Integration of Decision-Making with Predictive Capacity for Decadal Climate Impacts

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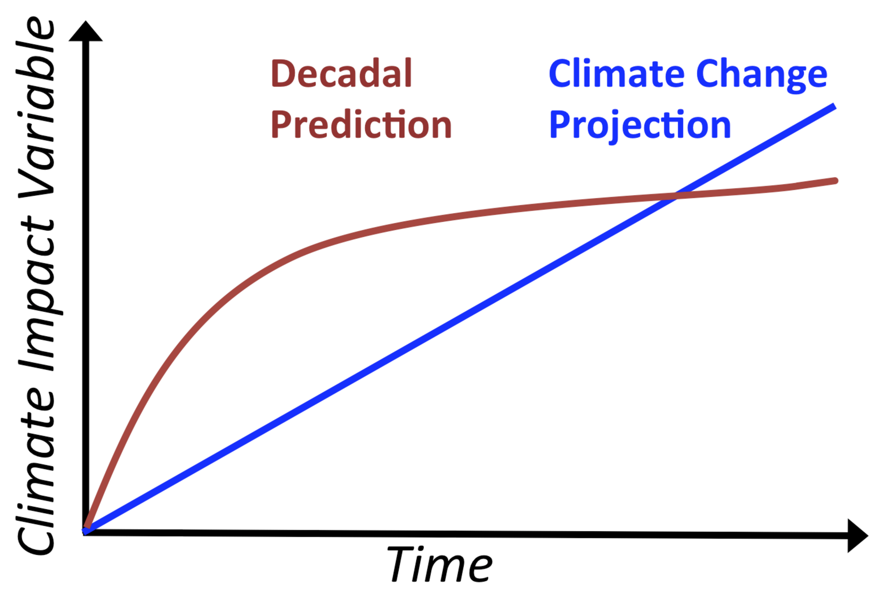
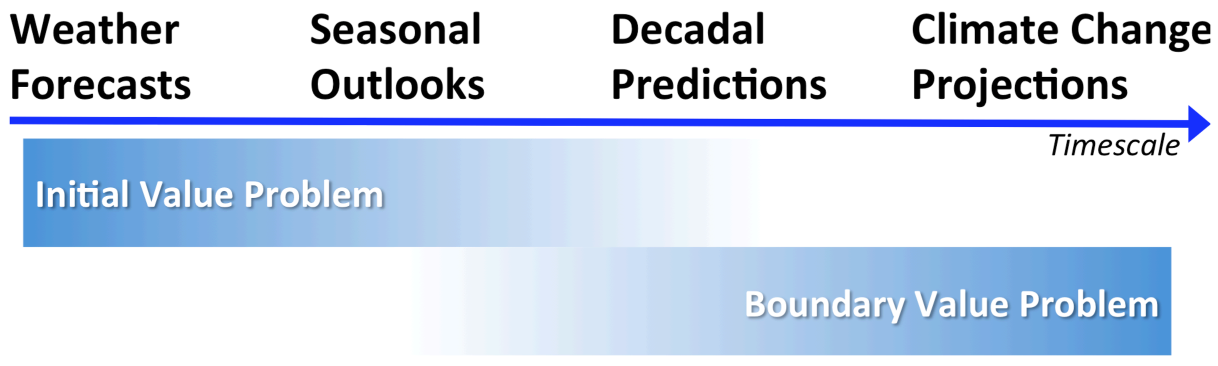
1 Introduction

Decadal prediction seeks to predict the time-varying trajectory of climate over the next 5-30 years.



Decadal prediction skill arises from:
i) initialization, and ii) forcing due to increased greenhouse gases and climate change commitment.

