

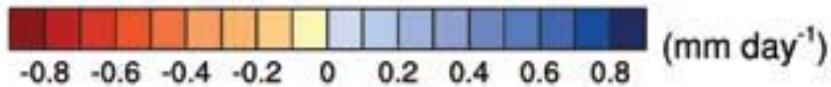
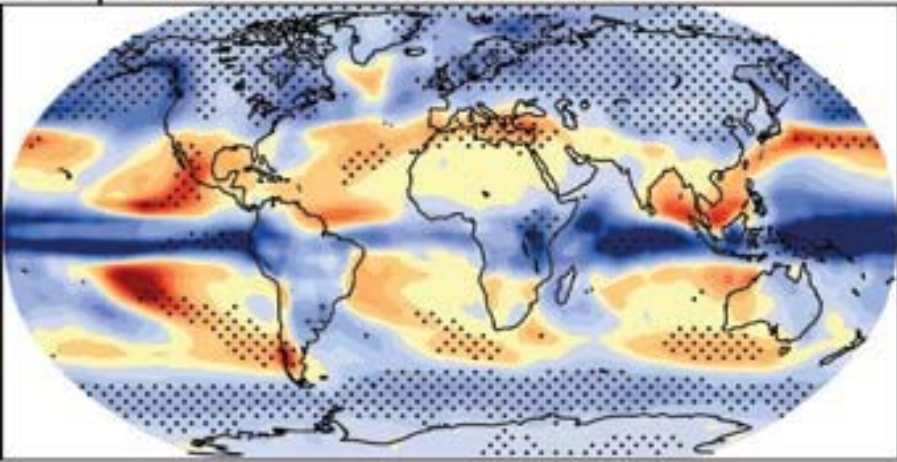
Climate Change and Water

Julie Winkler

ESPP “Mixer”

October 3, 2008

Precipitation A1B: 2080-2099 DJF



Precipitation A1B: 2080-2099 JJA

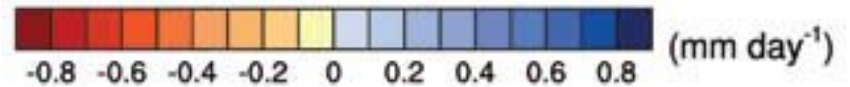
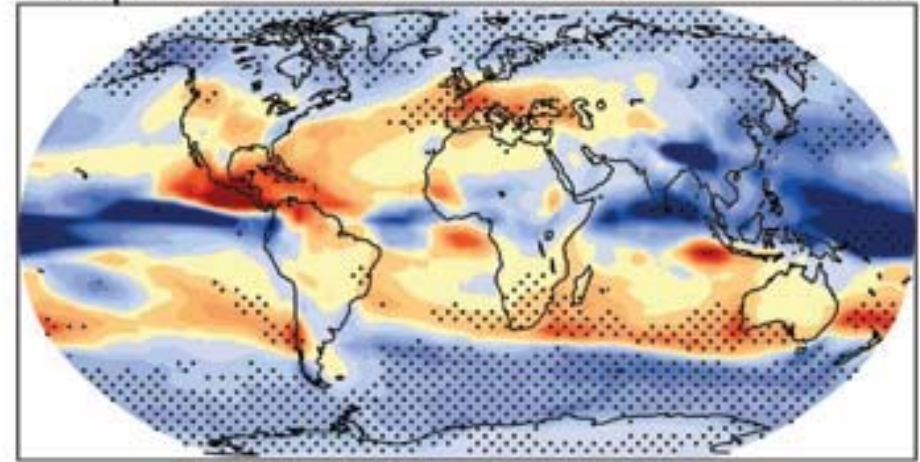
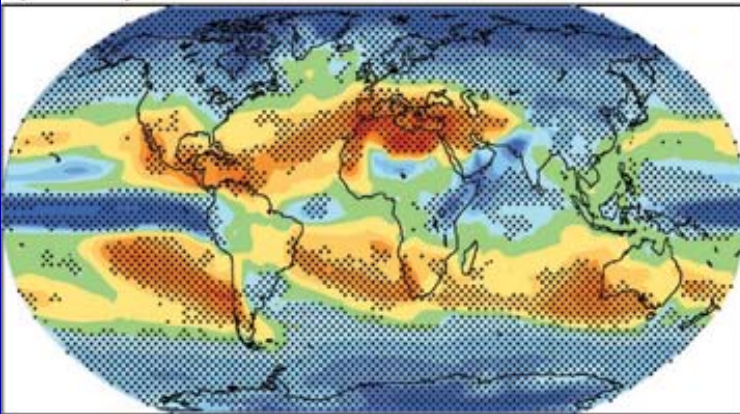
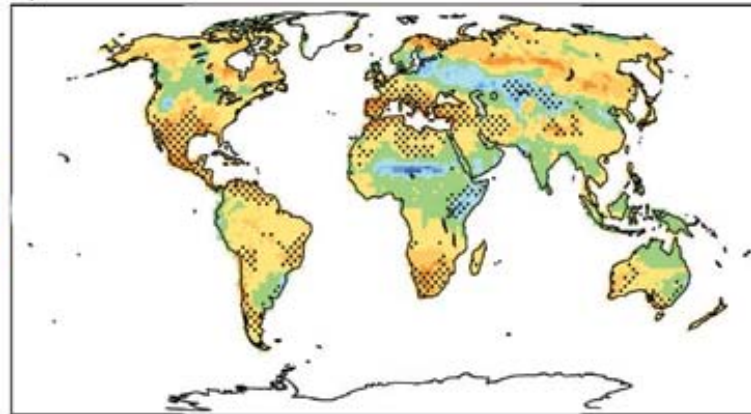


