

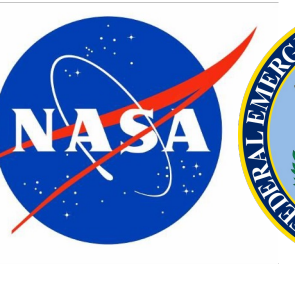


Poster 21

The Fall 2023 Interagency Workshop on Assessing U.S. Regional Climate Data for Decision Making

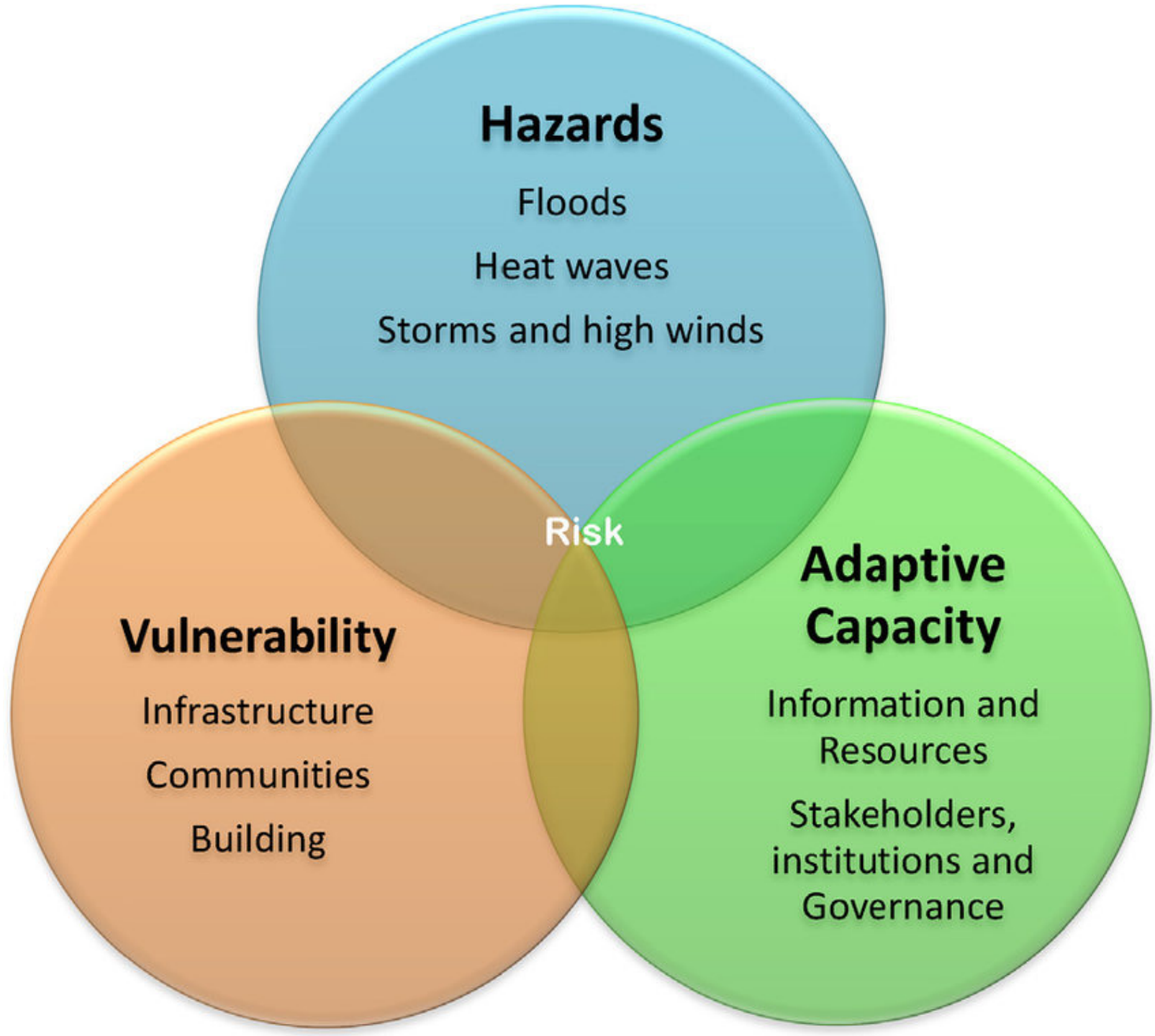
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With Major Contributions from Workshop Steering Committee and Workshop Attendees



