Sea Level Rise:
What is the Water Engineer to do with all Those Projections

By

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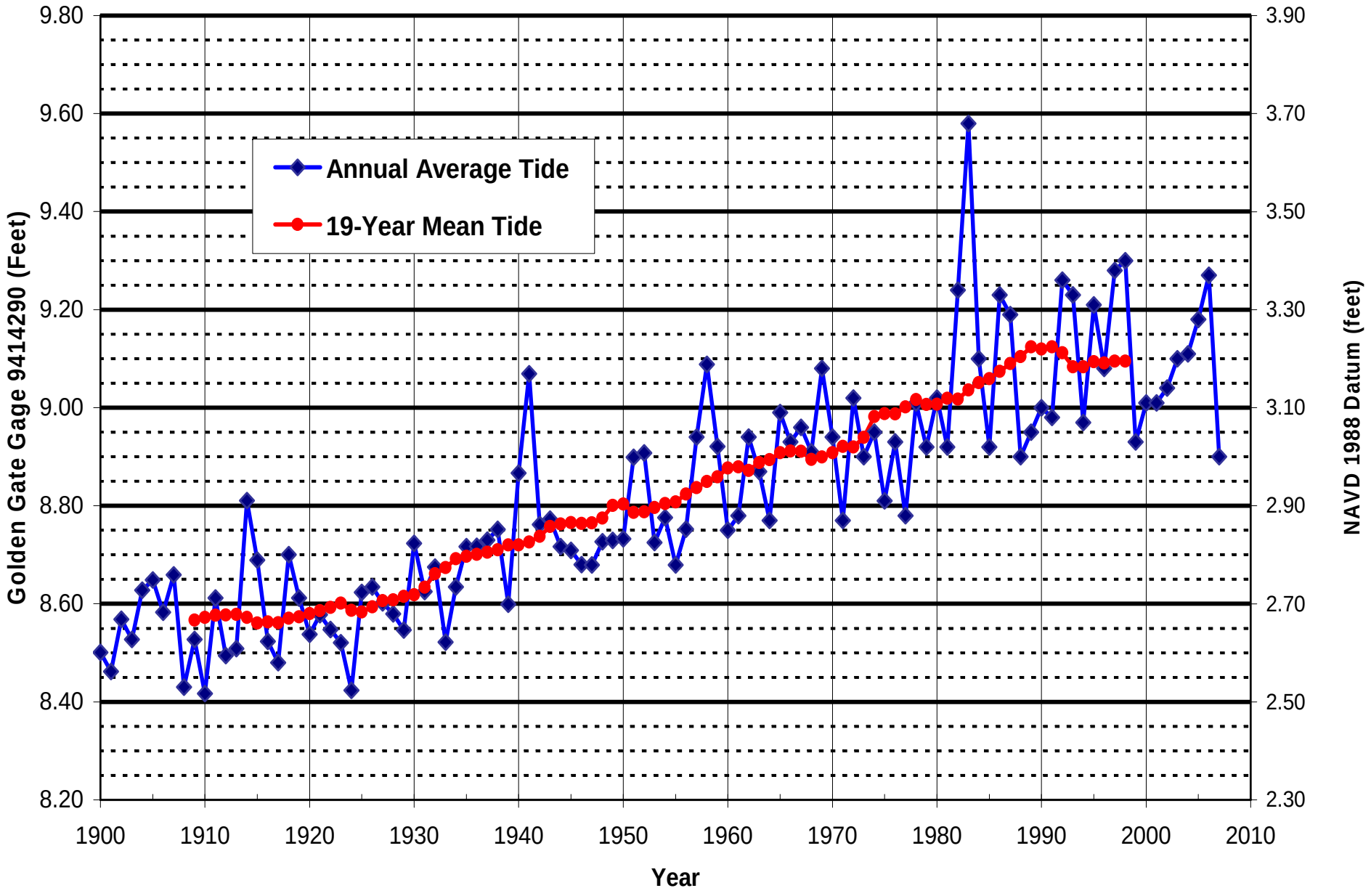
Calfed Science Conf. – Oct 2008