Figure 2.7: Fifteen-model mean changes in precipitation (unit: mm/day) for DJF (left) and JJA (right). Changes are given for the SRES A1B scenario, for the period 2080–2099 relative to 1980–1999. Stippling denotes areas where the magnitude of the multi-model ensemble mean exceeds the inter-model standard deviation. [WGI Figure 10.9]

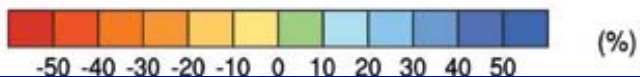
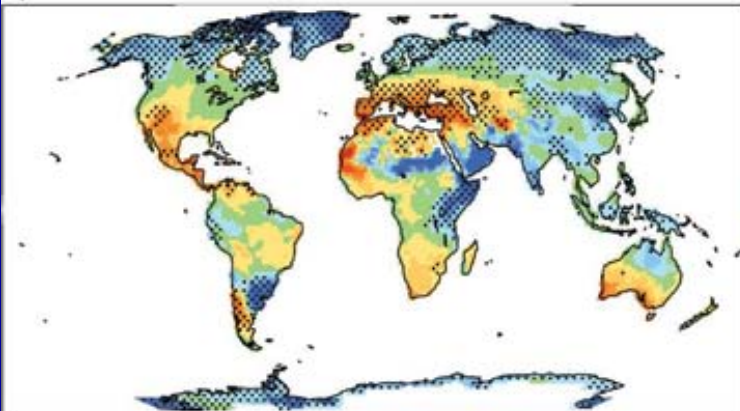
a) Precipitation



b) Soil moisture



c) Runoff



d) Evaporation

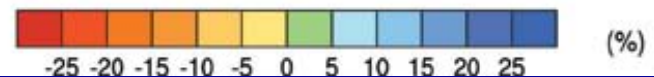
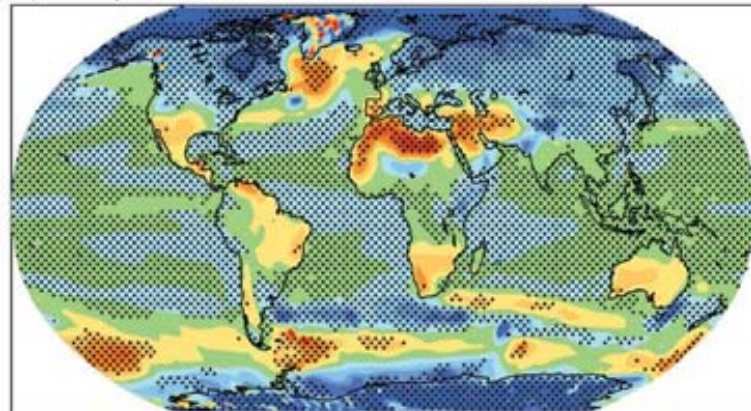