Abstract

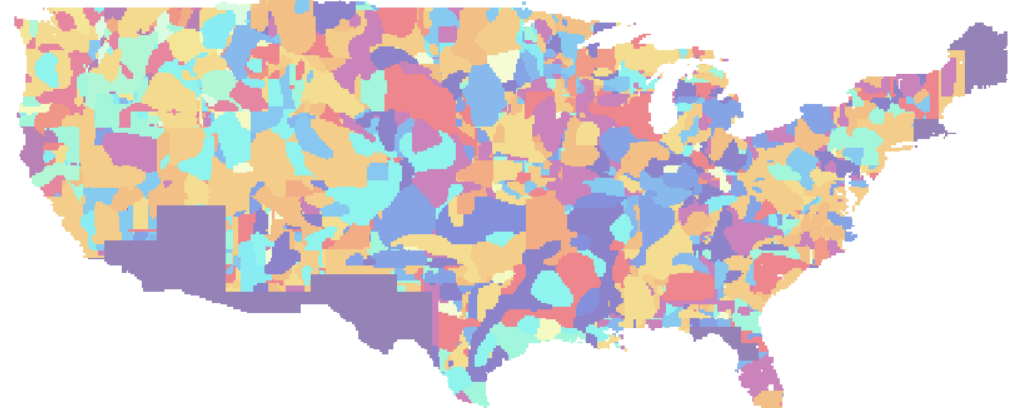
From November 14-16, 2023, the Lawrence Berkeley National Laboratory hosted the Decision-Relevant Climate Data Product (DRCDP) workshop. Dozens of attendees from National Labs, Universities, Research Centers, and Government Agencies attended and contributed.



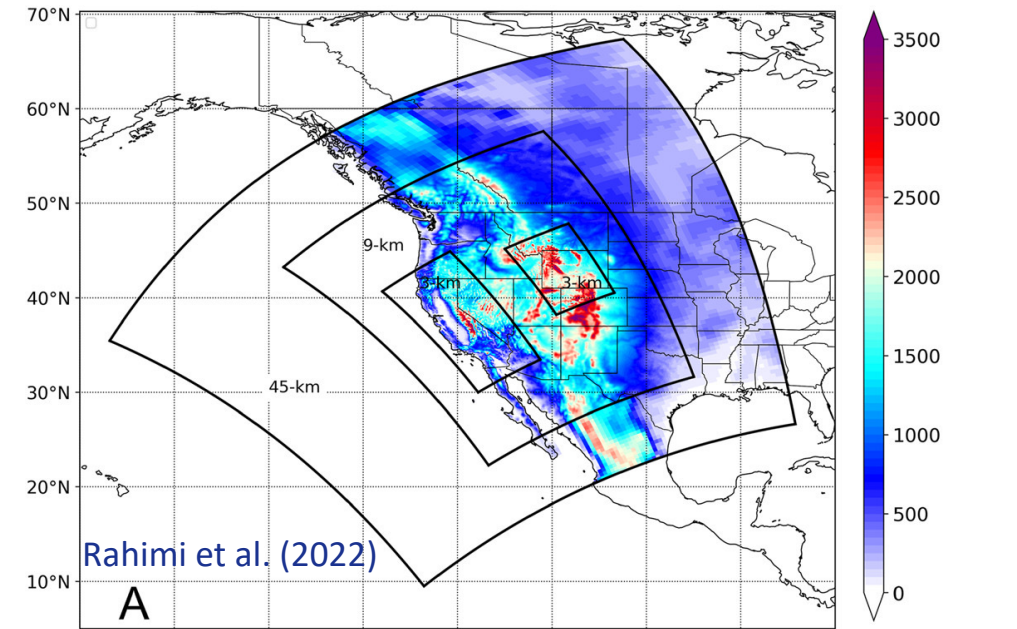
The Workshop focused on climate projections for the United States at <14 km resolution and brought together dataset producers, evaluators, translators, and end-users to discuss the state of statistical and dynamical downscaling of climate models for adaptation preparedness. A Workshop Report is currently being written to be finalized in May, 2024.

