Apr 6th, 9:00 AM - 9:15 AM

A multiple-methods vertical land movement analysis and its integration into probabilistic sea level rise projections for coastal Washington

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Speaker
Ian Miller, Tyler Newton, Ray Weldon, David Schmidt, Guillaume Mauger, and Eric Grossman

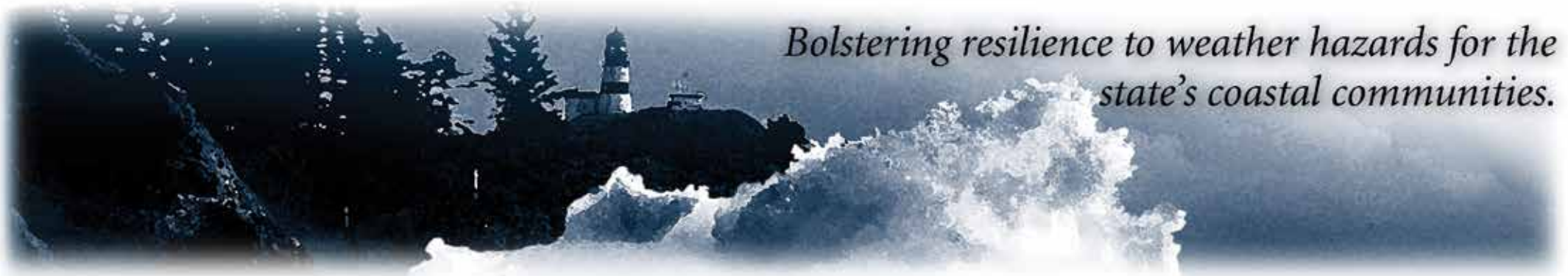
THE WASHINGTON COASTAL RESILIENCE PROJECT

A multiple-methods vertical land movement analysis and its integration into probabilistic sea level rise projection for coastal Washington

Ian Miller, Washington Sea Grant

with

Tyler Newton, University of Oregon
Ray Weldon, University of Oregon
Guillaume Mauger, Climate Impacts Group
Harriet Morgan, Climate Impacts Group
David Schmidt, University of Washington
Mark Welch, University of Washington (former)
Eric Grossman, US Geological Survey