Figure 2.8: Fifteen-model mean changes in (a) precipitation (%), (b) soil moisture content (%), (c) runoff (%), and (d) evaporation (%). To indicate consistency of sign of change, regions are stippled where at least 80% of models agree on the sign of the mean change. Changes are annual means for the scenario SRES A1B for the period 2080–2099 relative to 1980–1999. Soil moisture and runoff changes are shown at land points with valid data from at least ten models. [Based on WGI Figure 10.12]

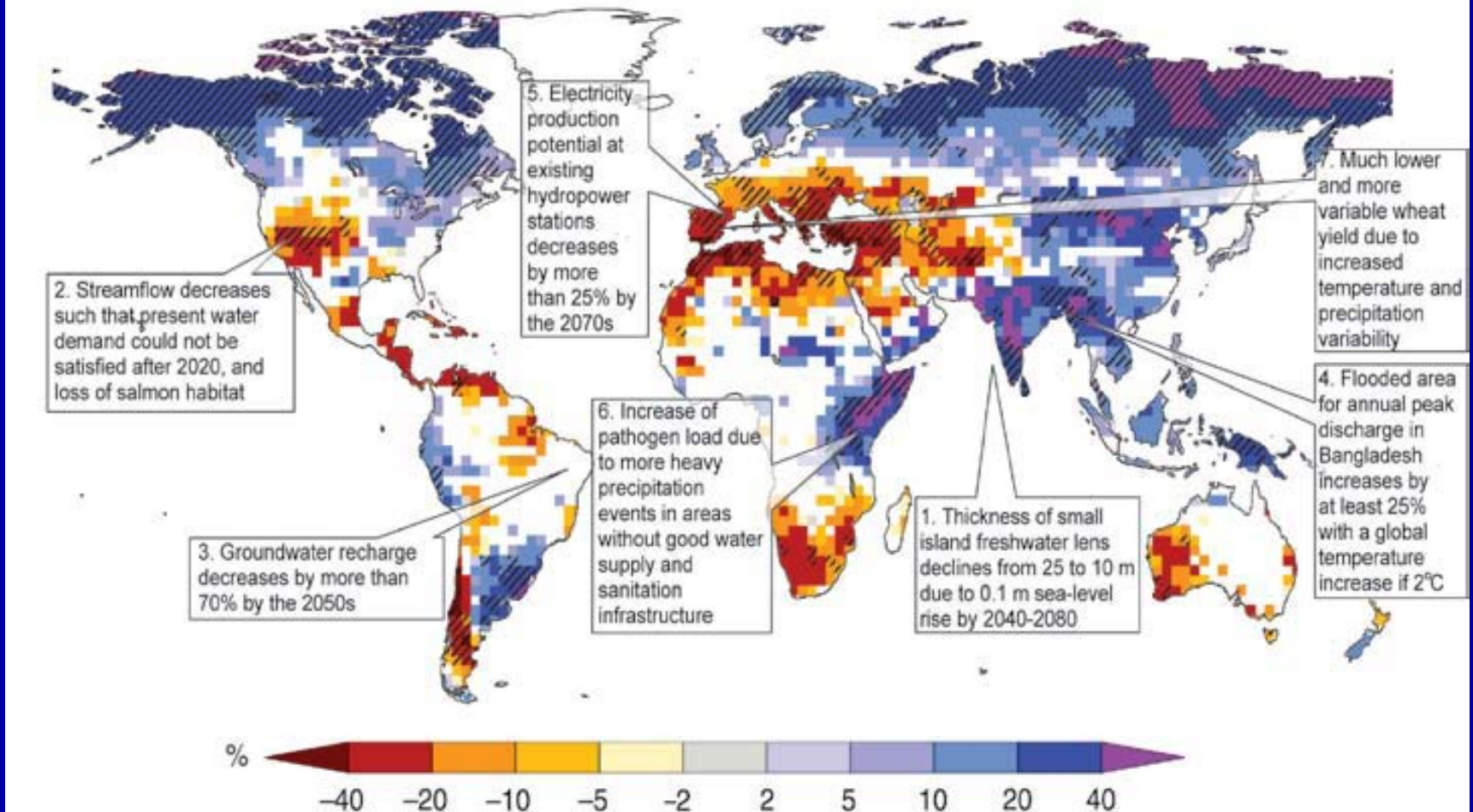
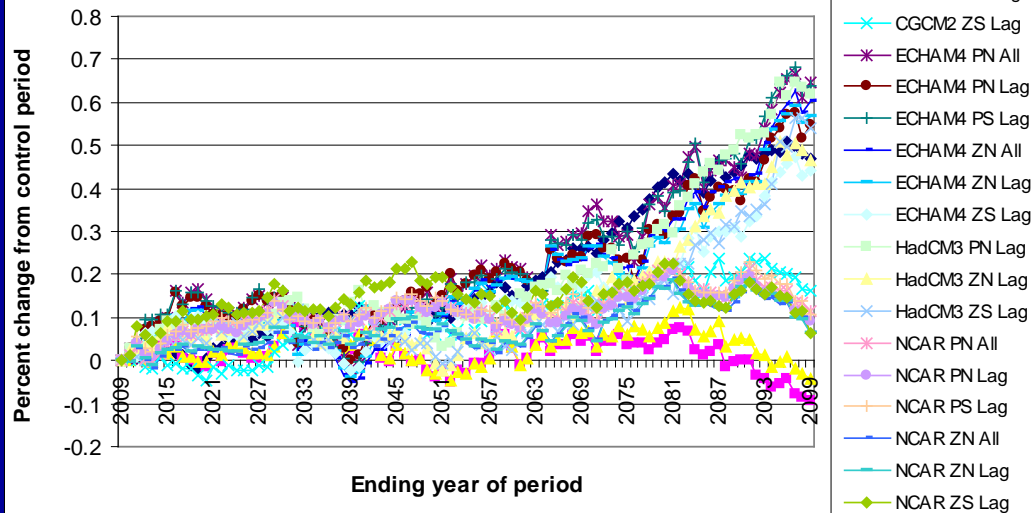