Decision-Relevant Data Products

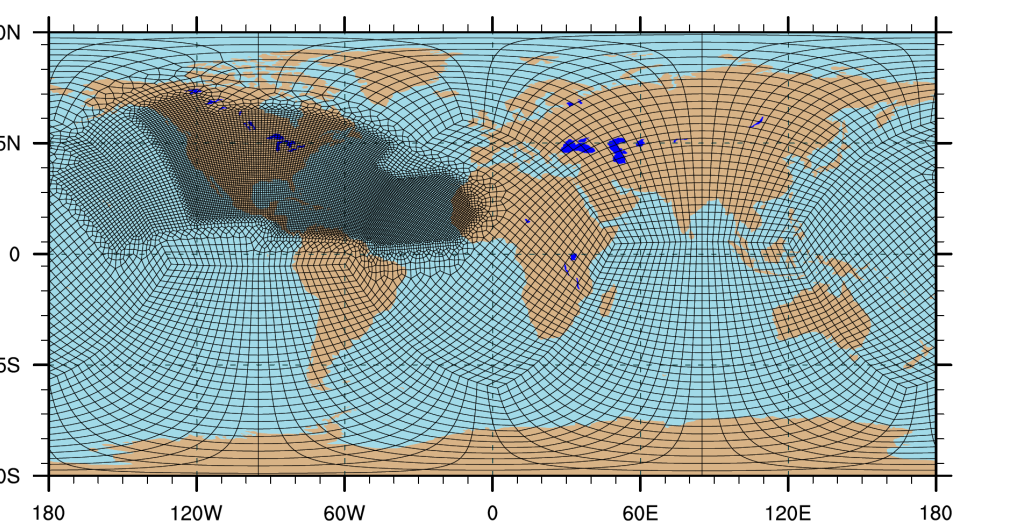
Statistically Downscaled Products (SDPs): Data products based on empirical and algorithmic relationships between coarse and fine scales, generally derived from observations (e.g., LOCA2, STAR-ESDM).



Dynamically Downscaled Products (DDPs): Data produced by regional climate models forced by coarse-resolution climate model inputs or reanalysis data.



Regionally-Refined Models (RRMs): Data produced using global climate models with nested or refined grids over a region of interest (e.g., DOE's E3SM).



Artificial Intelligence / Machine Learning (AI/ML): Cutting-edge techniques for downscaling and data generation using neural networks.

Statistically Downscaled Products	Grid Spacing	Years
Localized Analogues v2 (LOCA2)	4km	1950-2100 (multiple)
Seasonal Trends and Analysis of Residuals (STAR)	4km	1950-2100 (multiple)
Empirical-Statistical Downscaling Model (ESDM)	4km	1950-2100 (multiple)
Multivariate Adapted Constructed Analogues (MACA)	12km	1950-2100 (multiple)
Dynamically Downscaled Products	Grid Spacing	Years
Argonne Dynamically Downscaled Archive (ADDA)	12km and 4km	30 hist + 30 future (x3 models)
IM3/HyperFACETS TGW Ensemble	12km	40 hist + 40 PGW (x8 scenarios)
NCAR CONUS1 Product	4km	13 hist + 13 RCP8.5
NCAR CONUS2 Product	4km	21 hist + 21 RCP8.5
NCAR CONUS404 Product	4km	42 hist + 44 SSP370
PNNL Western US Product	6km	42 hist + 30 PGW (x5 ensemble)
Western U.S. Dynamically Downscaled Dataset	9km and 3km	40 hist + 85 SSP370 (x9 ensemble)

Why Do We Choose a Particular Product?

