

Sea Level Rise and Coastal Hazards

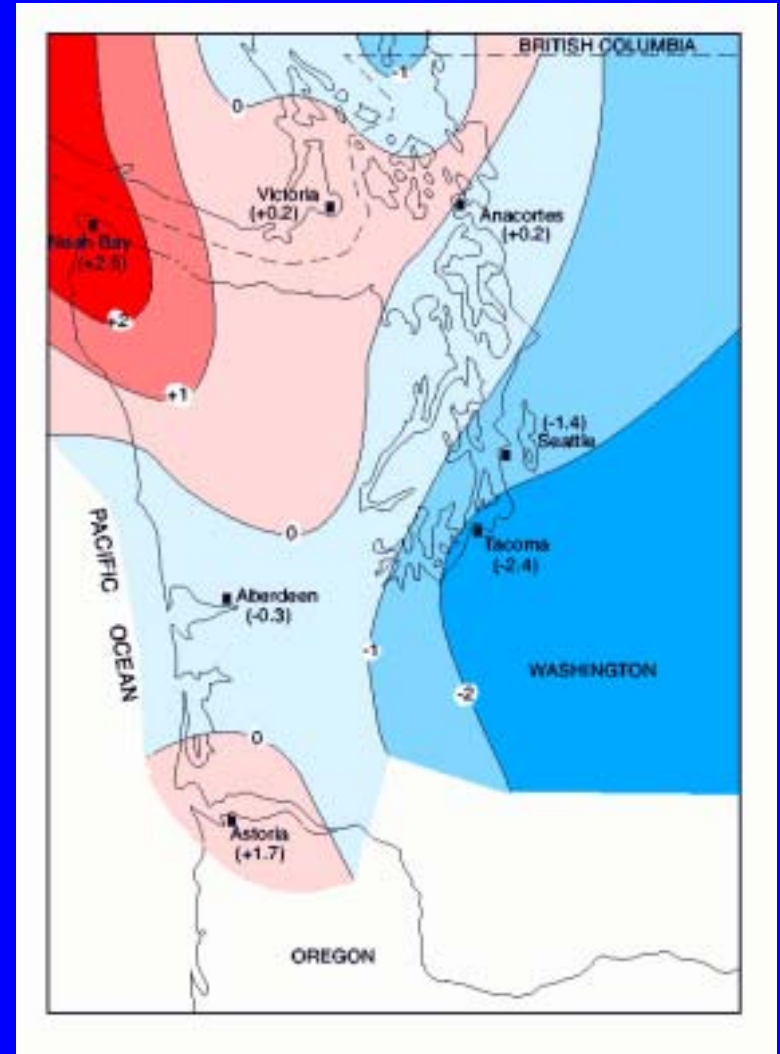
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Coastal Planners Group
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Past and Present Sea Level Rise

- global mean SLR
 - 1.0 to 2.5 mm/yr
- vertical land movements
 - -2.0 to +2.0 mm/yr in Washington