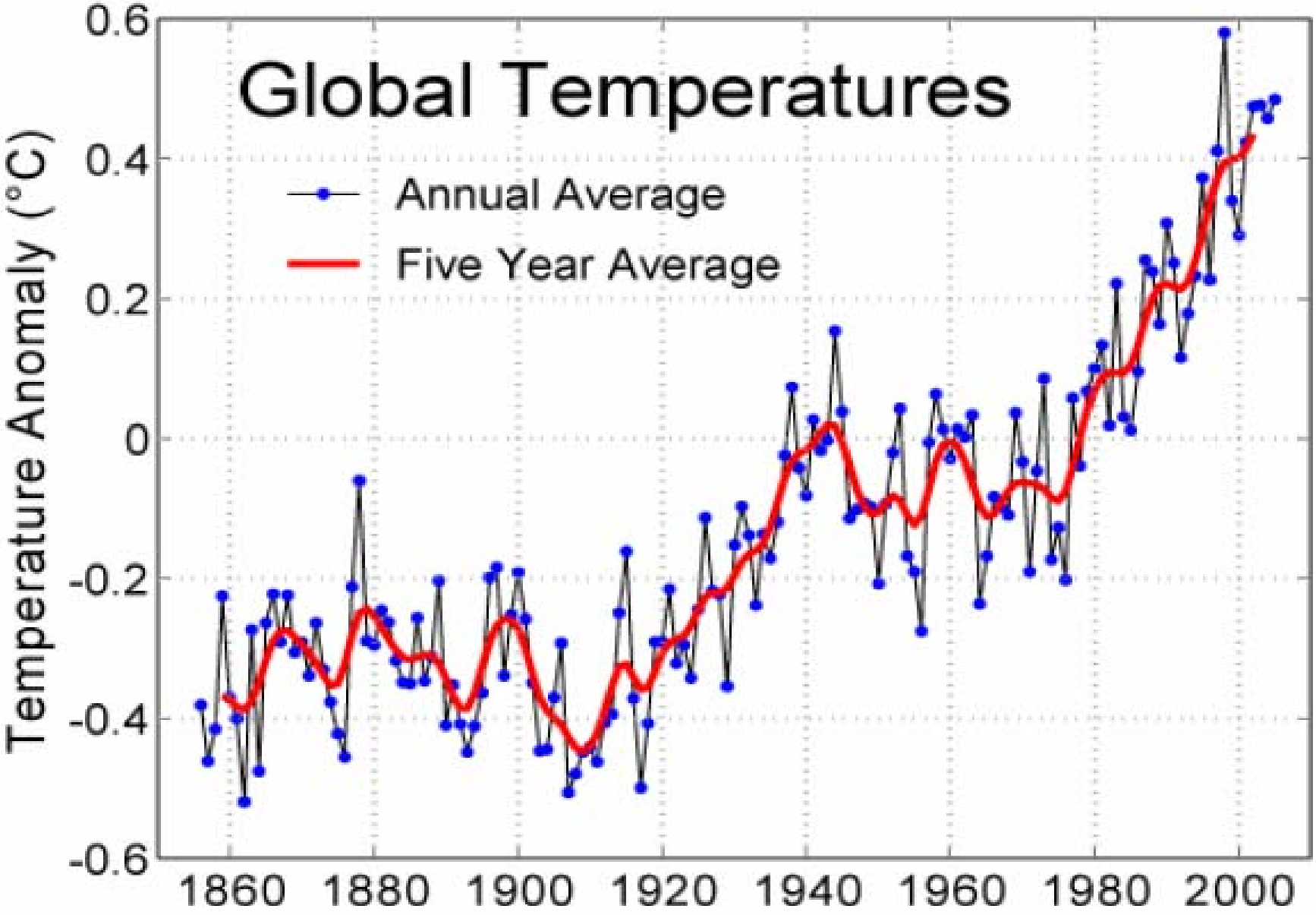
Sea Level Rise Projections

	by 2050	by 2100
Historic trend, SF gage	.35 ft	0.7 ft
IPCC 2007	-	0.6 – 1.9
Polynomial projection of historic	0.5	1.0
Mid-point CAT 12 scenarios, DWR	0.9	2.4
CalFed ISB and Delta Vision	1.3	4.6