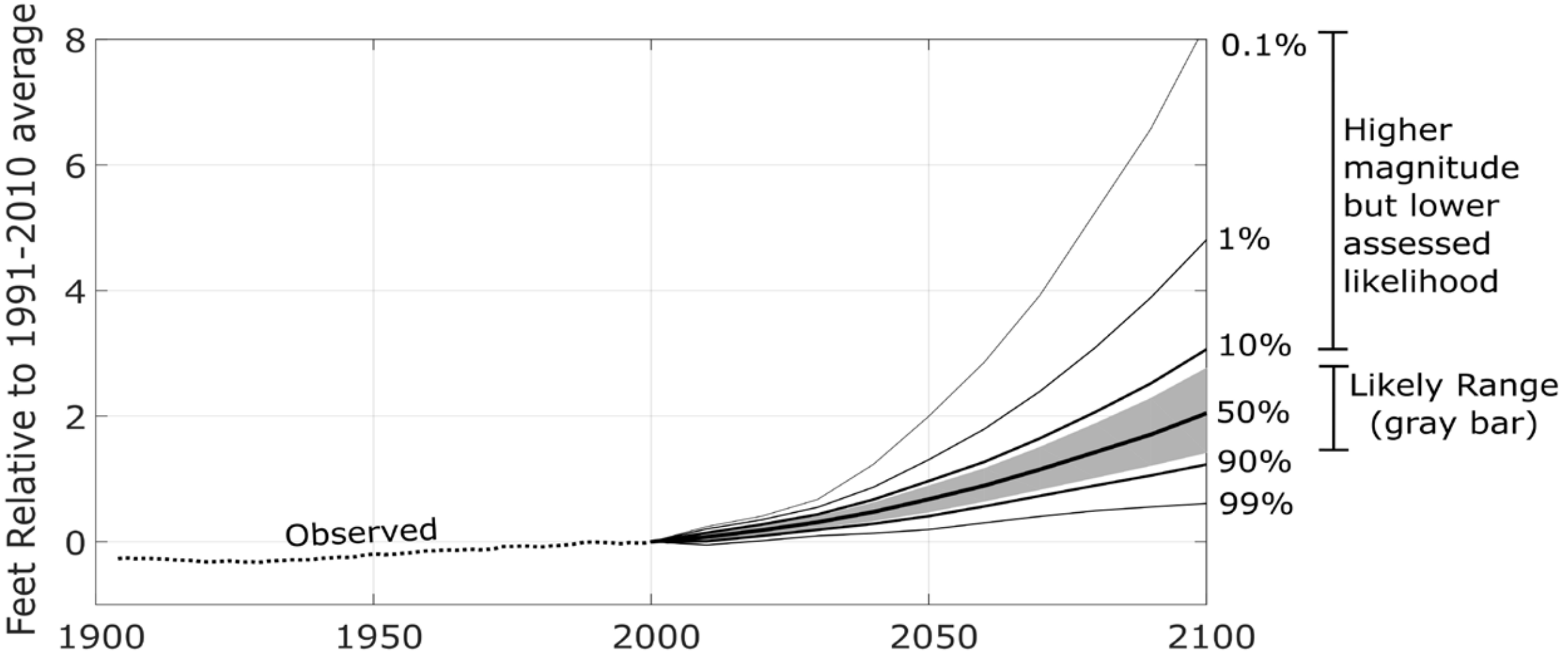


THE WASHINGTON COASTAL RESILIENCE PROJECT

Objective 1

"Fill critical information gaps and improve the communication of risk about coastal hazards and related climate impacts (sea level rise, storm surge, wave impacts and shoreline erosion) that hinder planning and action in Washington's coastal communities."

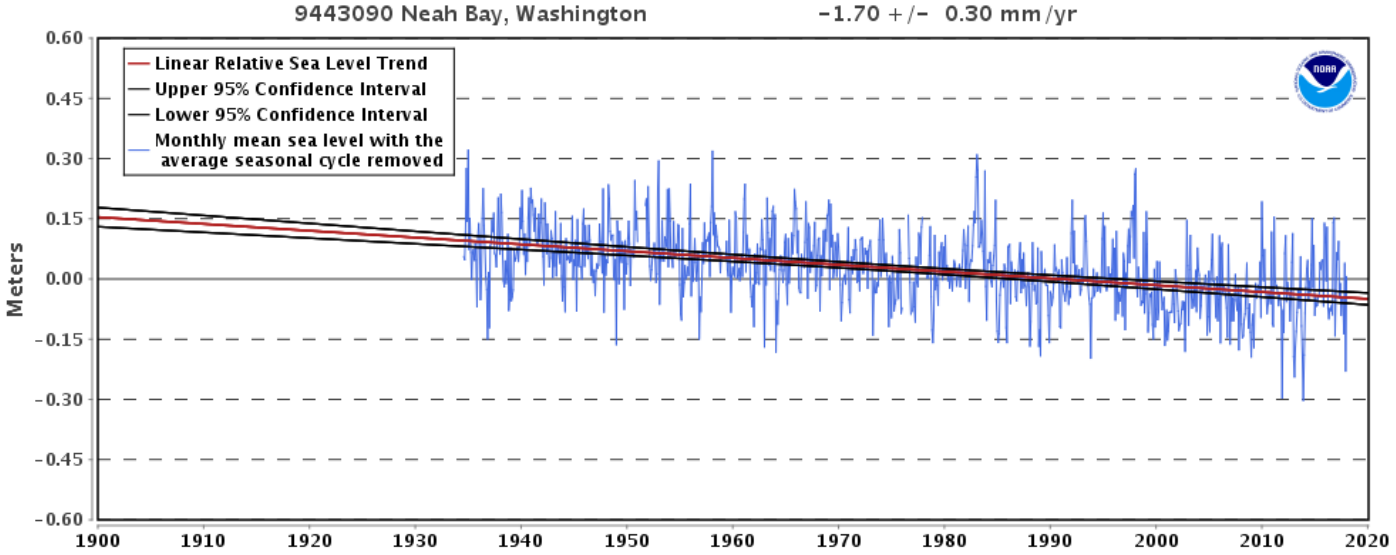
Probabilistic absolute sea level projections for Washington



