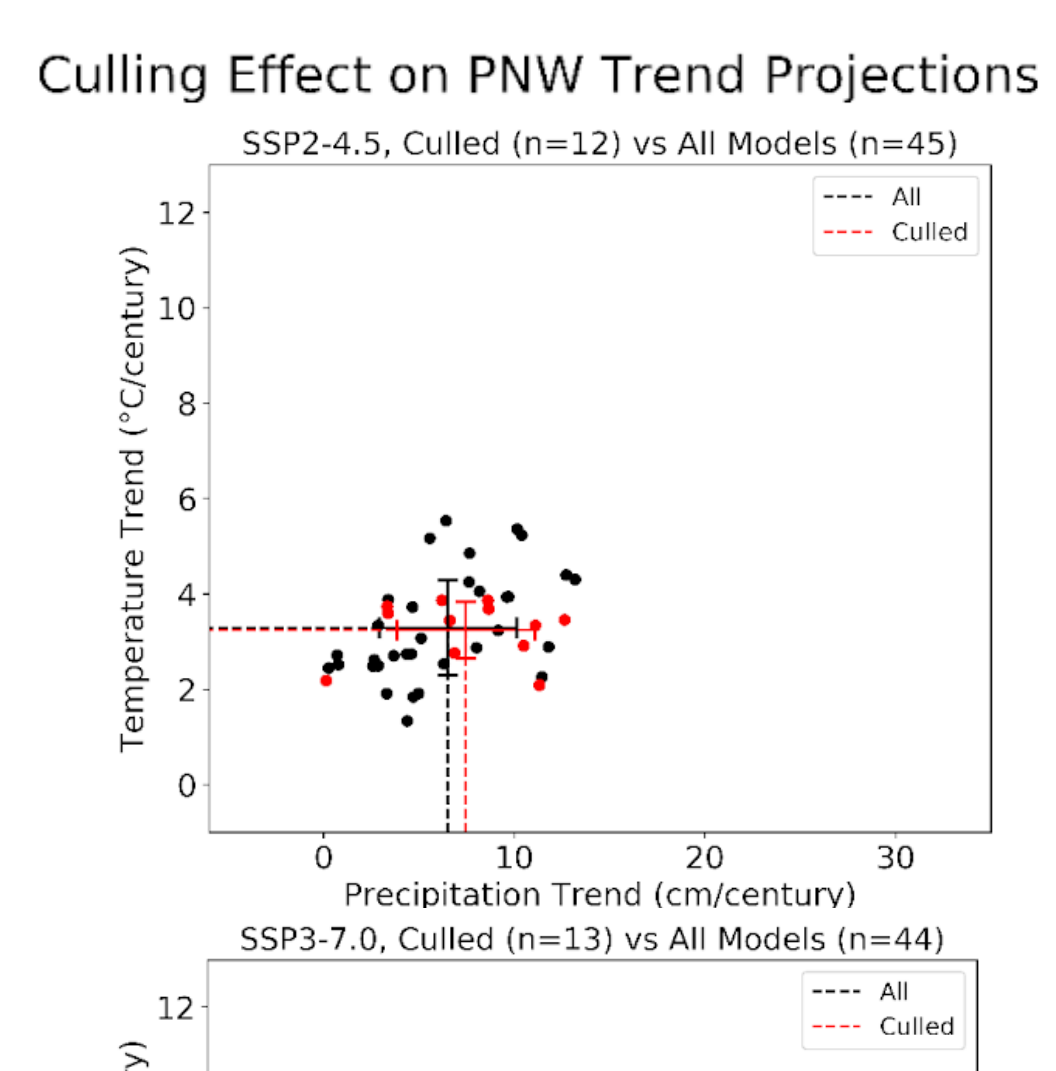
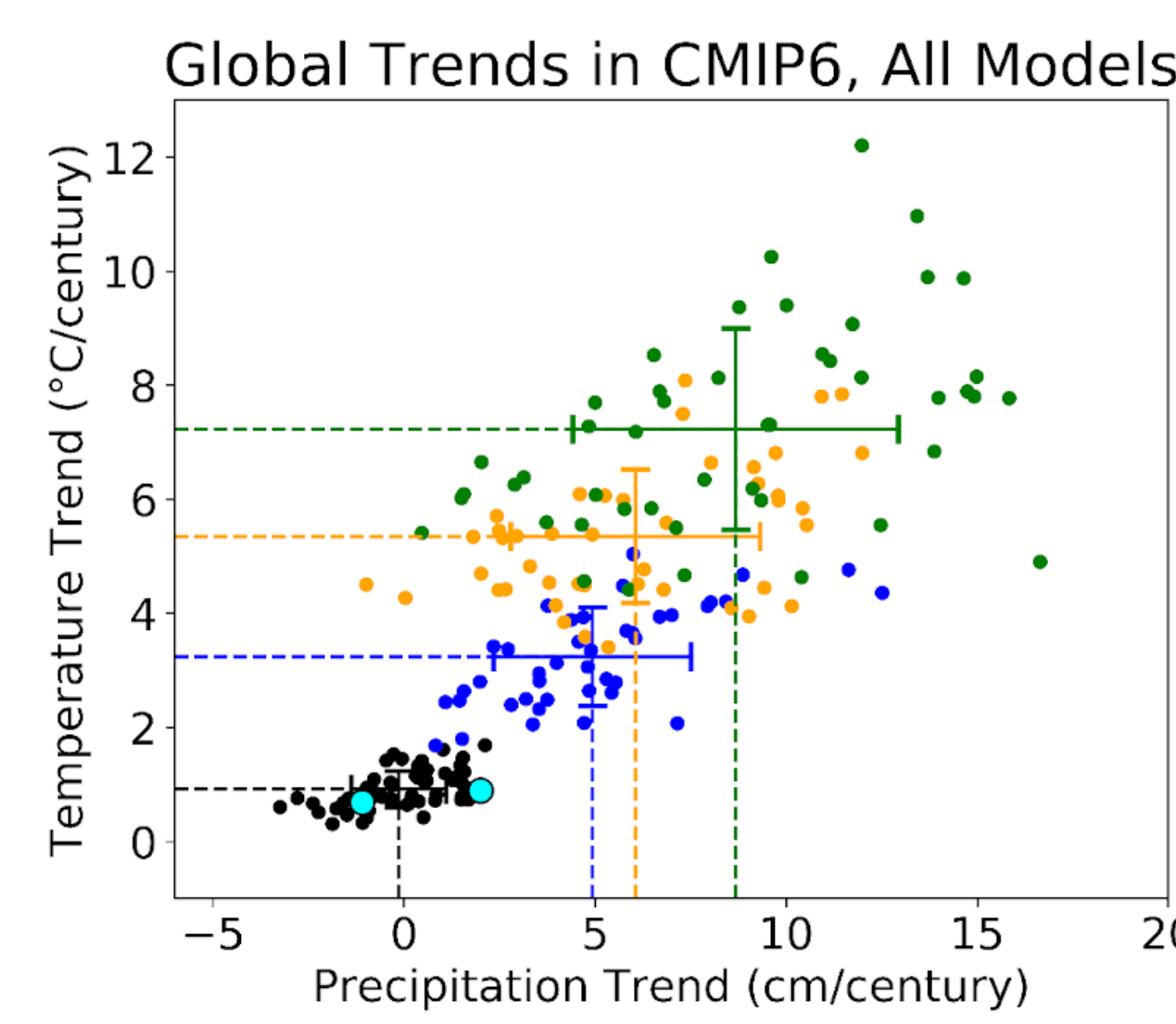
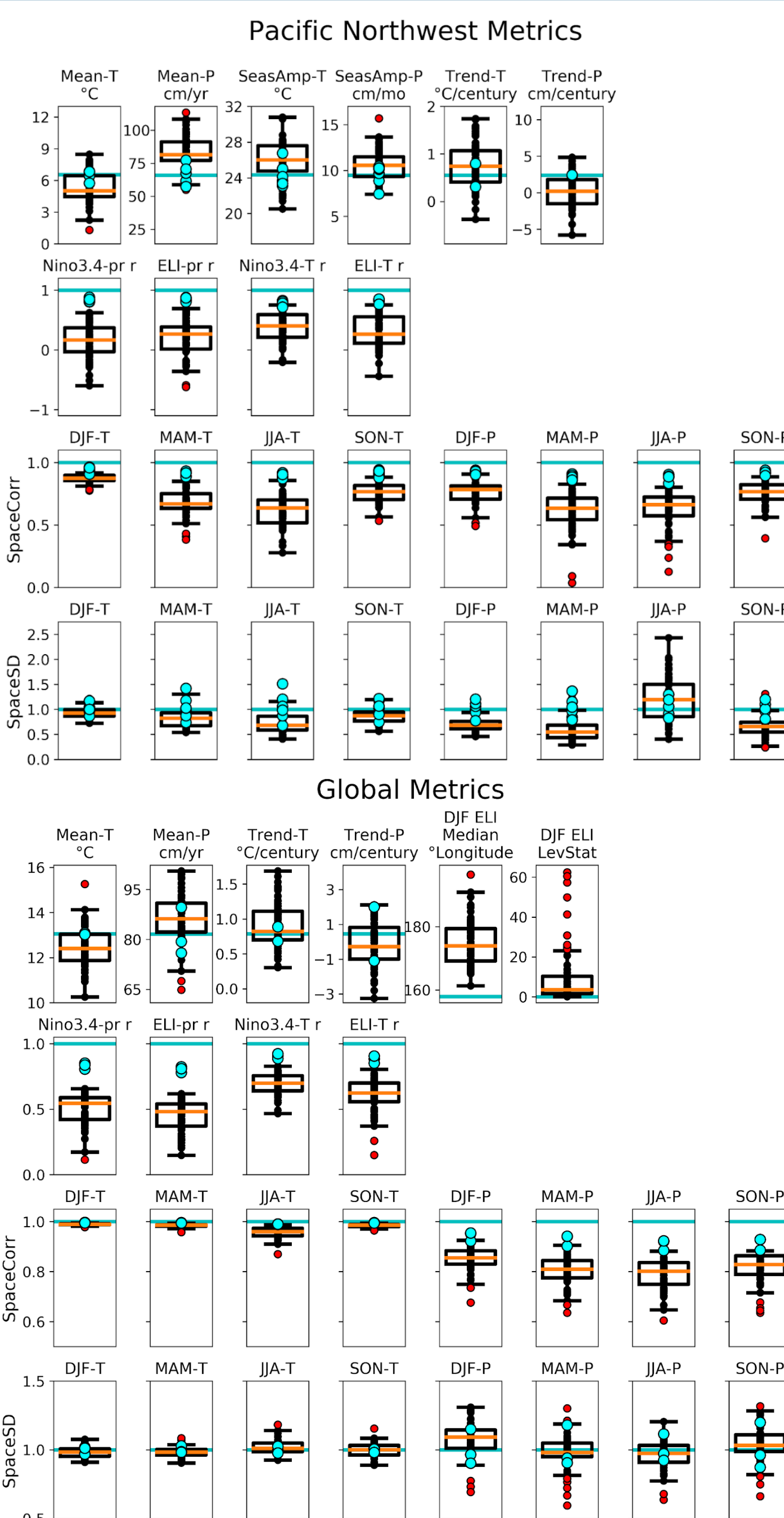
Methodology

- Suite of metrics variables and processes important for water availability projection developed.
- Models ranked based on relative metrics' performance, including both regional metrics over the PNW and global metrics (52 total metrics).
- Models culled based on optimal historical trend performance.
- Shared Socioeconomic Pathway runs analyzed based on culled model suite.
- Perfect model evaluation assesses each ESM's similarity to the rest of the CMIP6 suite.

MODEL RANKINGS



RESULTS



CONCLUSIONS AND FUTURE WORK

Conclusions

- Generalized framework for regional ESM evaluation developed.
- Results shown for PNW, but can be applied to any region across the globe.
- Culling criteria greatly reduce model ensemble size without significantly affecting trend projection envelope.
- Caveat: most extreme models culled due to outlying performance, may be concern for certain applications.
- Perfect model evaluation allows assessment of model similarity when considering models for applications.
- Python software used in this evaluation published on Zenodo (<https://doi.org/10.5281/zenodo.8231348>)

Future Work

- Forthcoming comparison with CMIP5 performance.
- Initial evaluations indicate that culled model ensemble would be untouched by including CMIP5 models in this evaluation.
- Generalize software to allow application to any input shapefile.
- Investigate further processed based metrics.

ACKNOWLEDGMENTS

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