Climate Science in Support of Adaptation Planning: *Assessing Changes in Washington State Urban Air Quality*

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Climate Science in the Public Interest

Dealing with Climate Change: Mitigation

Mitigation activities

Reducing emissions of greenhouse gases

Dealing with Climate Change: Mitigation and Adaptation

Mitigation activities

Reducing emissions of greenhouse gases

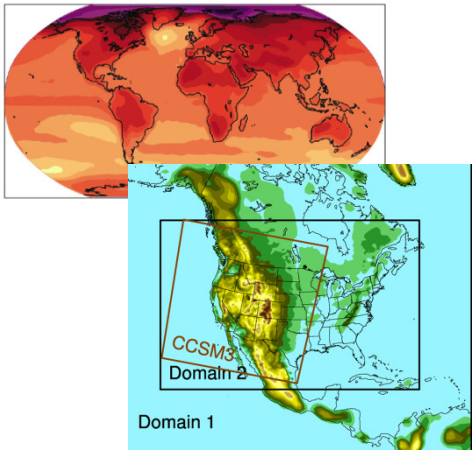
Adaptation activities

Managing the change that occurs as mitigation strategies are implemented.

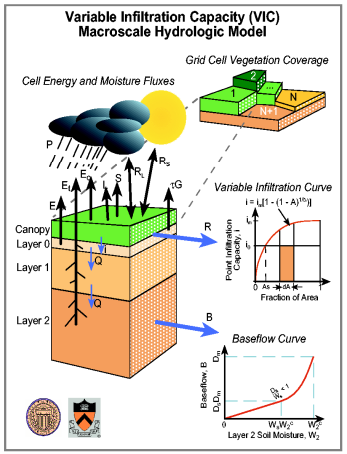
The Climate Impacts Group

An interdisciplinary research team studying the impacts of climate variability and climate change in the PNW and western U.S.