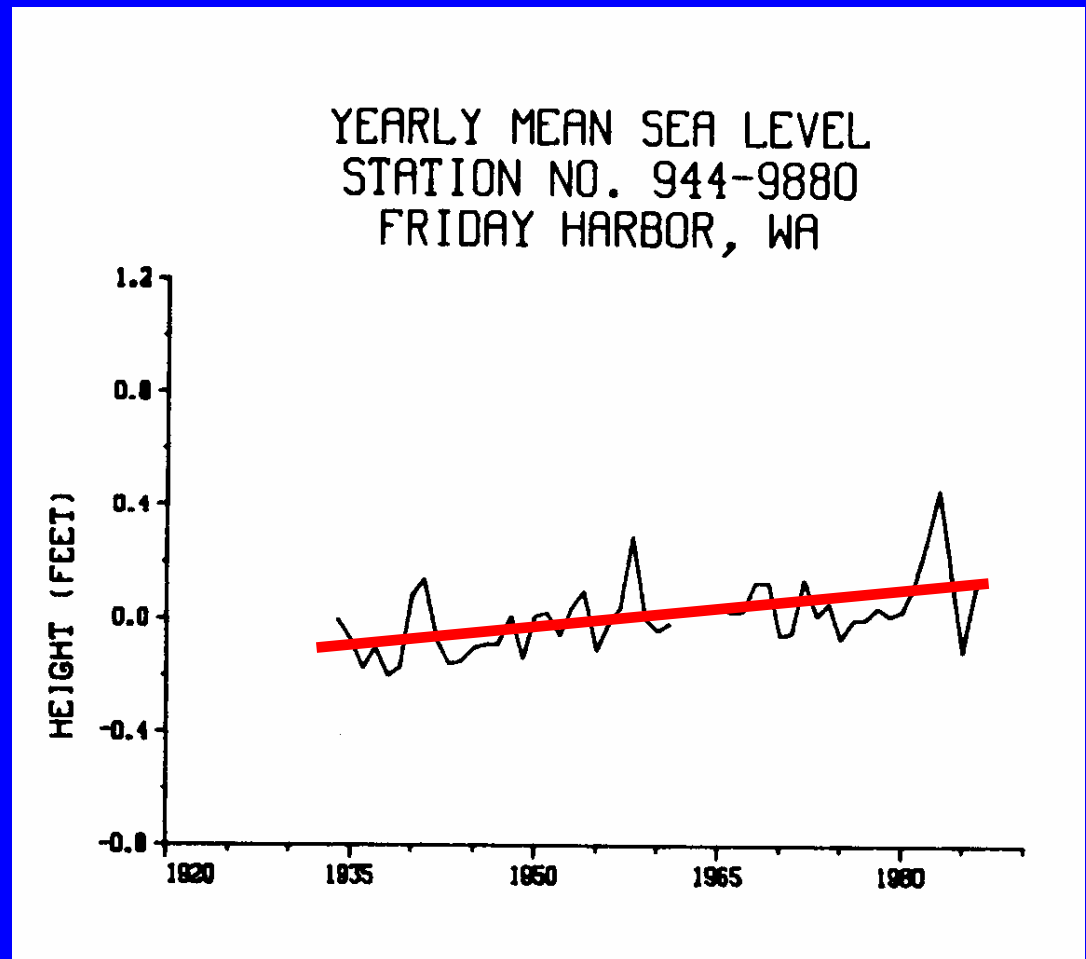
Vertical Land Movement

- Subduction zone tectonic forces move the land:
- Uplift occurs on most of the Ocean coast
- Subsidence occurs in most of Puget Sound