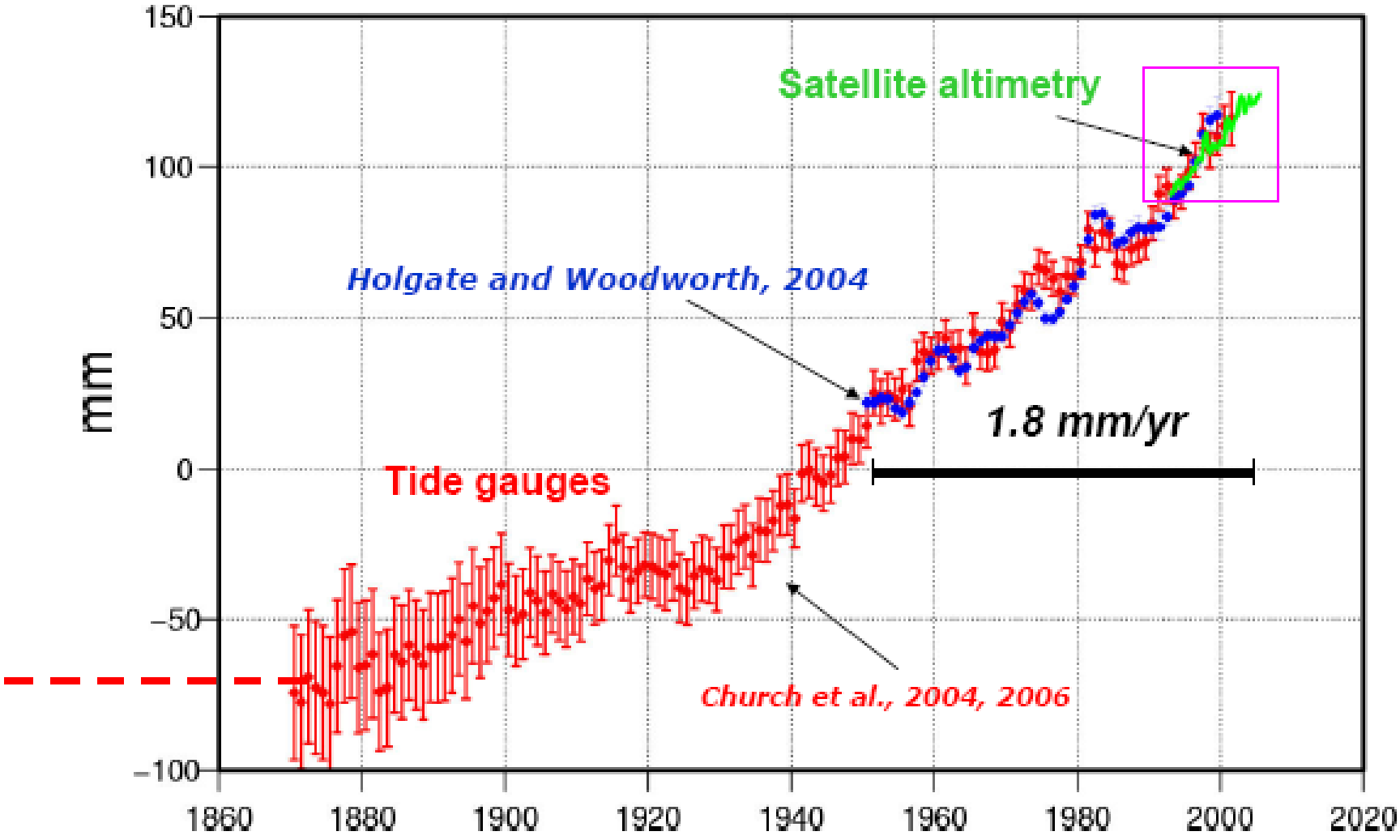
Golden Gate Annual Average and 19-Year Mean Tide Levels