Downscaling global climate model projections

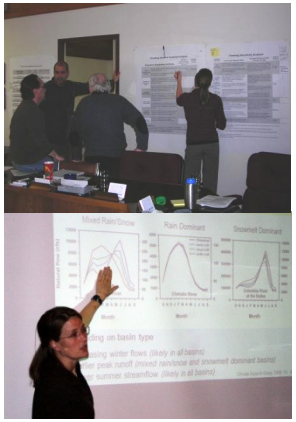


Macro and fine-scale hydrologic modeling



Impacts assessments for water resources, terrestrial and aquatic ecosystems

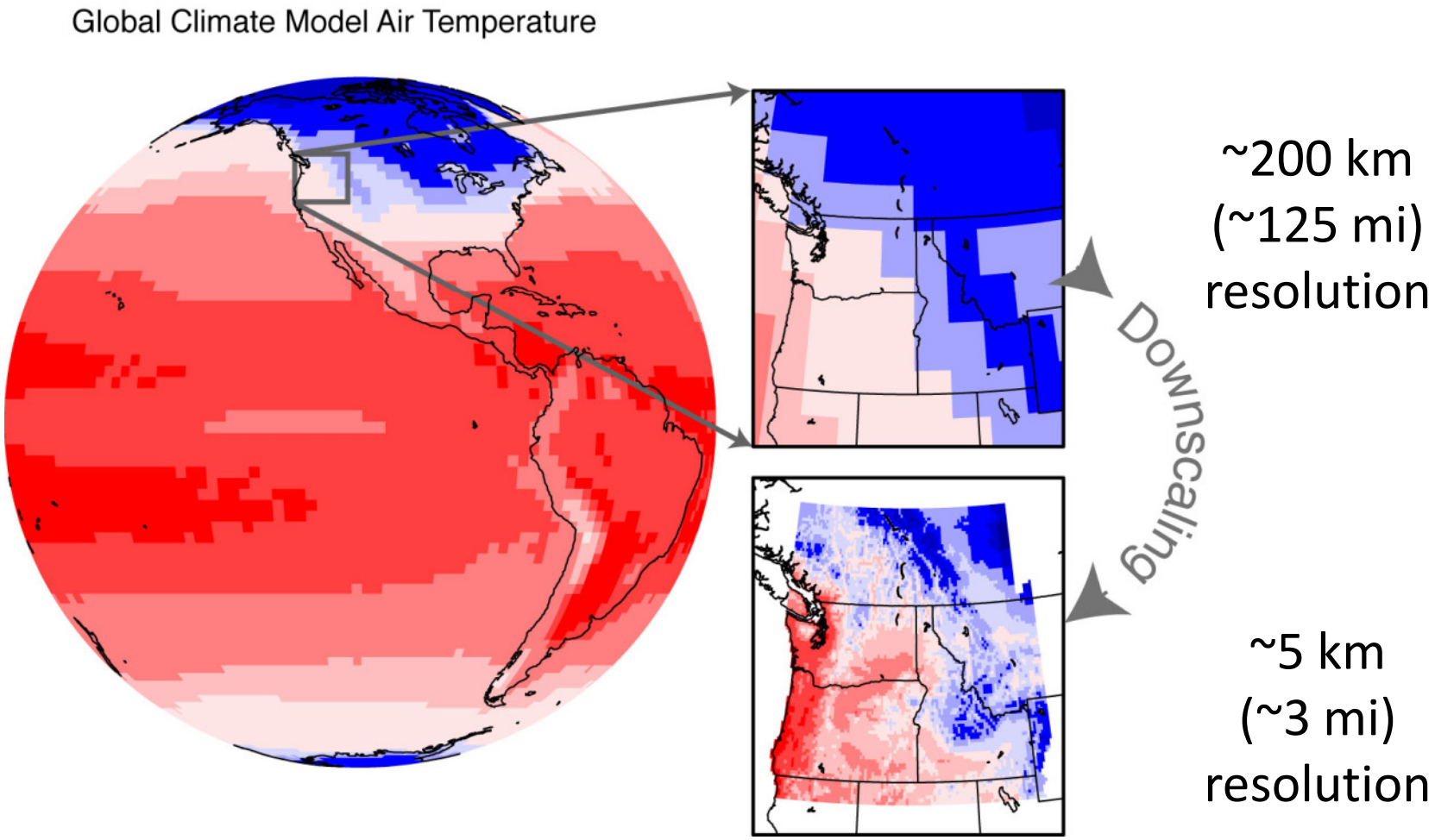
Adaptation planning and outreach