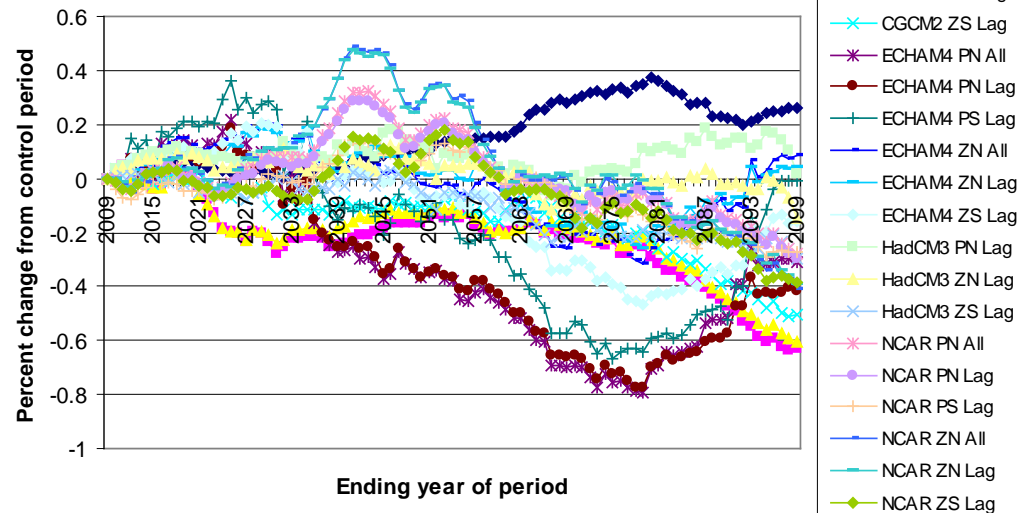
Figure 3.4: Illustrative map of future climate change impacts related to freshwater which threaten the sustainable development of the affected regions. 1: Bobba et al. (2000), 2: Barnett et al. (2004), 3: Döll and Flörke (2005), 4: Mirza et al. (2003), 5: Lehner et al. (2005), 6: Kistemann et al. (2002), 7: Porter and Semenov (2005). Background map, see Figure 2.10: Ensemble mean change in annual runoff (%) between present (1980–1999) and 2090–2099 for the SRES A1B emissions scenario (based on Milly et al., 2005). Areas with blue (red) colours indicate the increase (decrease) of annual runoff. [Based on WGII Figure3.8 and SYR Figure 3.5]

**Change in spring (March, April, May) precipitation
for 20-year overlapping periods, 1990-2099
Eau Claire, A2 scenarios**



Downscaled Precipitation Scenarios for Eau Claire, Michigan

**Change in summer (June, July, August) precipitation
for 20-year overlapping periods, 1990-2099
Eau Claire, A2 scenarios**



Pileus Project
Climate Science for Decision Makers

The *Pileus Project* was funded by EPA.