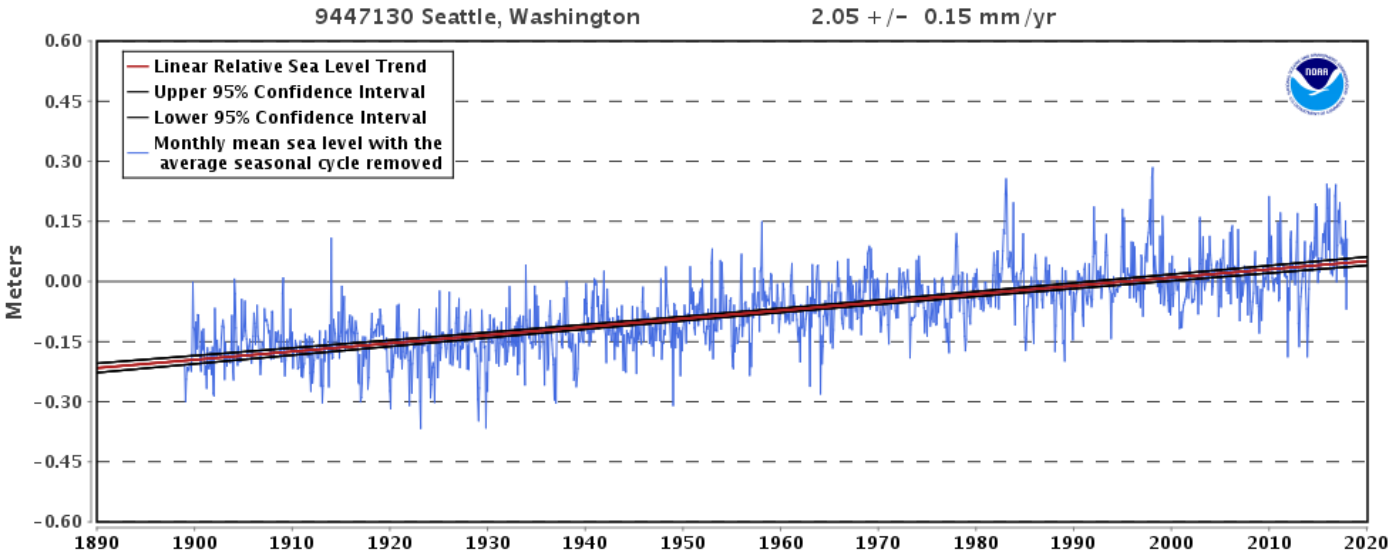
From Miller, Mauger, Morgan and Grossman, in press. Derived from Kopp et al, 2014

Absolute vs. Relative Sea Level Change

Neah Bay, WA



Seattle, WA



Responding to demand for an updated approach with better resolution

CGPS (N=165):
UN RENO Group
JPL
PANGA
SOPAC (Scripps)

Individual estimates averaged. Uncertainty = SD

VLM Point Estimates with uncertainty (N=607 observations + Locking Model)

Tied to an absolute reference frame using CGPS

Water Level (N=17): All coastal estimates!

Tectonic Locking Model: at 1/10th degree intervals, bedrock vertical movement estimates. Courtesy of David Schmidt and Ray Weldon

Physically derived model. Arbitrary uncertainty of 2 mm/yr

Interpolated VLM field with uncertainty estimate

Tied to an absolute reference frame using CGPS

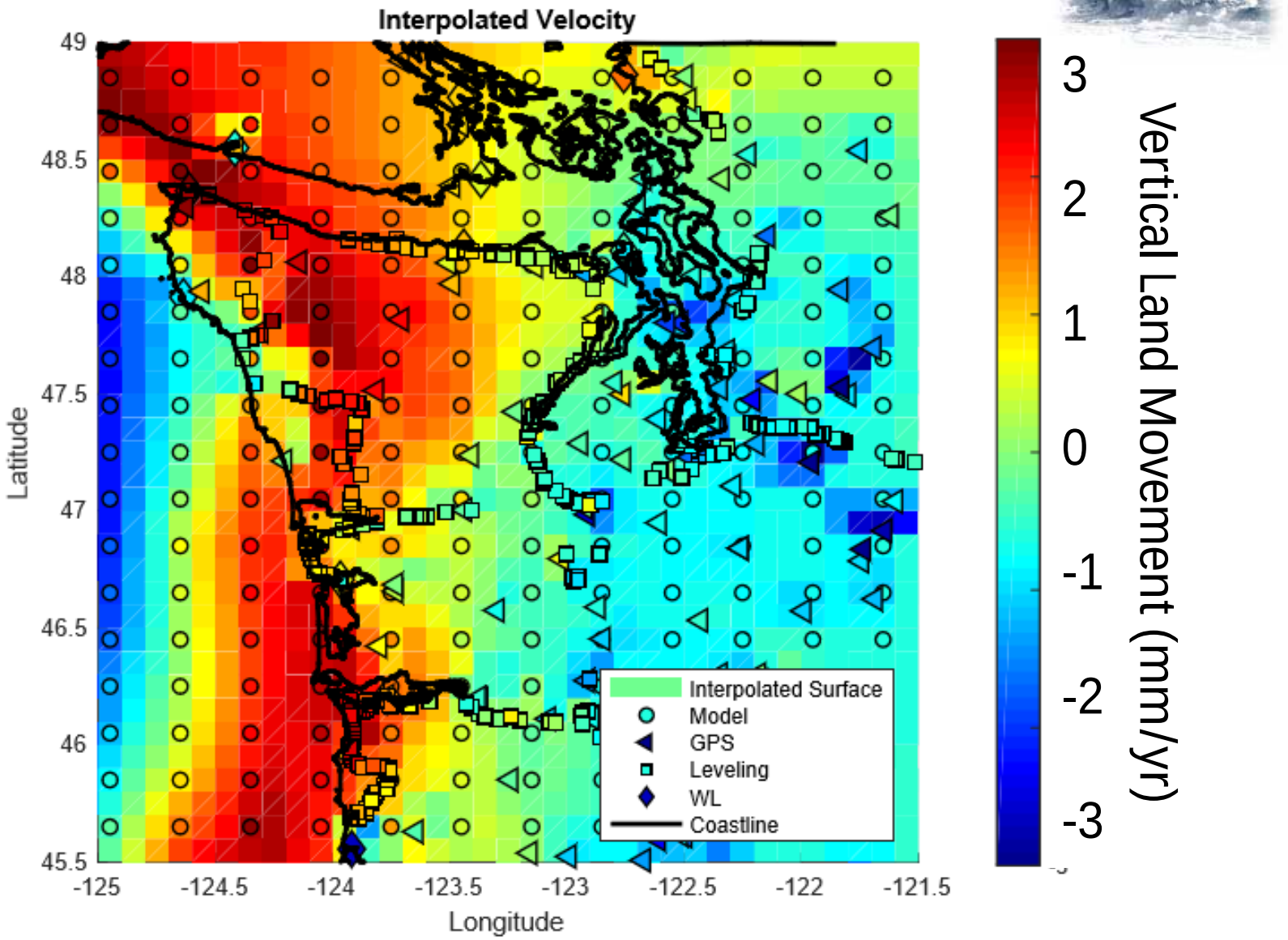
Leveling (N=425): Unpublished data courtesy of David Schmidt and Ray Weldon