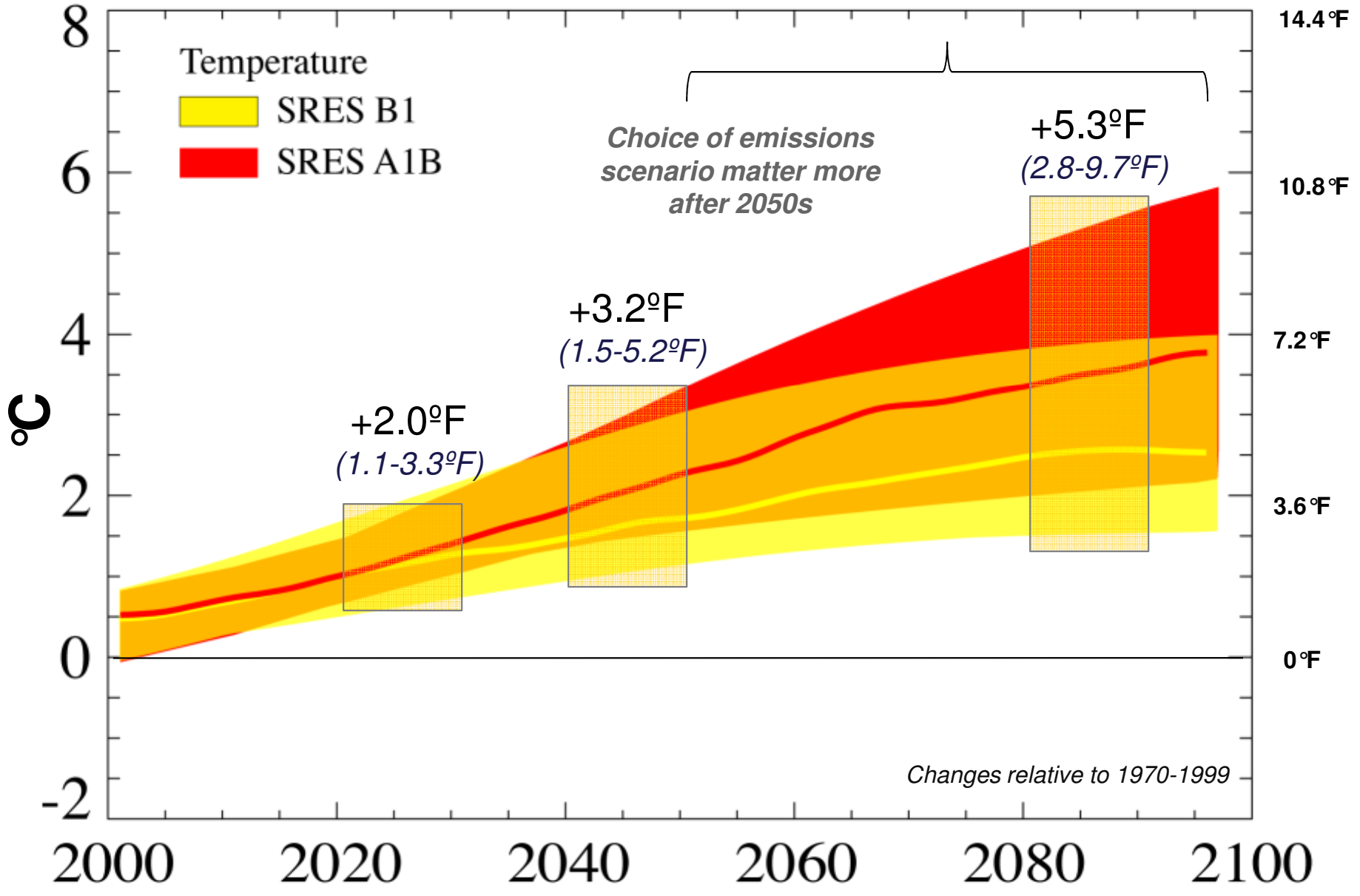
Objectives

- Increase regional resilience to climate variability and change
- Produce science useful to (*and used by*) the decision making community

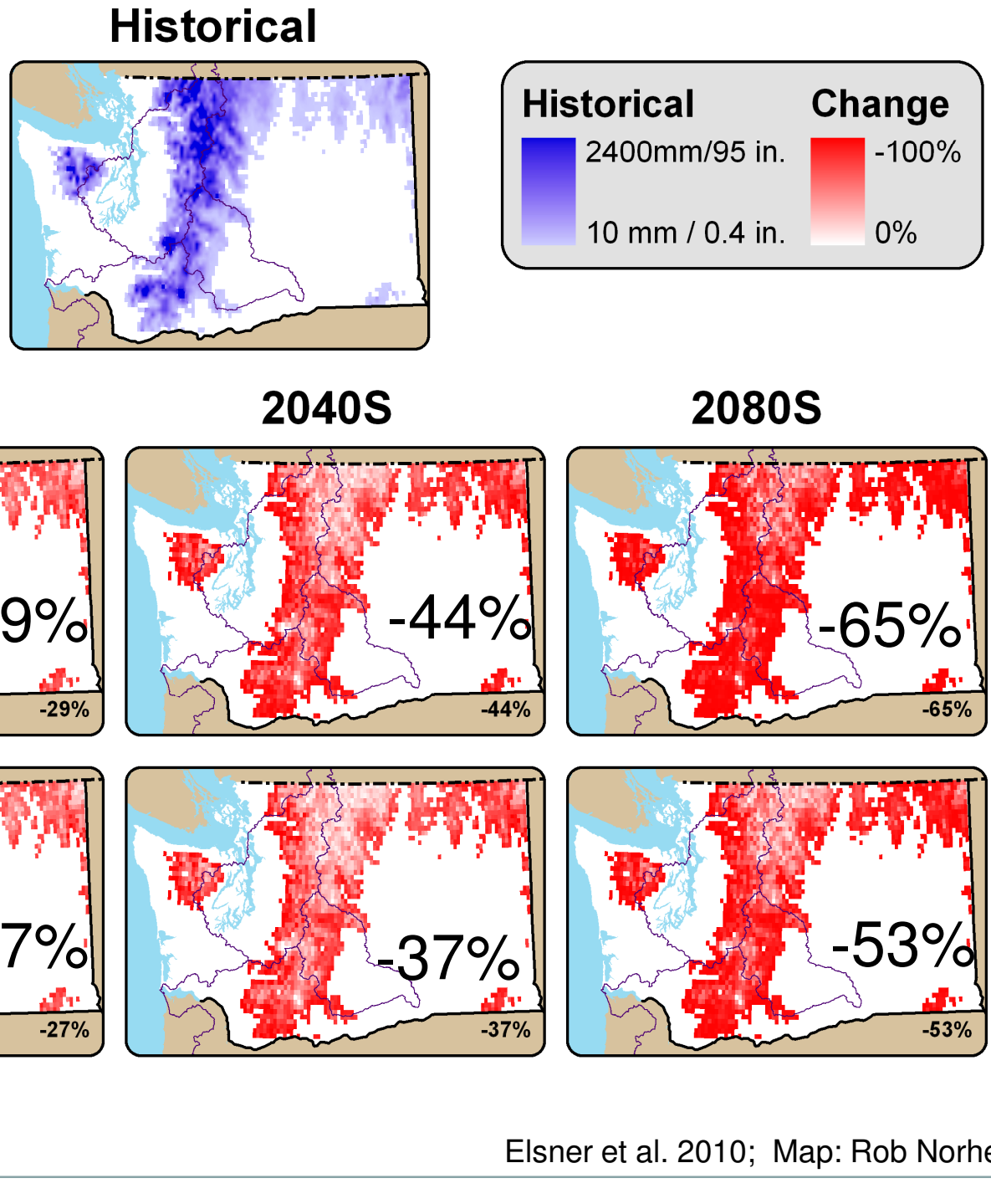
Downscaling
Relates the “Large” to the “Small”