Updated Through 2007

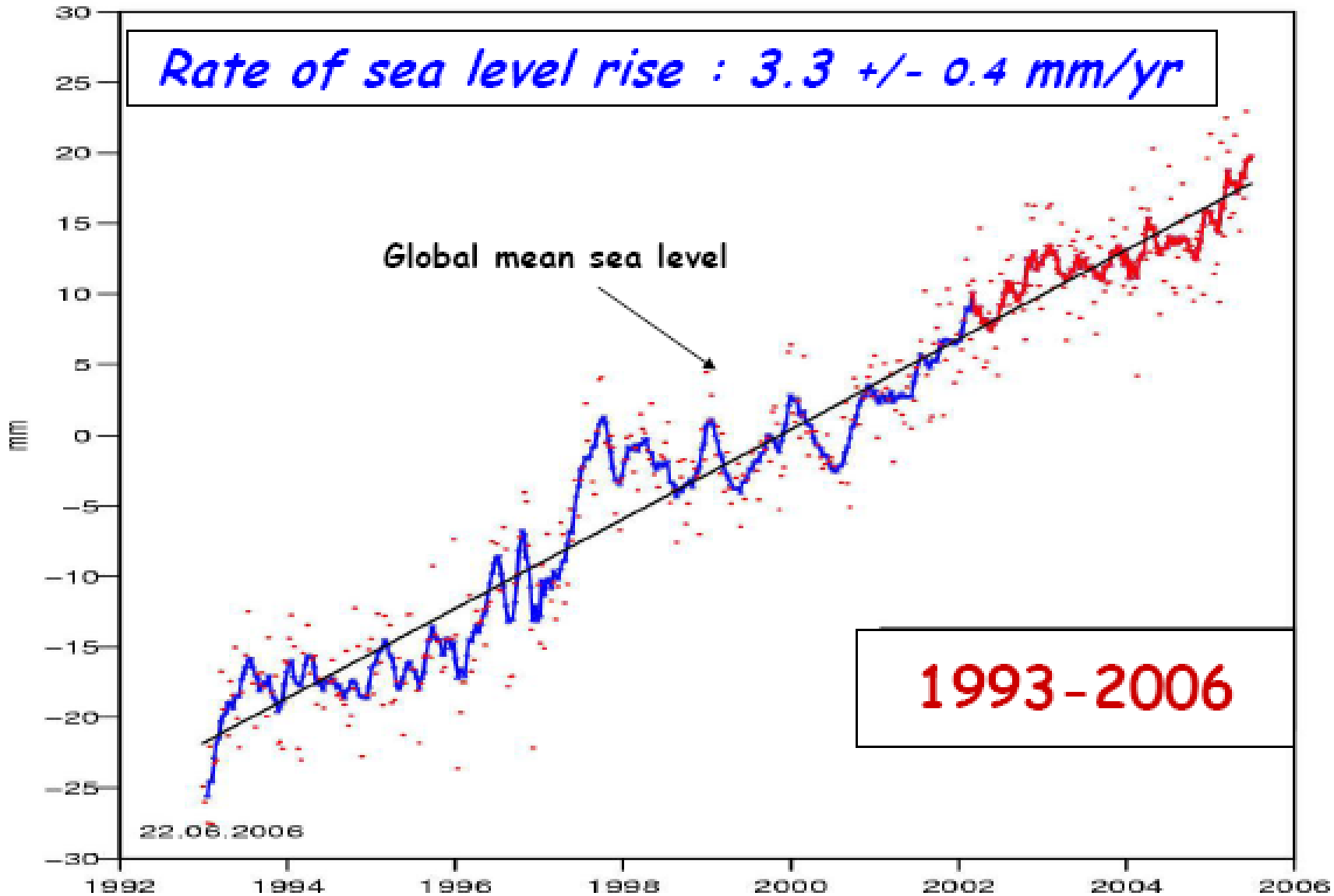

Global Temperatures
Annual Average
Five Year Average
Temperature Anomaly (°C)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1860
1880
1900
1920
1940
1960
1980
2000