Selection of climate data products often occurs via:

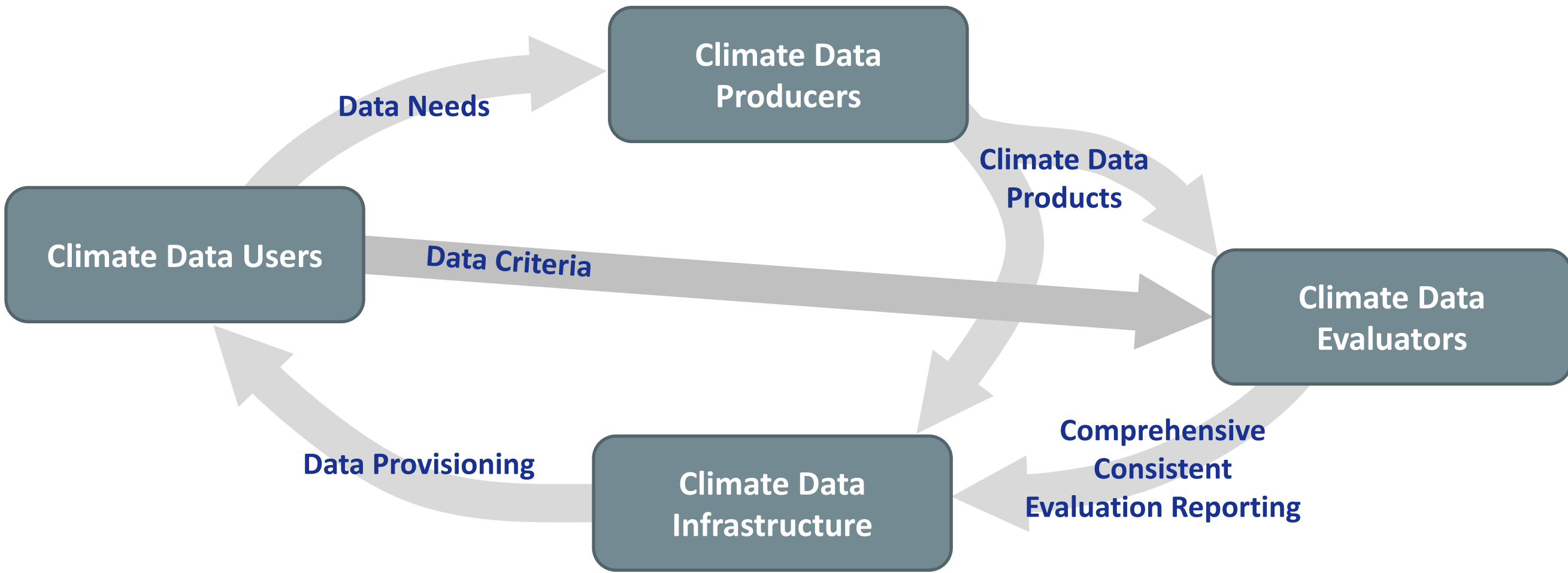
- Word-of-mouth
- Existing collaborations
- Agency affiliation
- Government mandate
- Use elsewhere
- Highest resolution available
- It's what's available

To a significant degree, this is because of:

- A lack of coordination in development
- A lack of standards for evaluation
- No user-ready evaluation tools
- Gaps in research on metrics and diagnostics
- No agreement on who should perform evaluation

Multiple data products are demonstrably superior to singular data products, but incompatibilities and inconsistencies means multiple products are rarely used in practice.

The Need for a Community of Practice



Common standards can streamline communication among community members and reduce the effort necessary to incorporate data in the decision process. With the November 14-16 Workshop, the seeds of a Community of Practice are now being planted.