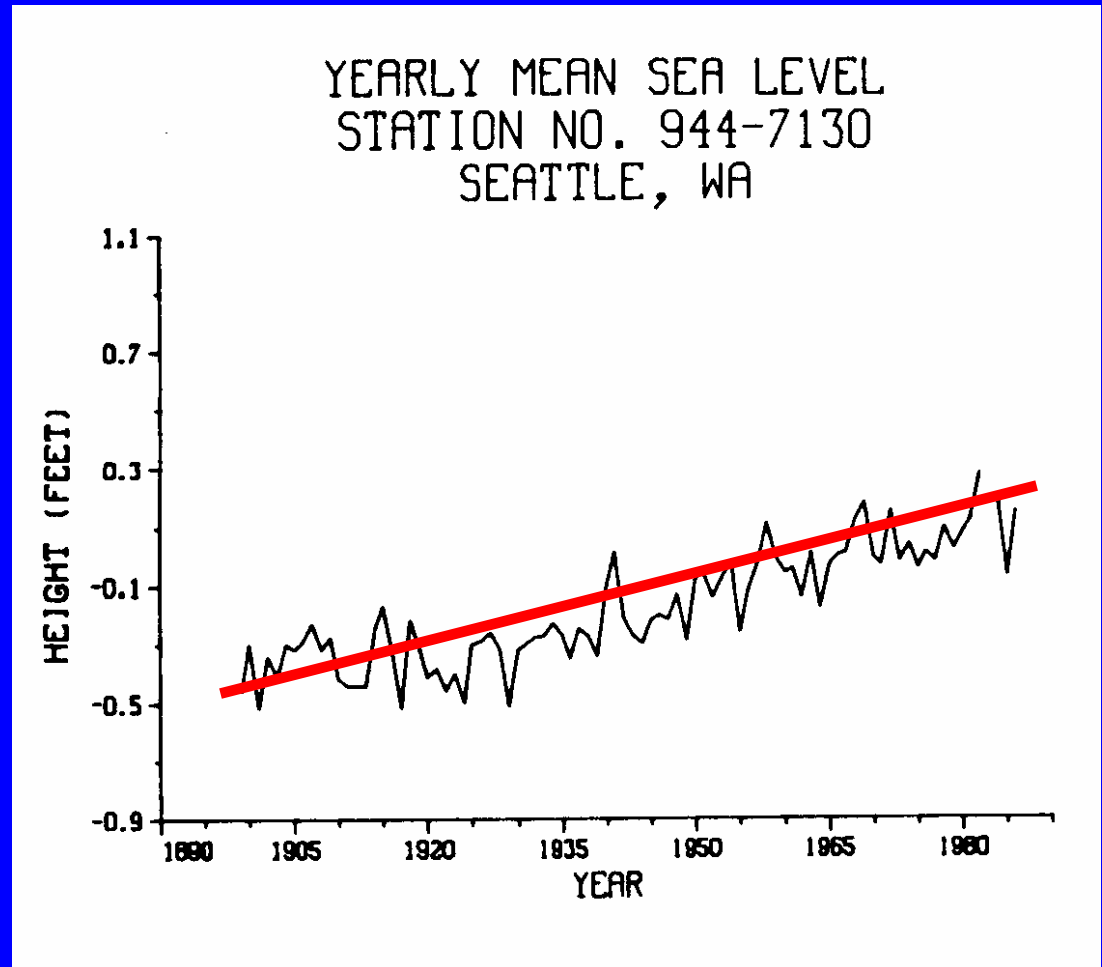
Friday Harbor sea level trend

From 1935 to the present, water level at the Friday Harbor gage has been rising at about the global average.