Global mean sea level rise during the 20th centurry



IPCC & A. Casenave

Sea level rise observed by Topex and Jason satellites



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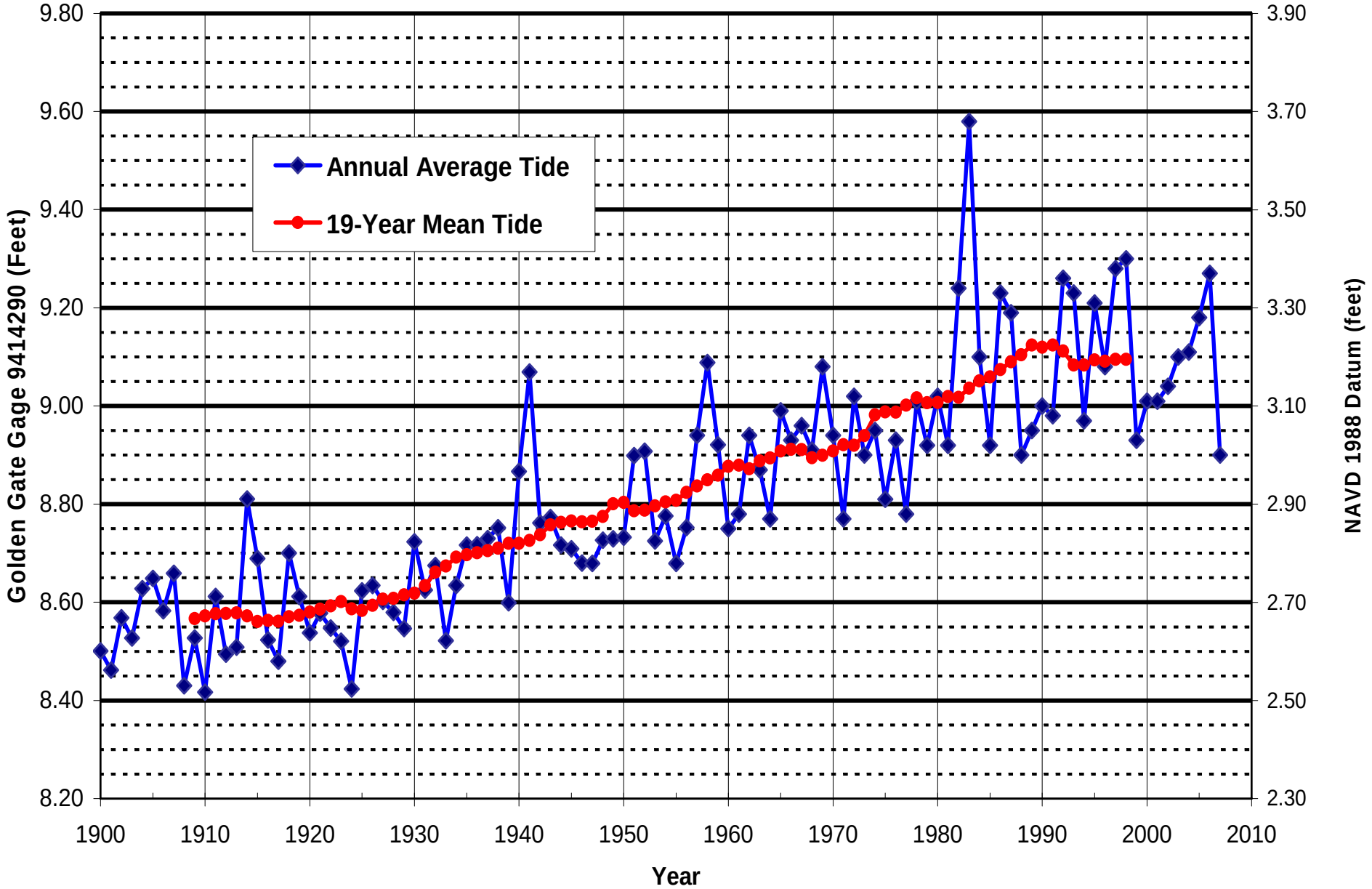
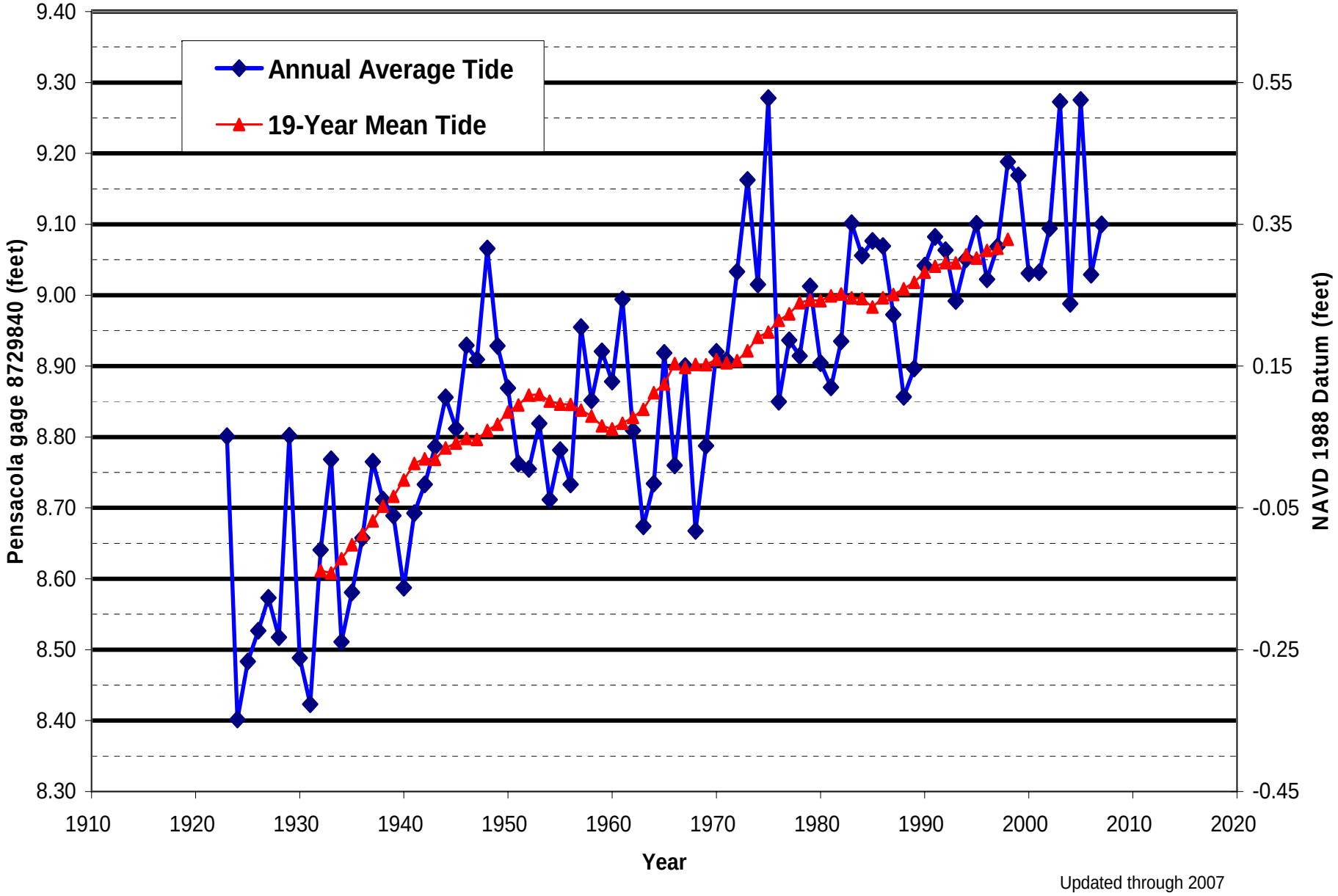
Golden Gate Annual Average and 19-Year Mean Tide Levels