Community of Practice Challenges

Grand Challenges:

- A common framework for decision-relevant climate data that includes common variable names and file metadata.
- A common framework for climate data product evaluation, including metrics, diagnostics and other relevant criteria.
- Cyberinfrastructure to support cataloguing and provisioning of decision-relevant climate data products.

Near-Term Challenges:

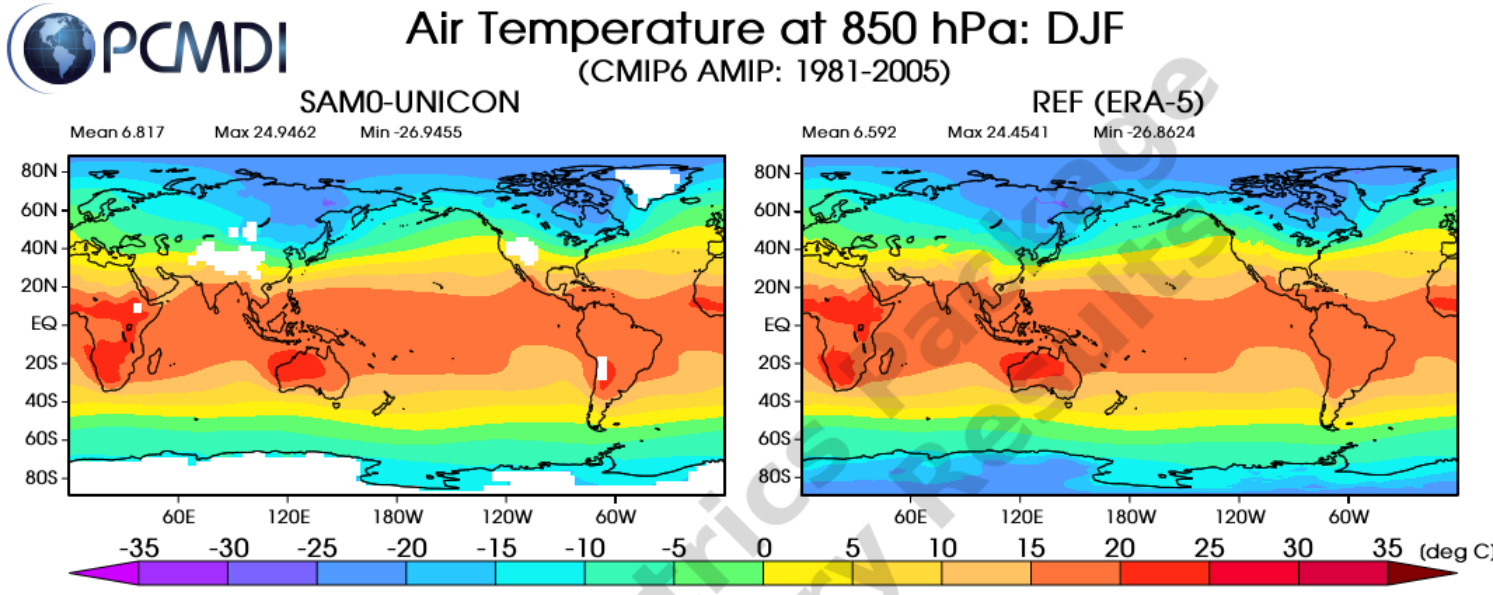
- Establish a common vocabulary
- Identify glaring gaps in presently-available data products
- Avoid redundancy and leverage limited computational resources
- Develop guidance for Federal approval of data products (e.g., for NCA6)
- Improve understanding of how decision-makers use climate data

Credibility Through Evaluation

The credibility of downscaling data is end-user dependent and relies on the skill of such data determined through evaluation against a range of metrics, many of which share common themes.