Time for an update using more and newer data

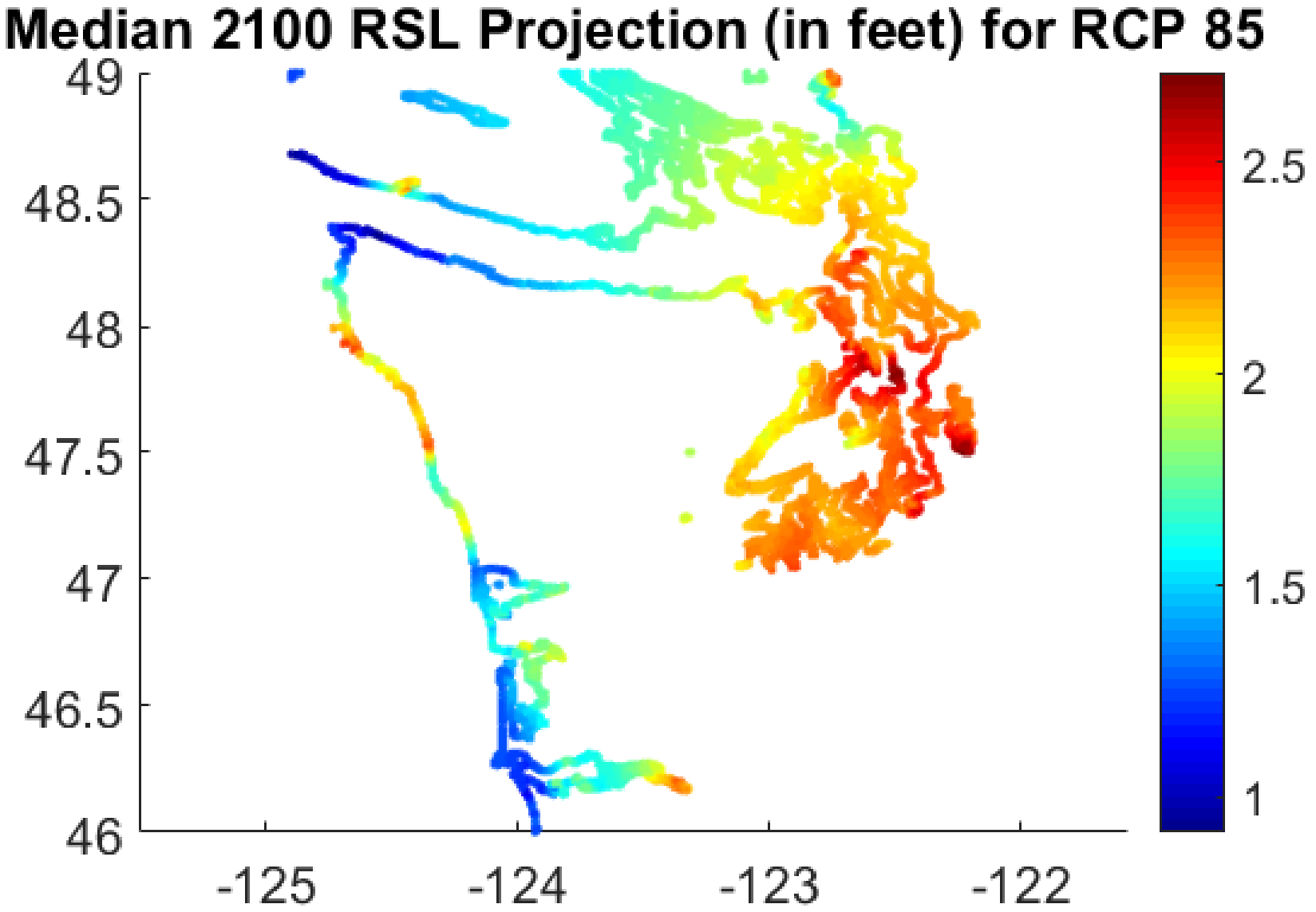
Subsidence on the north coast?