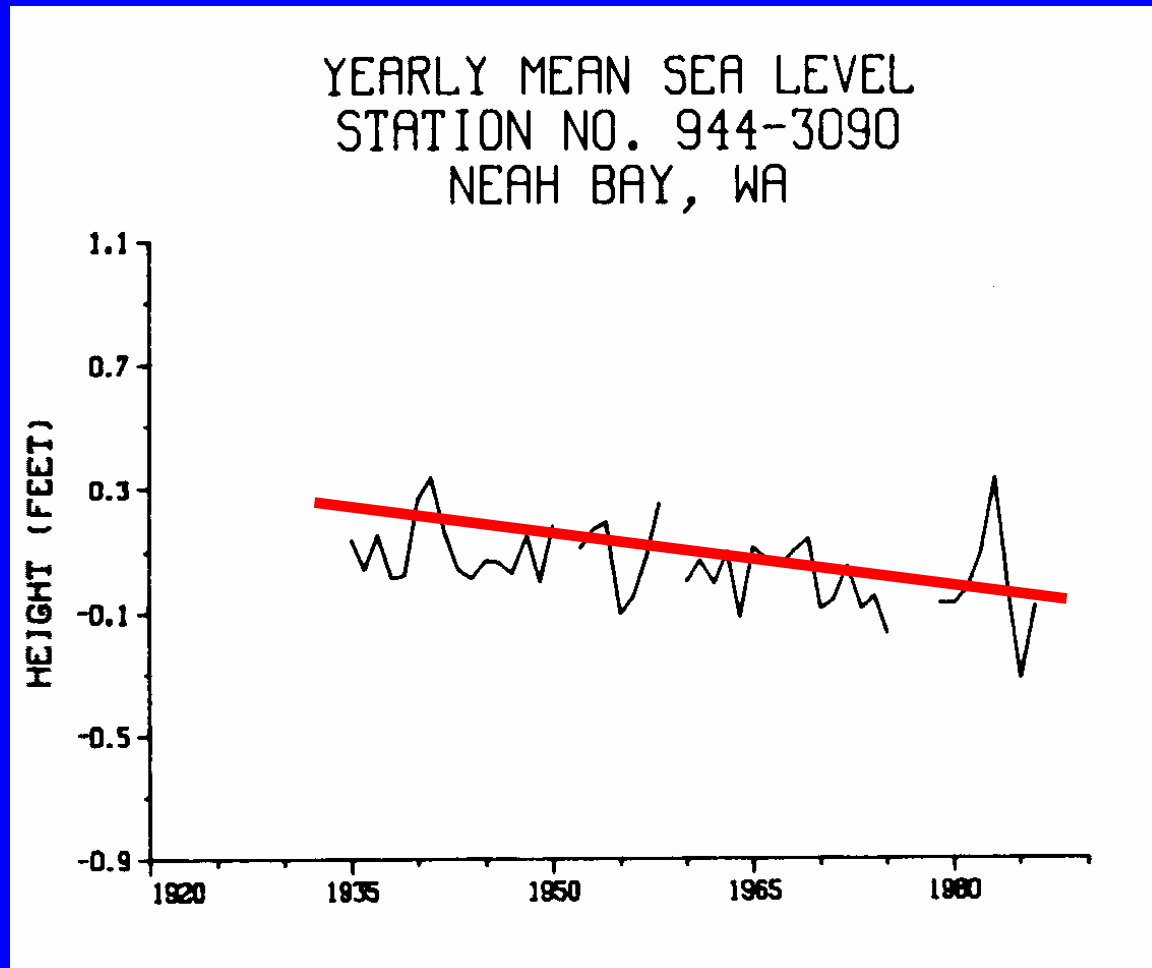
Seattle sea level trend

From 1900 to the present, water level at the Seattle gage has been rising at about 2X the global average.