Tools > [Future Scenarios Tool](#)

Future Scenarios Tool

[Learn about this tool](#) [User Cases](#)

Select a Result Option for Eau Claire

Reference Climate

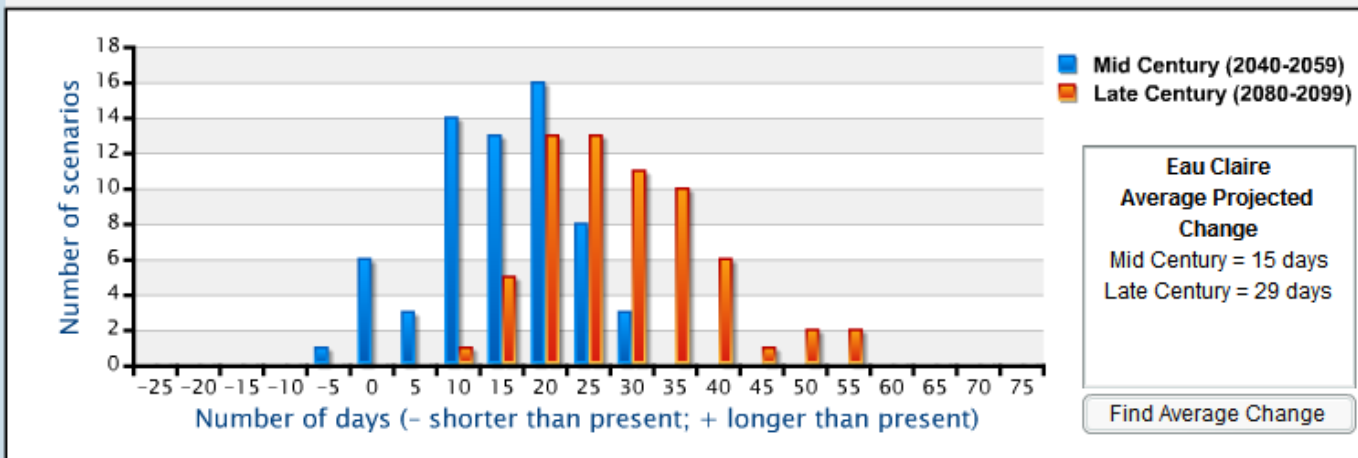
Early vs. Mid Century

Mid vs. Late Century

A2 vs. B2 for Early Century

Trend 1990-2099

**Projected Change in the
Median Length of the Growing Season**



Help

[Definitions of Terms](#)

[Interpretation Guide for:](#)

[Comparison by Period](#)

[Back to Input](#)

**Potential Impacts of
Climate Variability and Change on
Water Quantity and Quality in the
Great Lakes Region**

*April 28, 2008
8:00 AM – 5 PM*



*The James B. Henry Center for Executive Development
3535 Forest Road
Lansing, MI 48910-3831*

Funded by ESPP

MICHIGAN STATE
UNIVERSITY

Potential Impacts

- Potential for both positive and negative impacts
 - Impact will vary with the nature of the climate change and the character of the industry/system

Research Needs

- **Better monitoring**
 - Denser weather/climate network
 - Monitoring of water cycle components (e.g., evapotranspiration)
 - Enhanced monitoring of water quality indicators
 - Information specific to the individual lakes (each lake is different)
- **Improved Modeling/Integrated Modeling**
 - Finer resolution (time and space)
 - Improved coupling between climate models and hydrologic models
 - Integration of land use, economics, and policy into integrated modeling
 - Better user interfaces
- **Adaptation**
 - Research on adaptation options
 - Analysis of costs of mitigation/adaptation including costs of no adaptation/mitigation
- **Social/economic aspects**
 - Research on demographics and population shifts
 - Social acceptable risk of water quality
- **Attitudes and communication**
 - Attitudes towards conservation
 - Communication strategies
- **Human Health**
 - Better understanding of extreme weather events on water quality
- **Policy/Management**
 - Development, application and evaluation of policy strategies for water conservation (e.g., incentives and disincentives)
 - Development and evaluation of management practices
 - Mechanisms for resolving disputes

Summary

- There are excellent opportunities for interdisciplinary research on water and, in particular, climate change and water, here at MSU.