Subsidence in Puget Sound

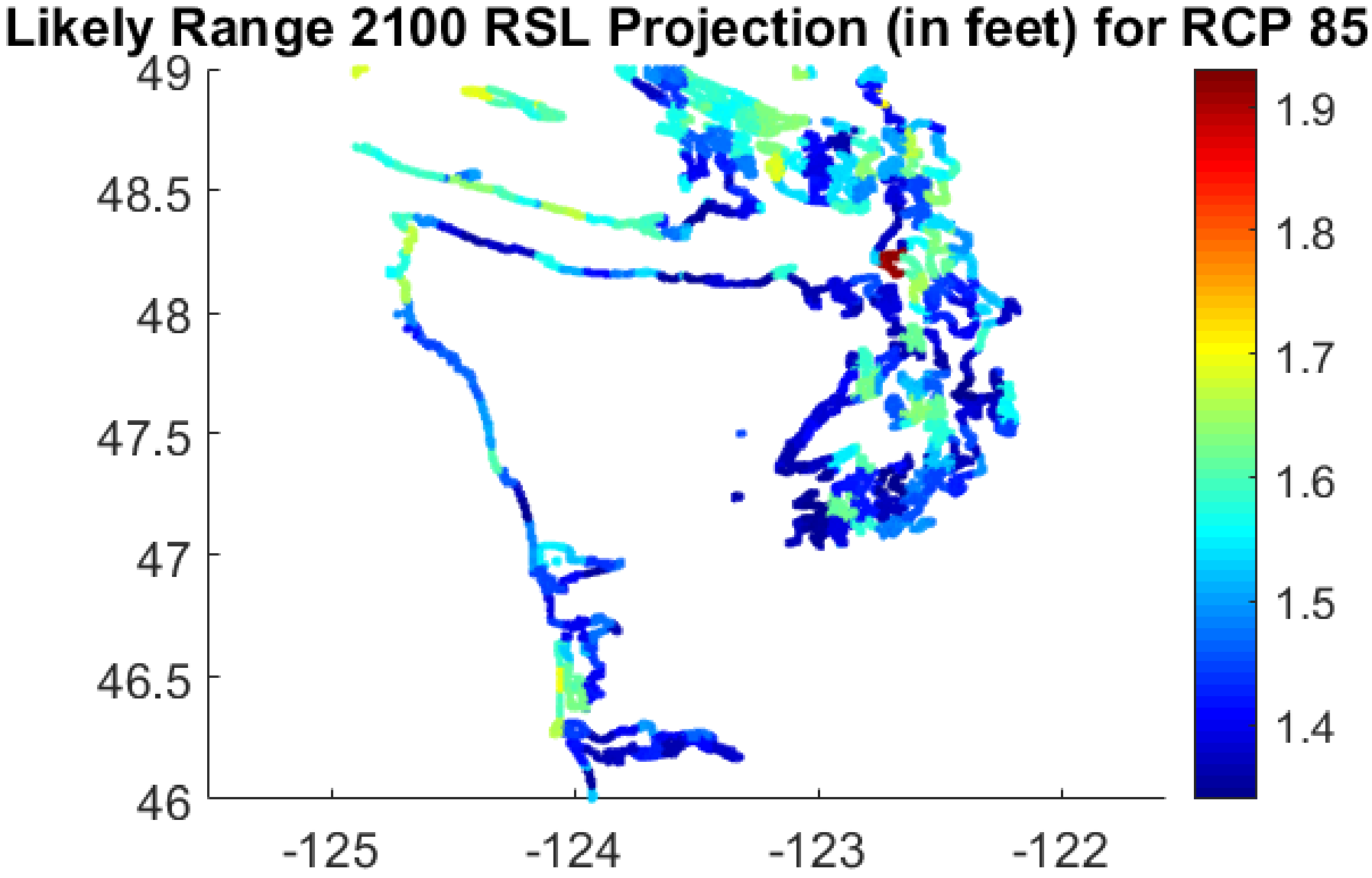
Rapid uplift in SW WA?