Projected Increases in PNW Temp



Key Impact: Loss of April 1 Snow Cover

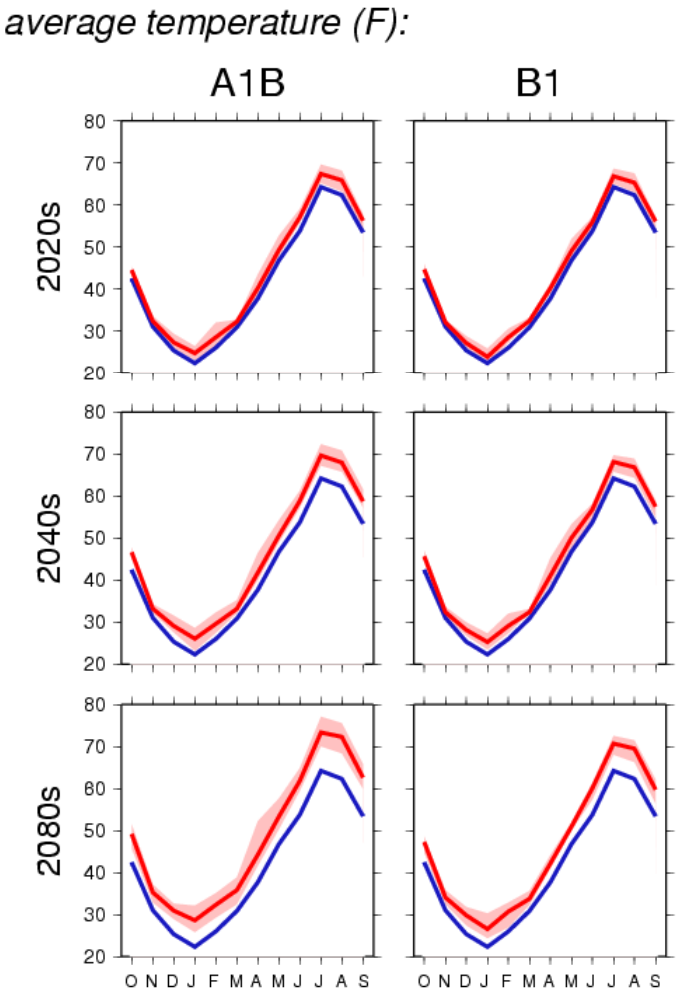


Elsner et al. 2010; Map: Rob Norheim

Hydrologic Climate Change Scenarios for the Pacific Northwest Columbia River Basin and Coastal Drainages

- Raw and summary data sets of meteorological and hydrological variables for the entire study domain *and* for 297 specific streamflow locations in the PNW.