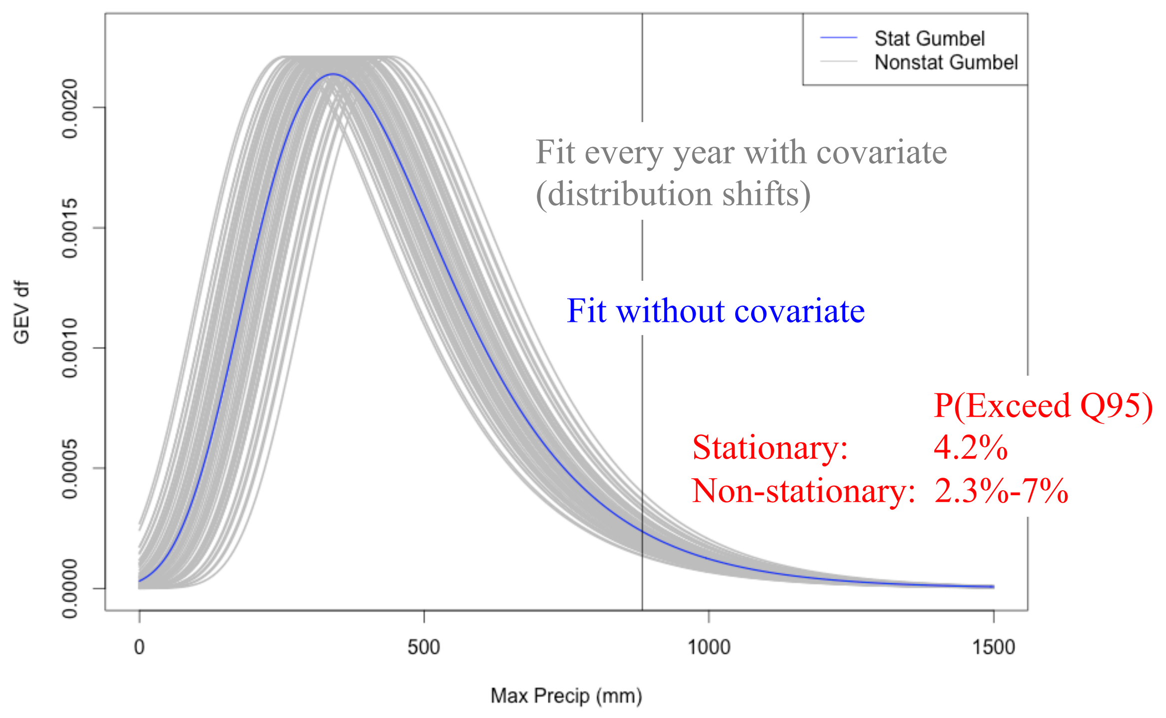


Adapted from Meehl et al. (2009)

2 Towards Decadal Impacts

Physical mechanisms connecting local extremes and the larger scale, more slowly varying, and crucially *predictable,* components of the climate system suggest an untapped source of decadal predictability of local high-impact weather.

Example: Annual average Atlantic Multi-Decadal Oscillation is significant (p = 0.024) as a covariate to predict maximum summer precipitation at Carlsbad, New Mexico.



Advance warning of shifts across thresholds of vulnerable systems could allow for mitigation of future costs and maximize potential benefits.

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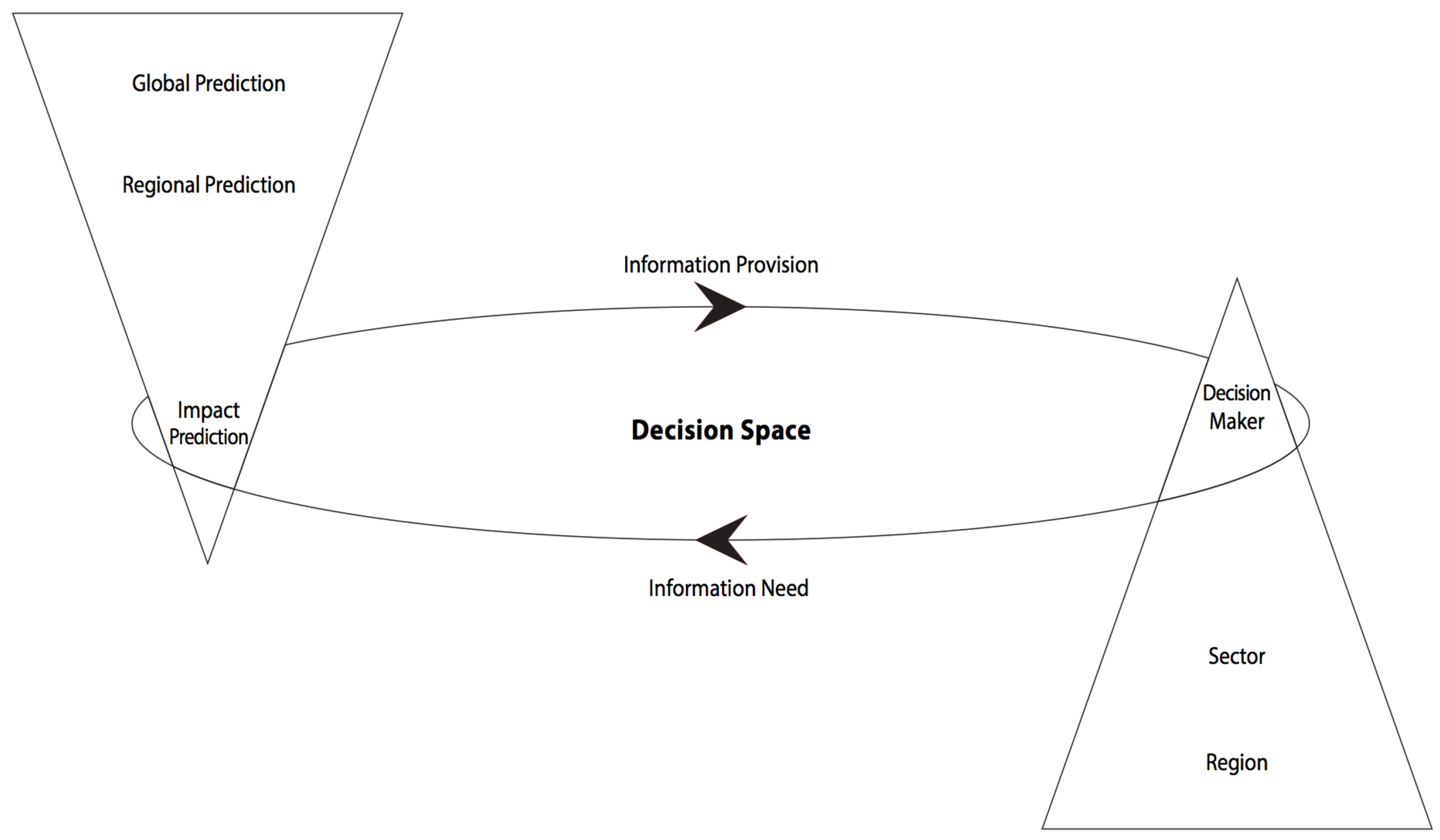
Gerald A. Meehl, and CoAuthors 2009: Decadal Prediction. *Bull. Amer. Meteor. Soc.*, **90**, 1467–1485.