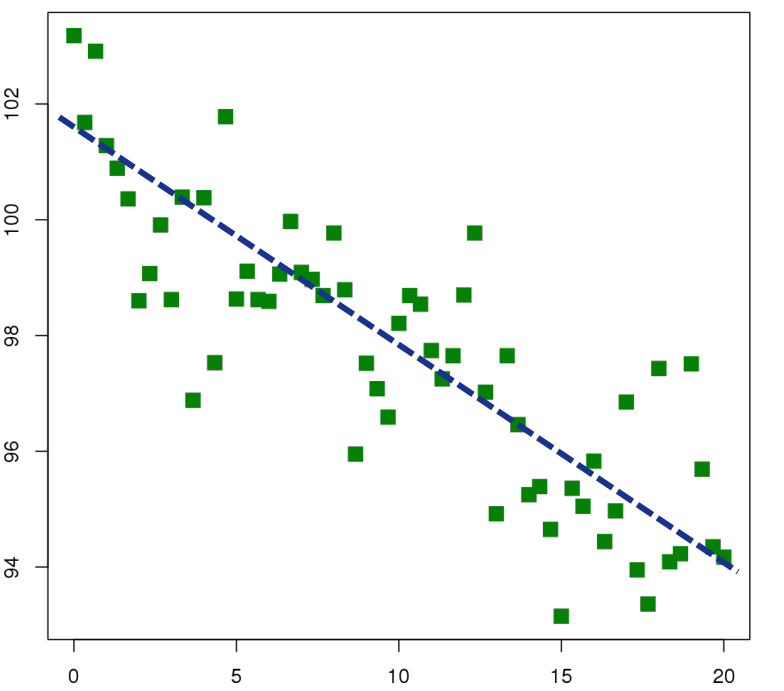
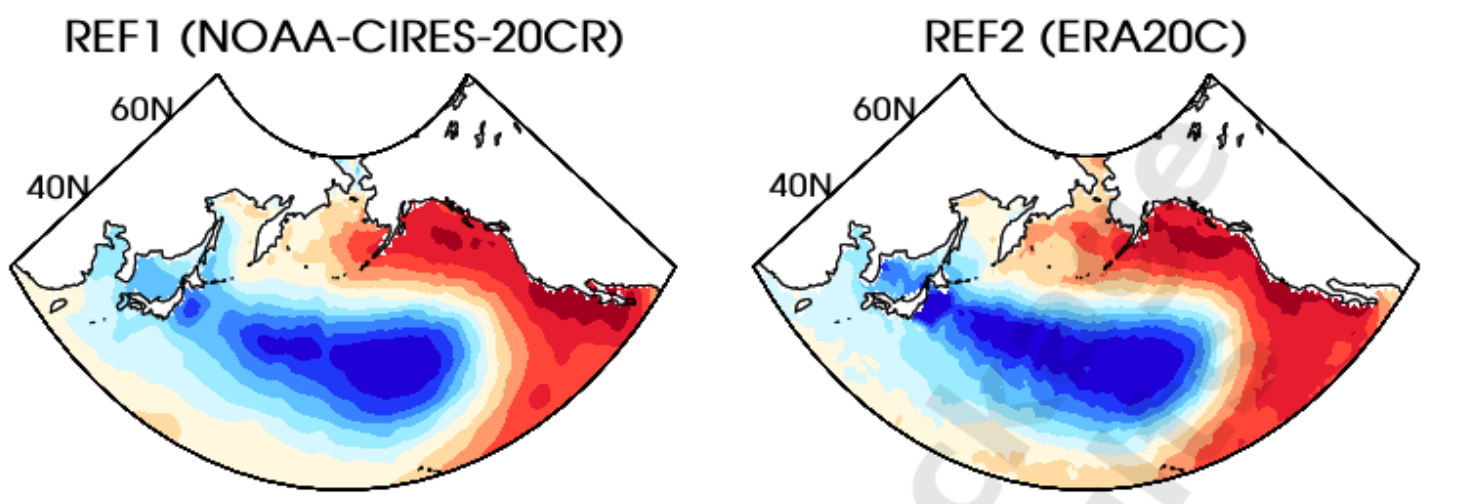
Average:

Mean state reproduction is an initial metric for establishing credibility.