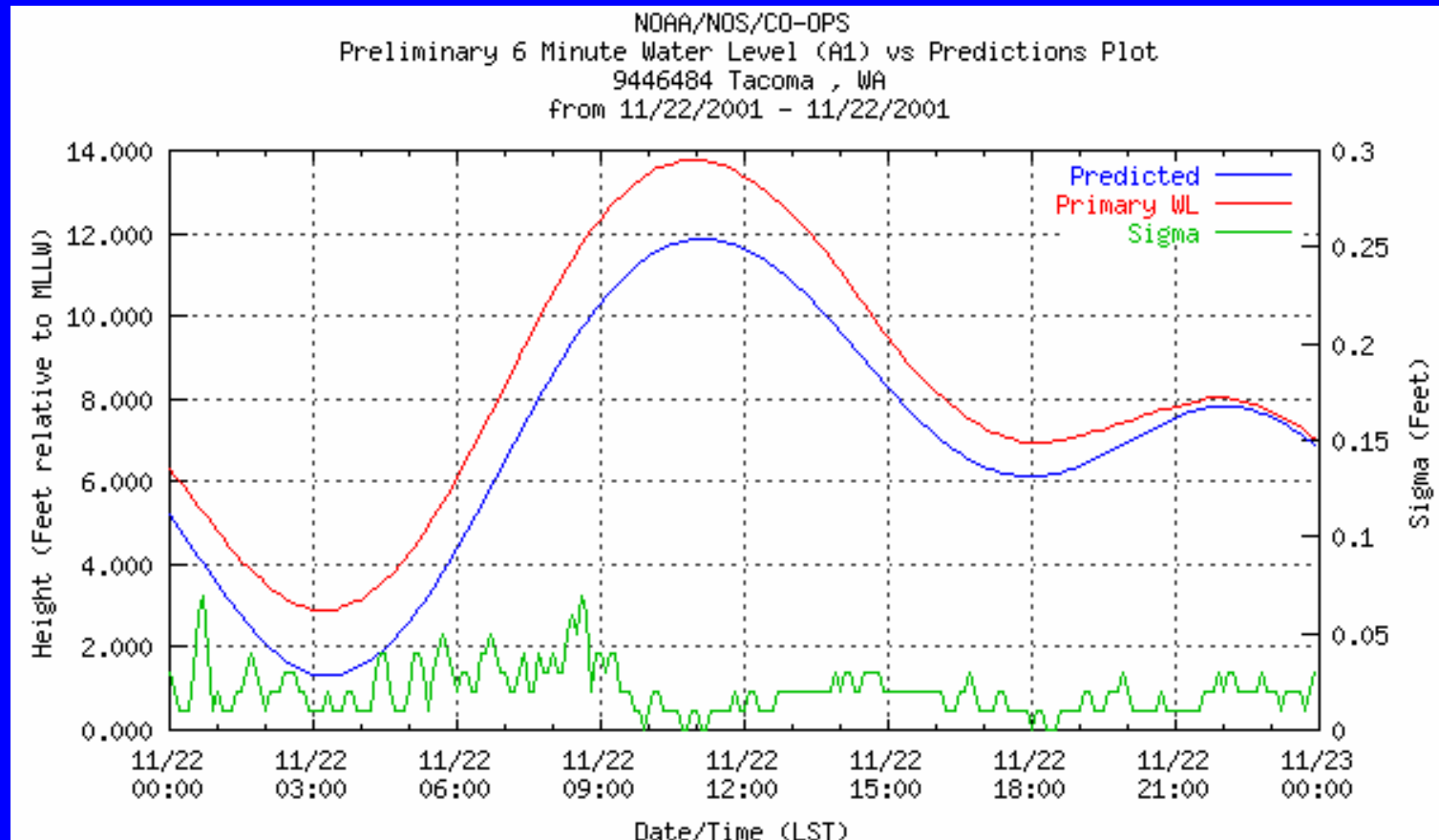


Neah Bay sea level trend

From 1935 to the present, water level at the Neah Bay gage has been trending down.



Barometric Pressure Effects



Short term low pressure cells allow water level to rise: up to 2.0 ft on 22 Nov 2001 at Tacoma

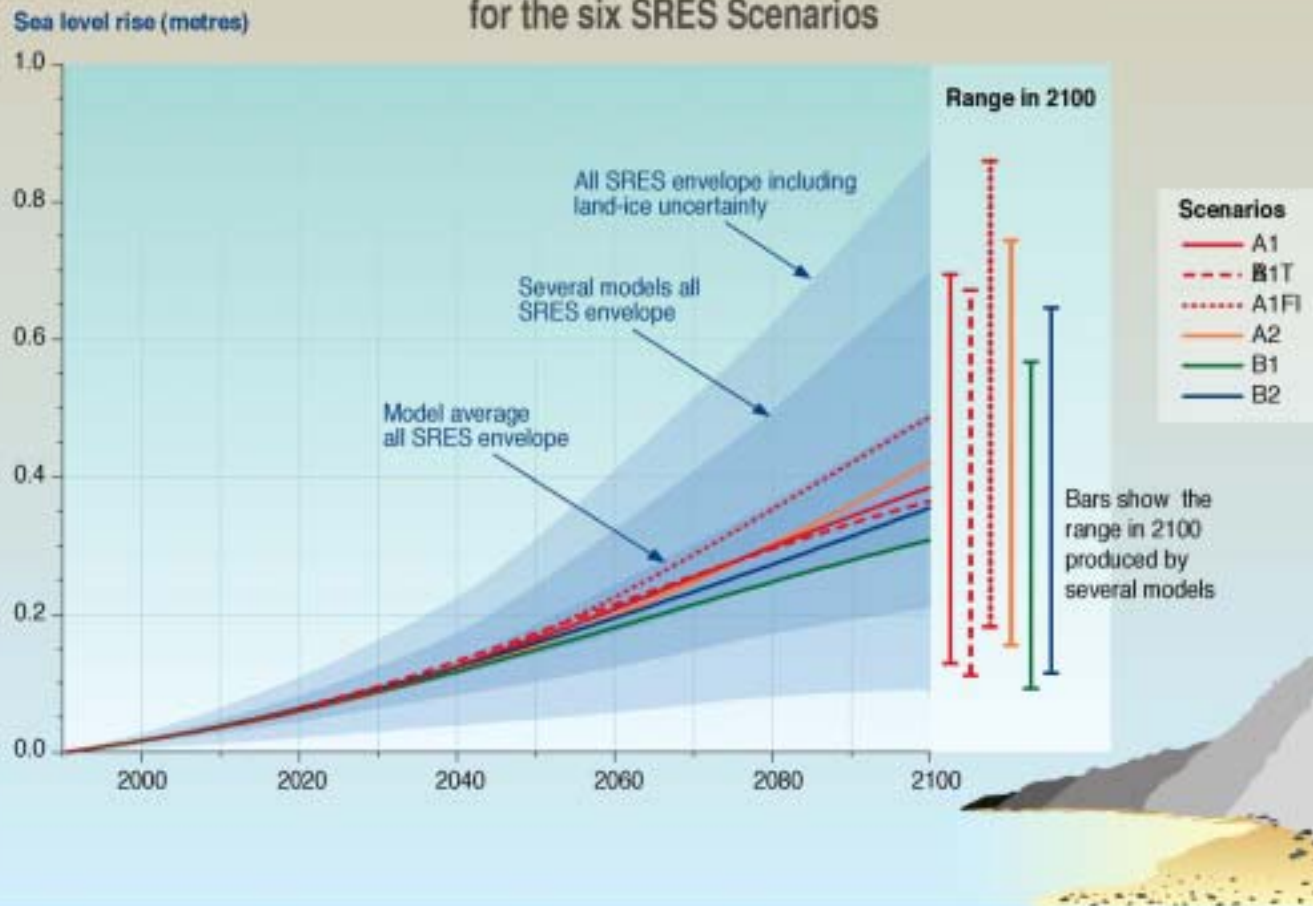
Seasonal El Niño Effects on winter water levels