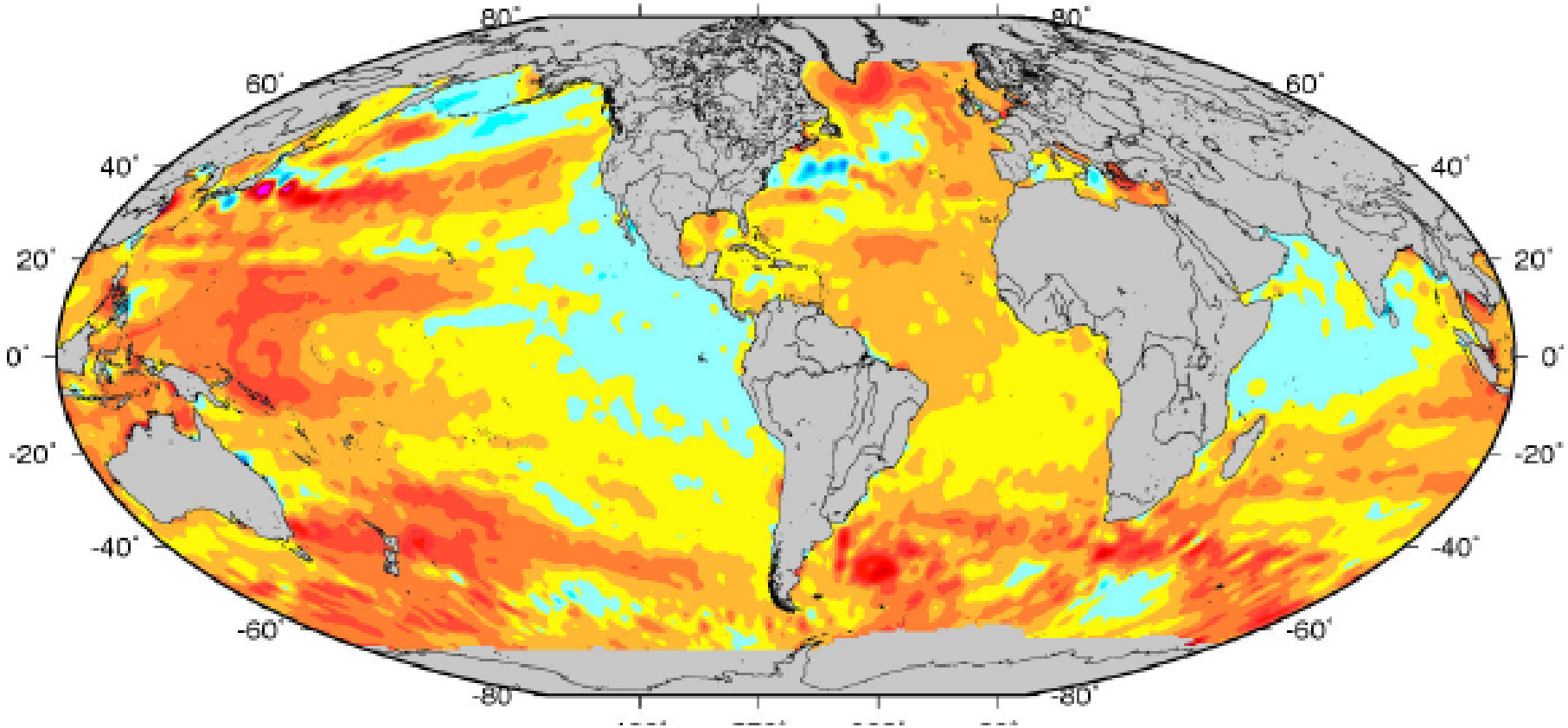


Updated Through 2007

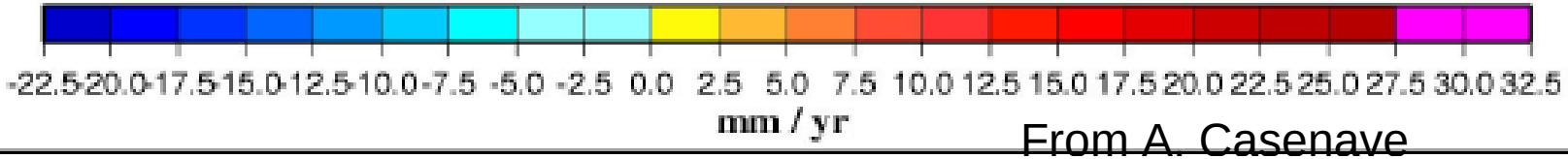
Pensacola Annual Average and 19-Year Mean Tide Levels



Sea level change is not uniform!



Geographical distribution of sea level trends (1993-2005)