- Scale is ~12 sq. mi. resolution



BOISE RIVER NR BOISE

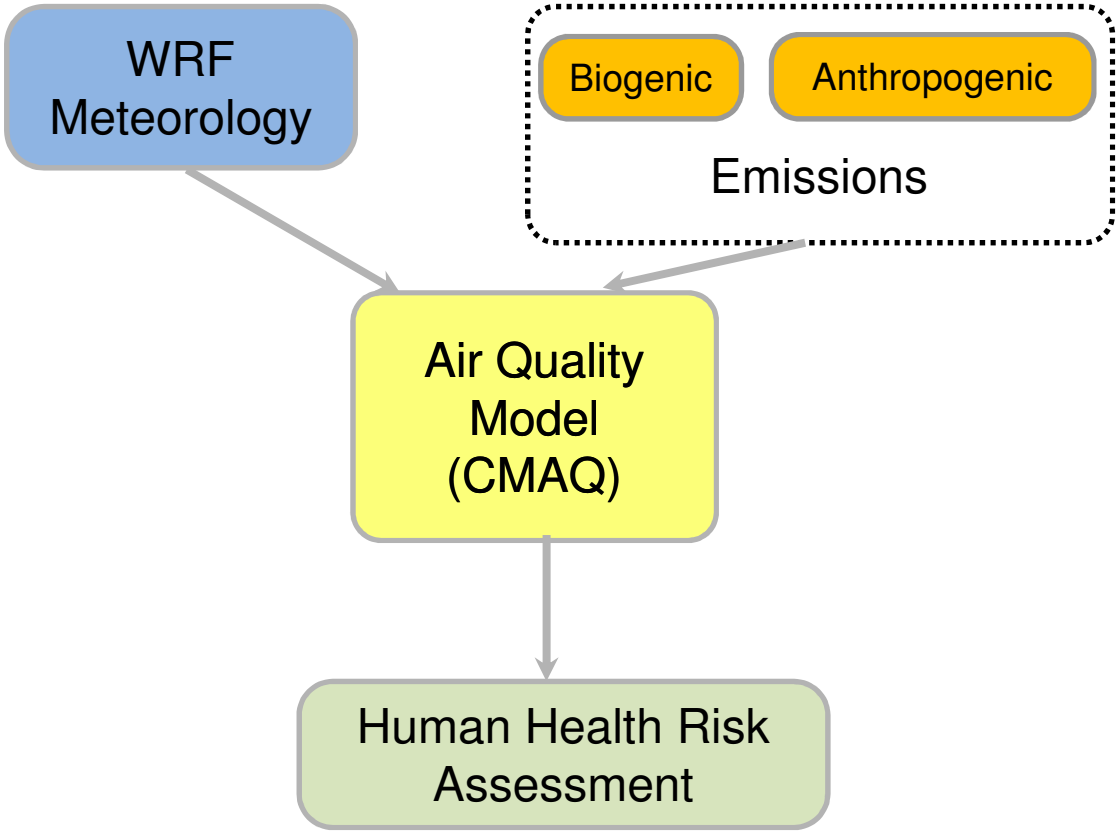
http://www.hydro.washington.edu/2860/

Output data for applications models

WRF Output provides the full hourly three-dimensional meteorological data needed as input for many applications models

- Air quality
- Puget Sound Circulation

Air Quality Modeling with WRF

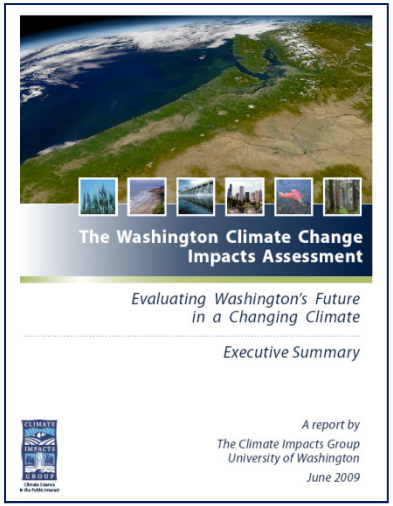


Washington State Air Quality Study: Background

Washington Climate Impacts Assessment evaluated climate change impacts on 8 sectors

Human health chapter examined changes in mortality by mid-21st century from 1) extreme heat events and 2) increased ozone. Based on the A2 emissions scenario.