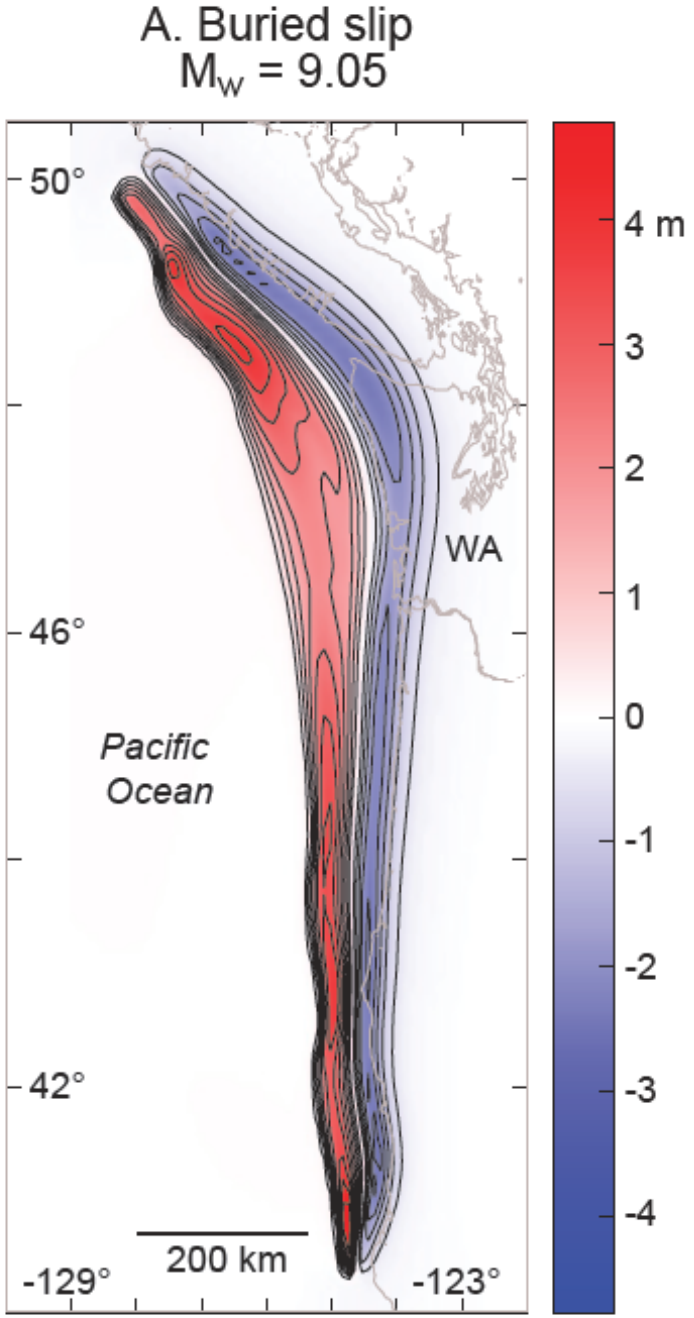


Translation into relative projections

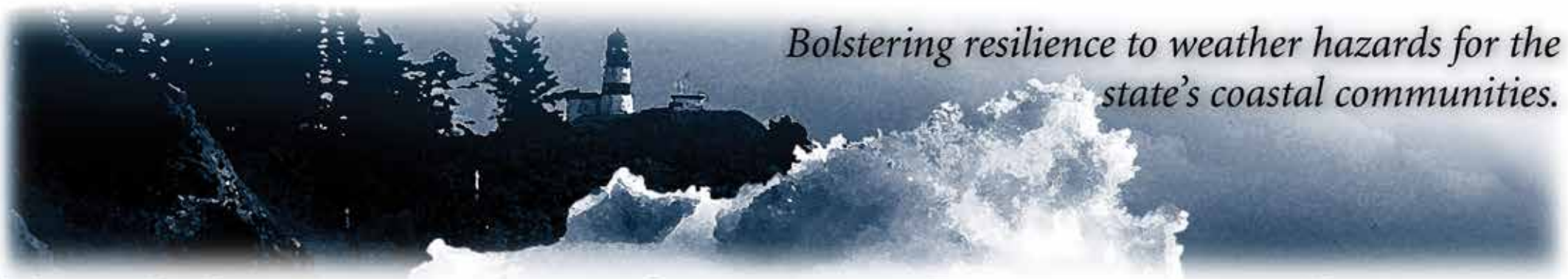


The role of uncertainty





The Co-Seismic Subsidence Disclaimer



THE WASHINGTON COASTAL RESILIENCE PROJECT

Take-Aways:

1. *We've developed a new, higher resolution vertical land movement analysis for coastal Washington*
2. *Our approach facilitates the incorporation of VLM and its uncertainty into relative sea level projections at community-scale resolution*
3. *Co-seismic land motions are not explicitly incorporated.*
4. *Next up: The tide/wave/storm surge driven extreme water level component*
5. *Comments, Questions, Complaints? Ian Miller, immiller@uw.edu or 360 417 6460*