Pattern:

Higher-order relationships (pattern Correlation, RMSE, etc) in atmosphere and surface variables can be relevant for end-users

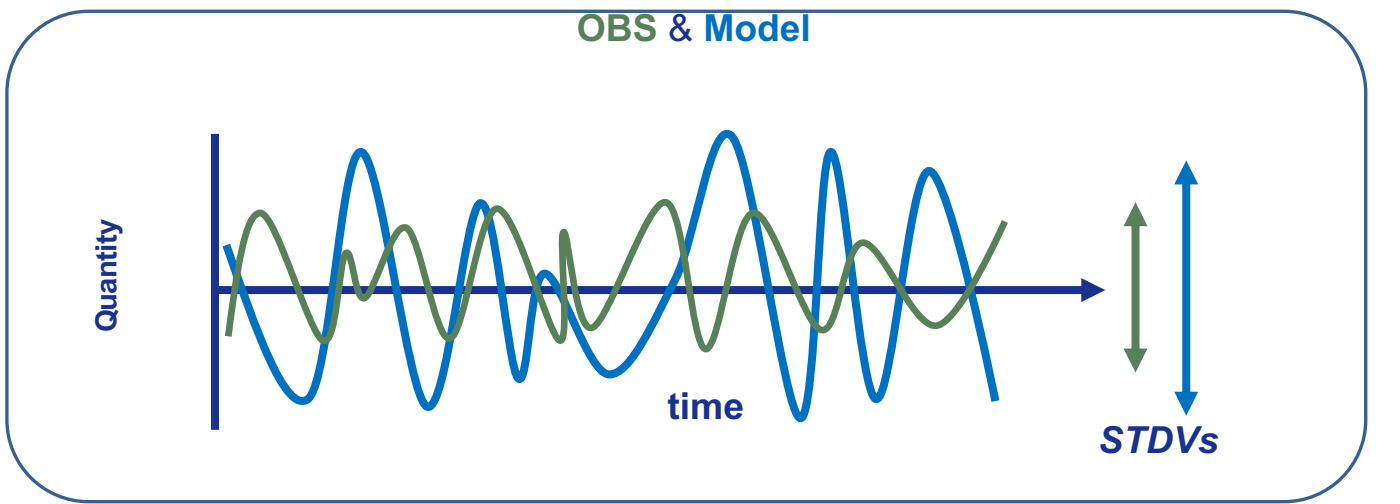


Physical Relationships:

Known physical relationships between climate data product values need to be reproduced in those products.

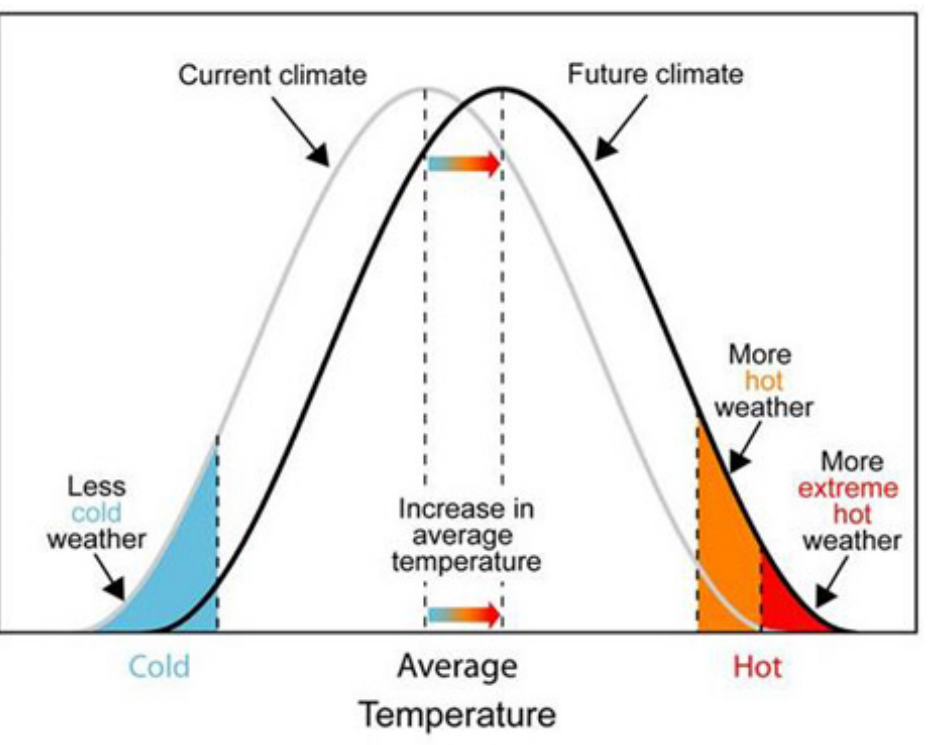
Variability:

Variance, standard deviation, and higher-moment statistics



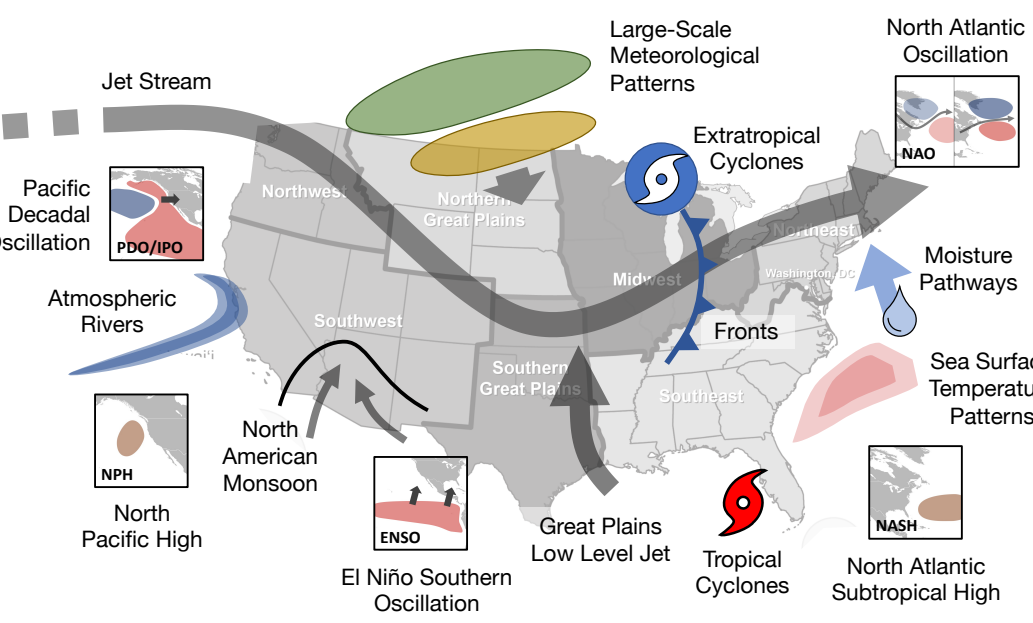
Extremes:

Climate data products need to be configured to estimate historical extreme events and their future changes.



Processes:

Climate impacts are generally the result of atmospheric and surface processes. Process evaluation strongly supports the credibility of projections.



Workshop Report

Following up on the Workshop, the attendees are currently drafting a Workshop Report that will be finalized in May, 2024. This Report, sponsored by the U.S. Department of Energy and SERDP/ESTCP, will include contributions from most Workshop participants and will focus on (1) the current state of downscaling datasets and their connections to end-users, practitioners, and translators, and (2) what is required to stand up a viable Community of Practice.

Acknowledgements

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