Robust evidence base linking ozone and mortality – multiple locations (US and non US)

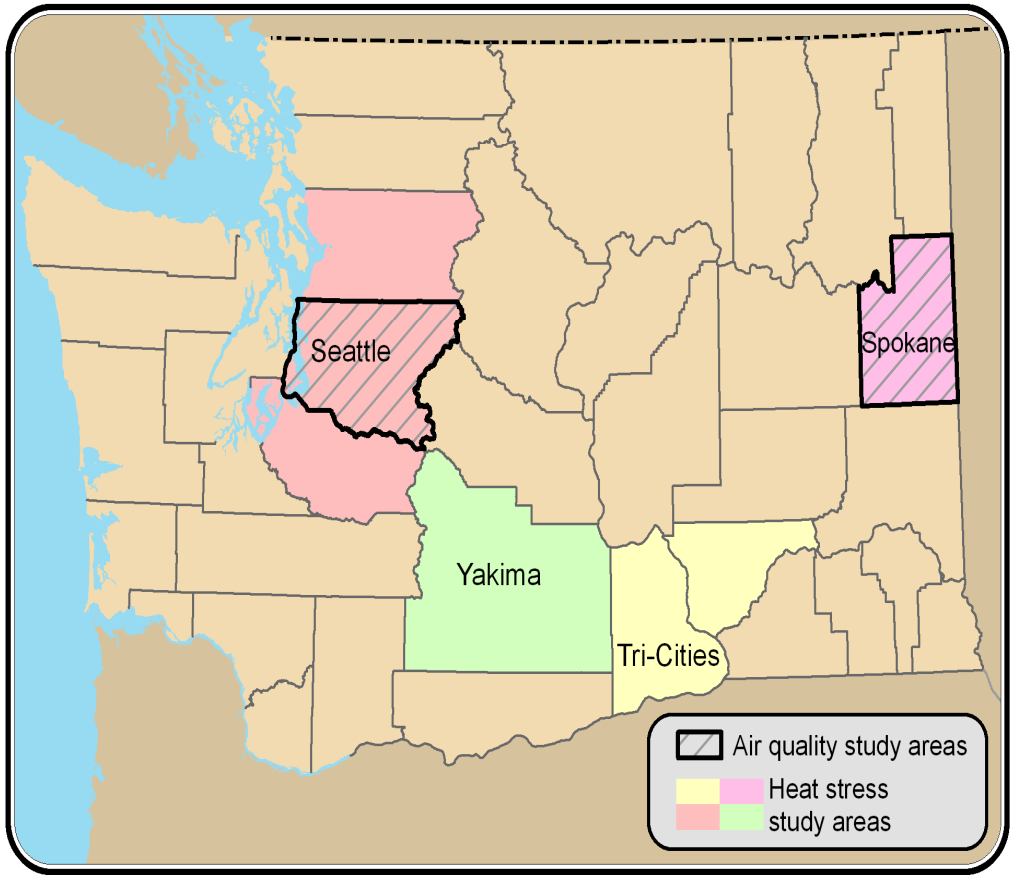


http://cses.washington.edu/cig/res/ia/waccia.shtml

Study Region: King Co, Spokane Co.

Monitoring data for 8 hour average max. daily O_3 concentrations, May-Sept (1997-2006):

- King County: 20.7 ppb
- Spokane County: 35.5 ppb



Jackson, JE. et al, 2010. *Climatic Change*

Results: Summertime Ozone Mortality

Although better control of air pollution has led to improvements in air quality, warmer temperatures threaten some of the sizeable gains that have been made in recent years.

	King 1997-2006	**King 2045-2055**	**Spokane 1997-2006**	**Spokane 2045-2055**
Population	1,758,260	2,629,160	424,636	712,617
O_3	20.7	26.5 *(+28%)*	35.5	41.6 *(+17%)*
Daily Mortality rate	0.026	0.033	0.058	0.068
Deaths	69	132	37	74

2045-2055 simulation = (IPCC) A2 scenario, business-as-usual US emission projections and projected alterations in land use, land cover (LULC) due to urban expansion and changes in vegetation.

Jackson, JE. et al, 2010. Climatic Change, in press.

Acknowledgements

Washington Assessment ozone assessment slides courtesy of:

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Co-investigators (UW associated): J. Elizabeth Jackson, Richard Fenske, Michael Yost, Cole Fitzpatrick, Roger Rosenblatt
Co-investigators (WSU associated): Brian Lamb, Serena Chung, Jack Chen, Jeremy Avise

Paper:

Jackson, J.E., M.G. Yost, C. Karr, C. Fitzpatrick, B. Lamb, S.H. Chung, J. Chen, J. Avise, R.A. Rosenblatt, and R.A. Fenske. 2010. Public health impacts of climate change in Washington State: projected mortality risks due to heat events and air pollution. *Climatic Change* 102(1-2): 159-186, doi: 10.1007/s10584-010-9852-3.

QUESTIONS?

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