Washington Sea Grant • Washington Department of Ecology • Island County • The City of Tacoma • King County • Padilla Bay National Estuary Research Reserve • NOAA Office of Coastal Management • The Nature Conservancy • U.S. Geological Survey • University of Oregon • University of Washington Climate Impacts Group • University of Washington Department of Earth and Space Sciences • Washington Department of Fish and Wildlife

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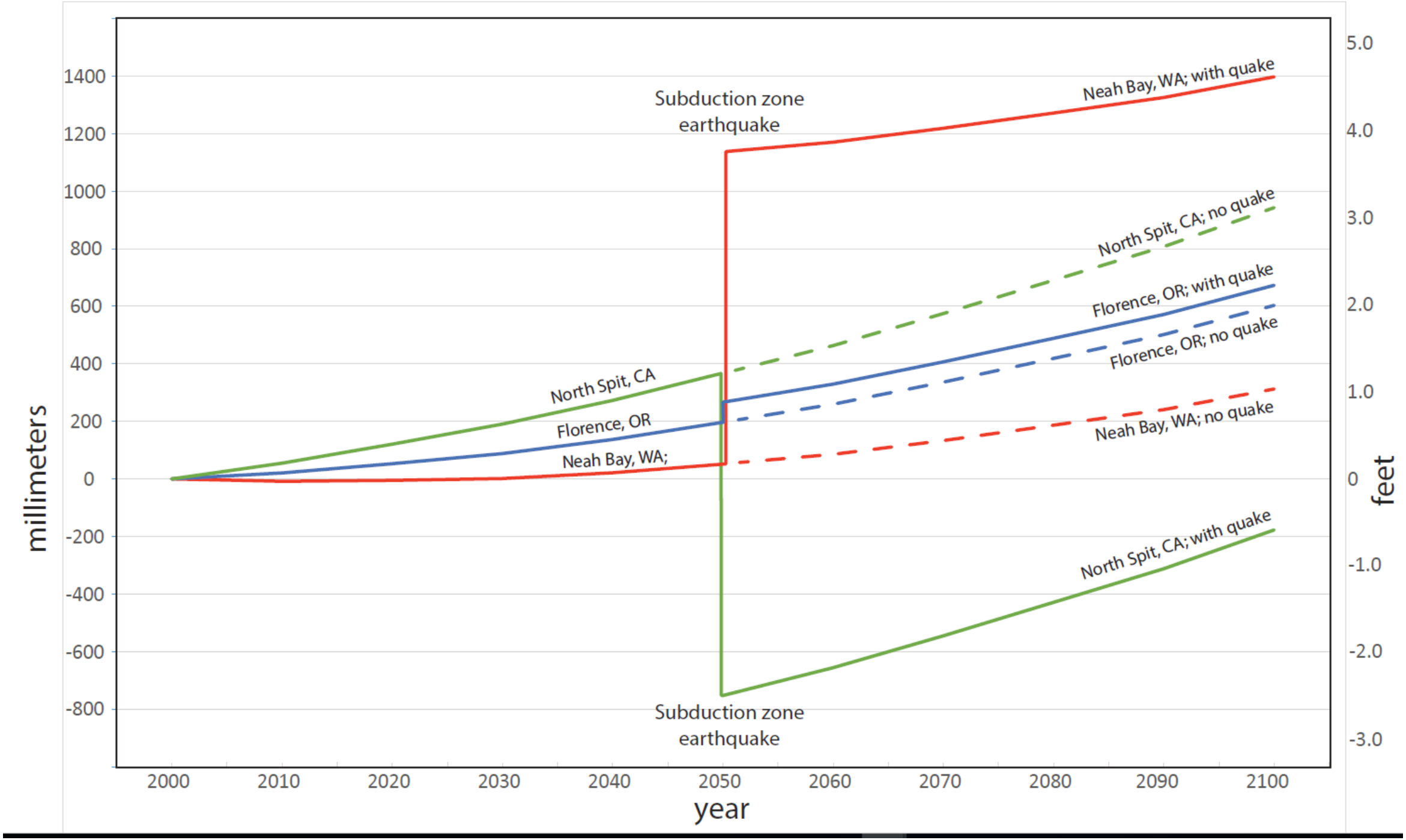
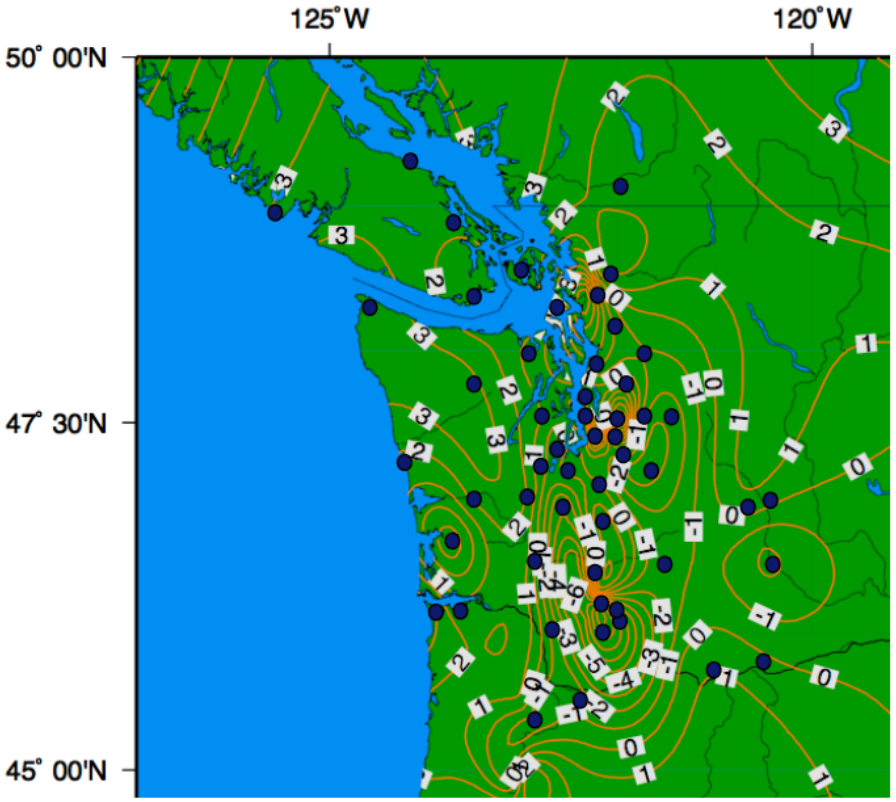
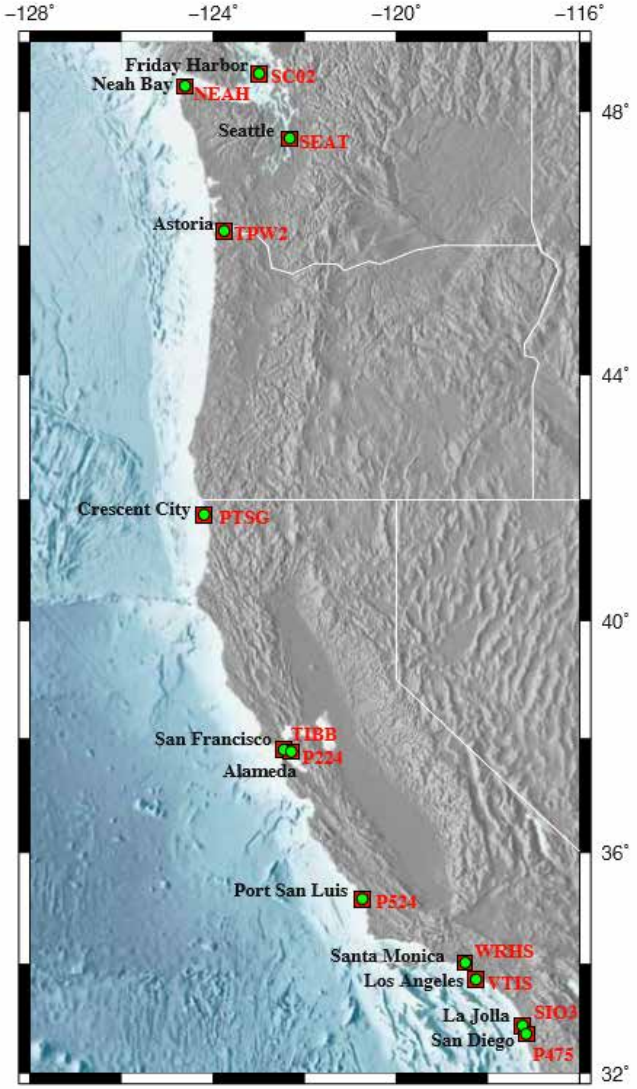

millimeters
feet
year
1400
1200
1000
800
600
400
200
0
-200
-400
-600
-800
5.0
4.0
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Subduction zone earthquake
Subduction zone earthquake
Neah Bay, WA; with quake
North Spit, CA; no quake
Florence, OR; with quake
Florence, OR; no quake
Neah Bay, WA; no quake
North Spit, CA; with quake
North Spit, CA
Florence, OR
Neah Bay, WA;

Making SL projections relative (and local): Vertical land movements

Mote et al, 2008: Single CGPS data set (N=50 for BC/OR/WA)





NAS, 2012: Small number (N=4 for WA/OR) of co-located tide gauge/CGPS stations

Uncertainty based on 1000 interpolated surfaced

Large uncertainties:

- on the coast,
- SW Washington,
- north Puget Sound