- 1982-83 mean water level at Newport
 - up to 1.04 ft above monthly mean
 - up to 0.62 ft above monthly high
- 1997-98 mean water level at Toke Point
 - up to 1.31 ft above monthly mean
 - up to 0.72 ft above monthly high

Future Sea Level Rise

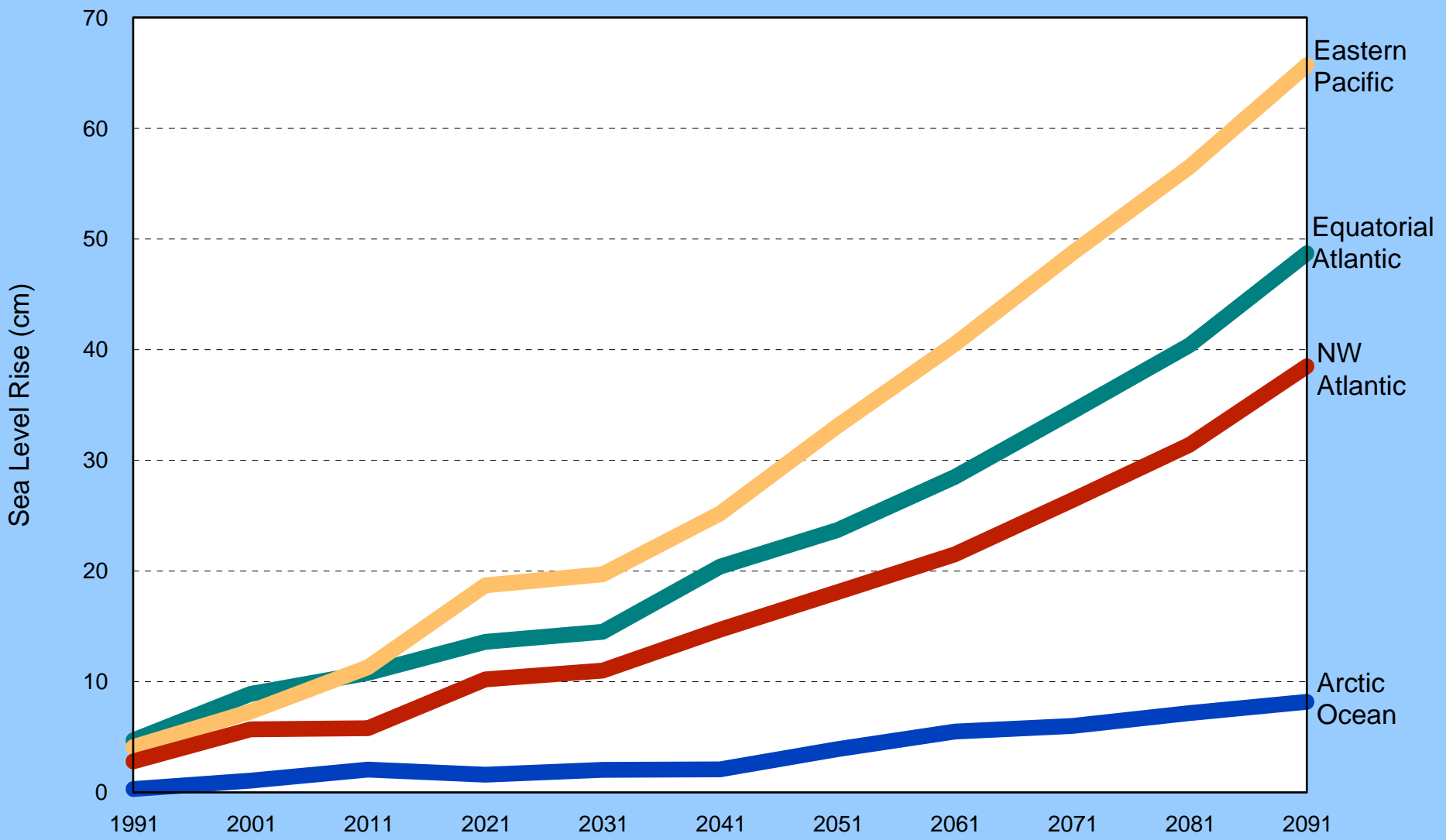
- Climate change effects component
 - thermal expansion
 - glacial melt water
 - East Pacific Ocean effects component
 - Local land subsidence component
- = Total local sea level rise