3 Approach

1. Understand societal need and usage of decadal predictive information;
2. Build predictive capacity of the needed information by combining our developing dynamical modeling capability with observed data via advanced statistical models.



Aligning information needs with information provision will be achieved through continuous ***iteration between the impact prediction and the information need*** and usage by the decision maker within the decision space.

4 Case Studies

1. Russian River Valley

Hazards: flood and drought.
Imperatives: Water provision, sanitation, flood management.
Stakeholder: Project partner CH2M Hill, an engineering consultancy.
High Vulnerable to rainfall extremes of rainfall.

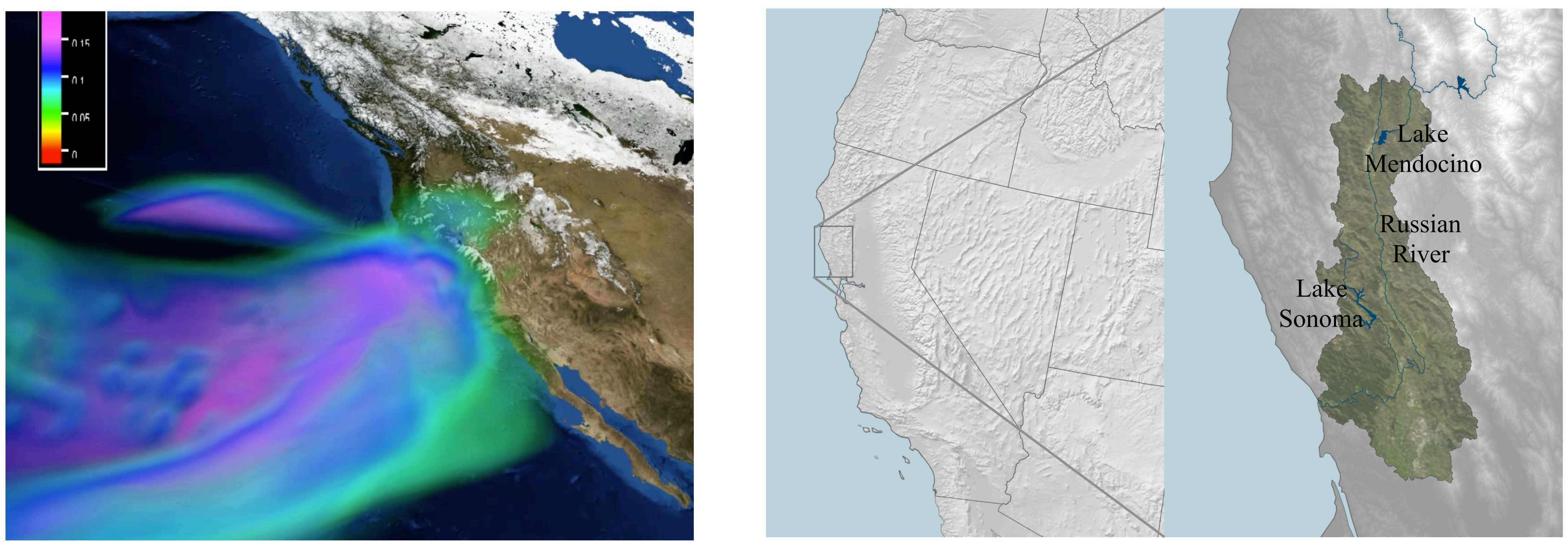


Figure: (left) Simulated water vapor flux (kgkg^{-1}ms^{-1}) showing a California winter storm. (right) Maps of the Russian River watershed (source: NOAA climate.gov).

2. Cities of Denver and Boulder

Hazard: Flood
Imperatives: Urban drainage and flood control.
Stakeholder: Project partner CH2M Hill.

5 Summary

A major project outcome will be a generalized integrated and interdisciplinary framework that integrates information needs with the provision of skillful predictive information.

This will transform how scientists from multiple disciplines and practitioners conceptualize decadal climate prediction.