Global average sea level rise (1990 - 2100) for the six SRES Scenarios



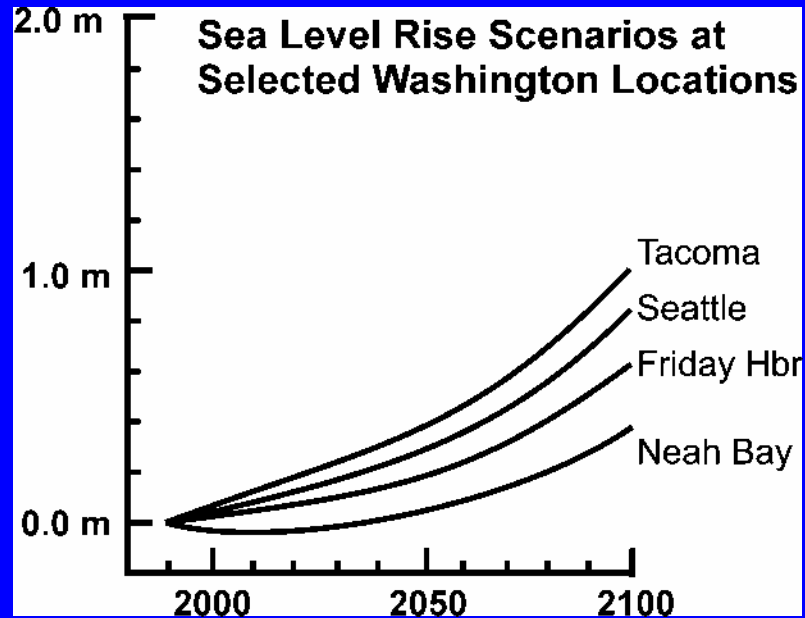
WG1 TS FIGURE 24

Regional Changes in Sea Level



Source: CCCma

Putting it all together for Puget Sound...



Basic Sea Level Rise Scenario Components

Component	1990		2000		2025		2050		2075		2100	
	cm	ft	cm	ft	cm	ft	cm	ft	cm	ft	cm	ft
Global Average SLR	0	0	2	0.1	10	0.3	20	0.7	35	1.1	50	1.6
Northeast Pacific Surcharge	0	0	2	0.1	8	0.3	8	0.3	23	0.8	20	0.7
Subtotal	0	0	4	0.1	18	0.6	28	0.9	58	1.9	70	2.3

Localized Adjustments for Local Vertical Land Movement

Locality	VLM mm/yr (subsidence is + and uplift is - for the formula)												
Padilla Bay; Discovery Bay	0.0	0	0	4	0.1	18	0.6	28	0.9	58	1.9	70	2.3
Port Townsend; Union	0.5	0	0	5	0.1	20	0.6	31	1.0	62	2.0	76	2.5
Maxwellton; Belfair	0.8	0	0	5	0.2	21	0.7	33	1.1	65	2.1	79	2.6
Eagle Harbor; Olympia	1.2	0	0	5	0.2	22	0.7	35	1.2	68	2.2	83	2.7
Thurston County avg; Seattle	1.5	0	0	6	0.2	23	0.8	37	1.2	71	2.3	87	2.8
Luhr Beach; Des Moines	2.0	0	0	6	0.2	25	0.8	40	1.3	75	2.5	92	3.0
Commencement Bay	2.4	0	0	6	0.2	26	0.9	42	1.4	78	2.6	96	3.2

SLR Response as Risk Response

- We respond to flood hazards by associating what's at risk with the probability of flood risk, e.g high risk situations with lower probability events.
- We can respond to SLR hazard by associating what's at risk with the probability of the SLR scenario (high, medium, low scenario).