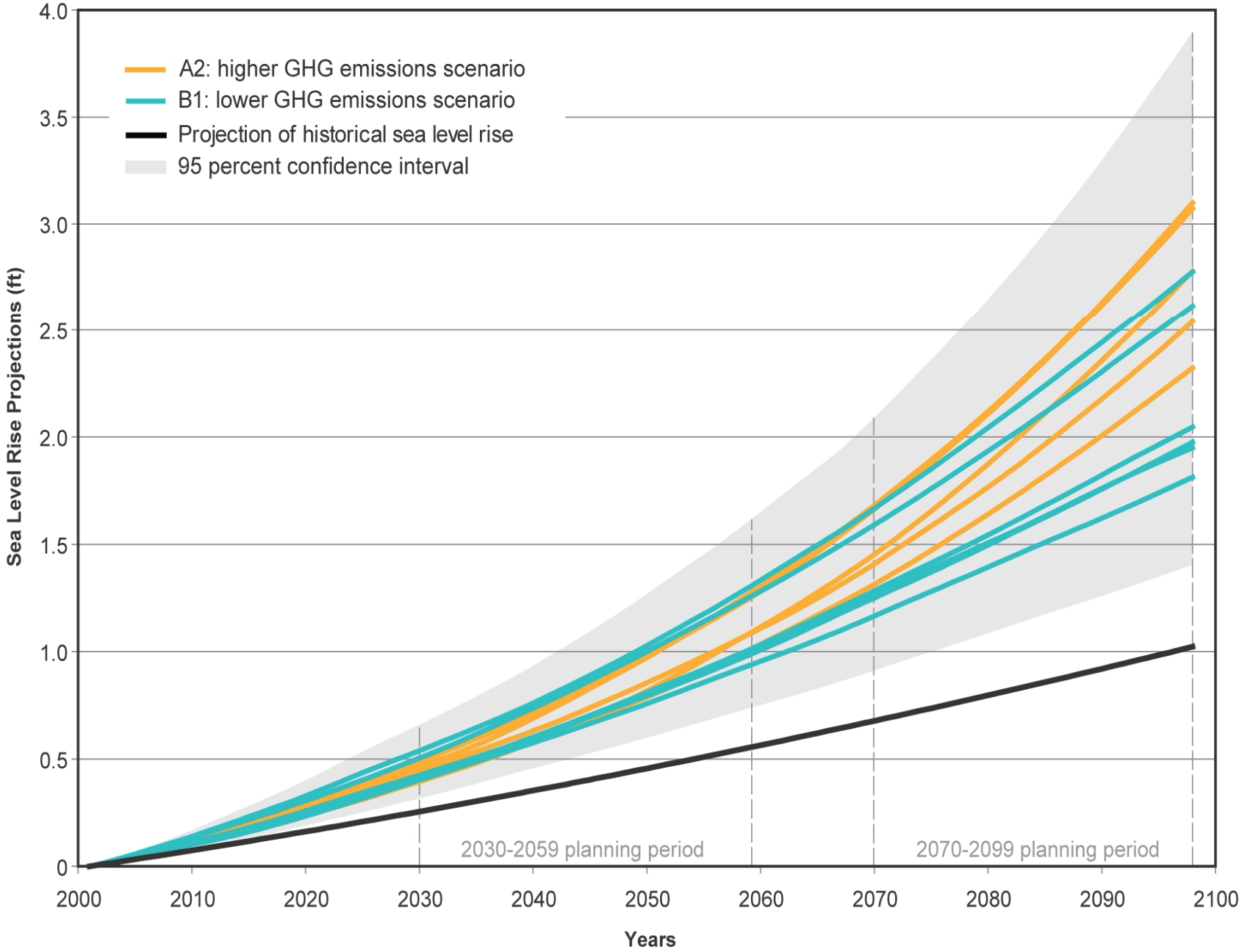
From A. Casenave

LEGOS

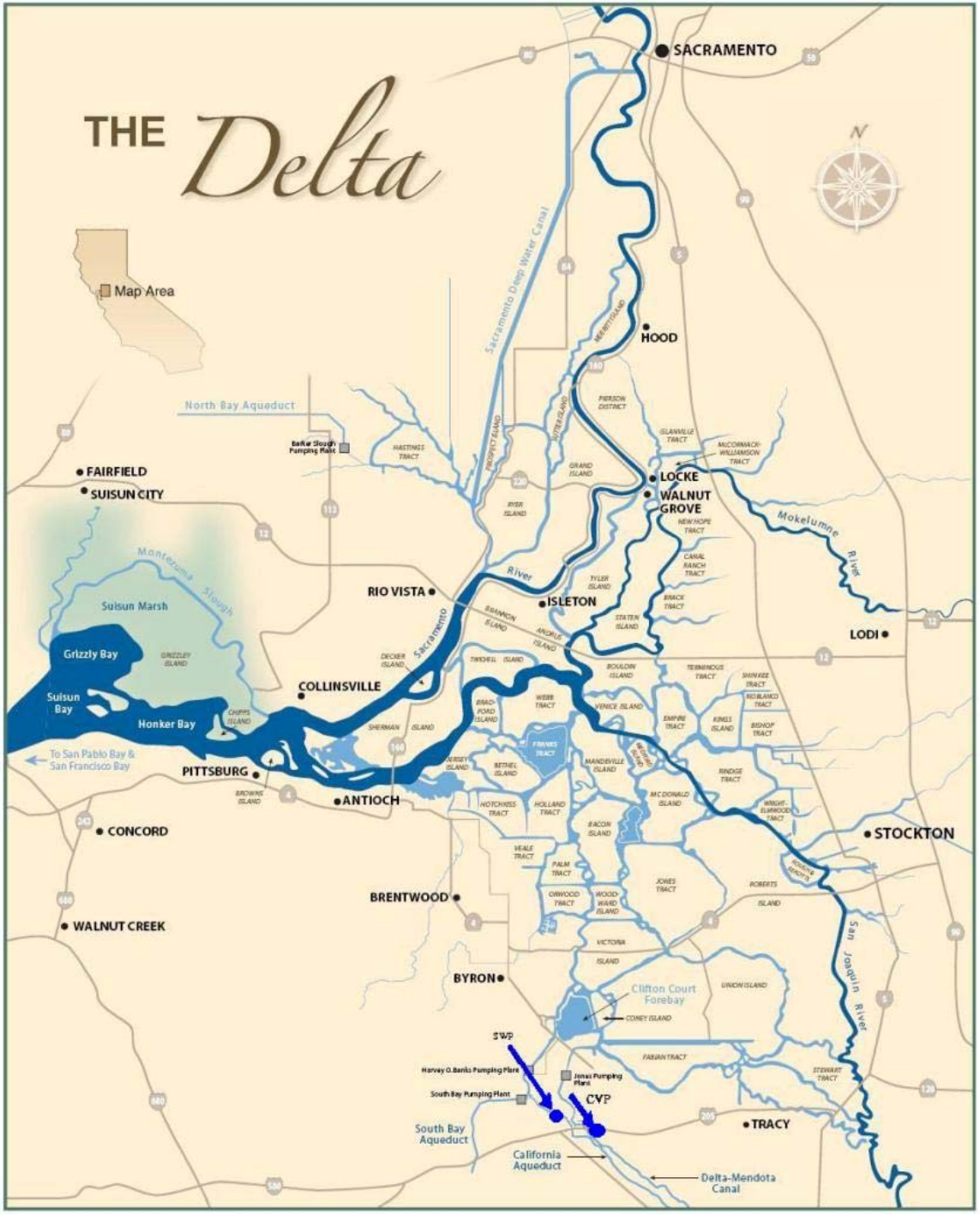
Components of Sea Level Rise, 1993-2003

• Thermal expansion	1.6	mm/yr	
• Glaciers and icecaps	0.8	“	
• Greenland ice sheet	0.2	“	
• Antarctic ice sheet	0.2	“	
– Total	2.8	“	
– Observed	3.1	+ or -	0.7

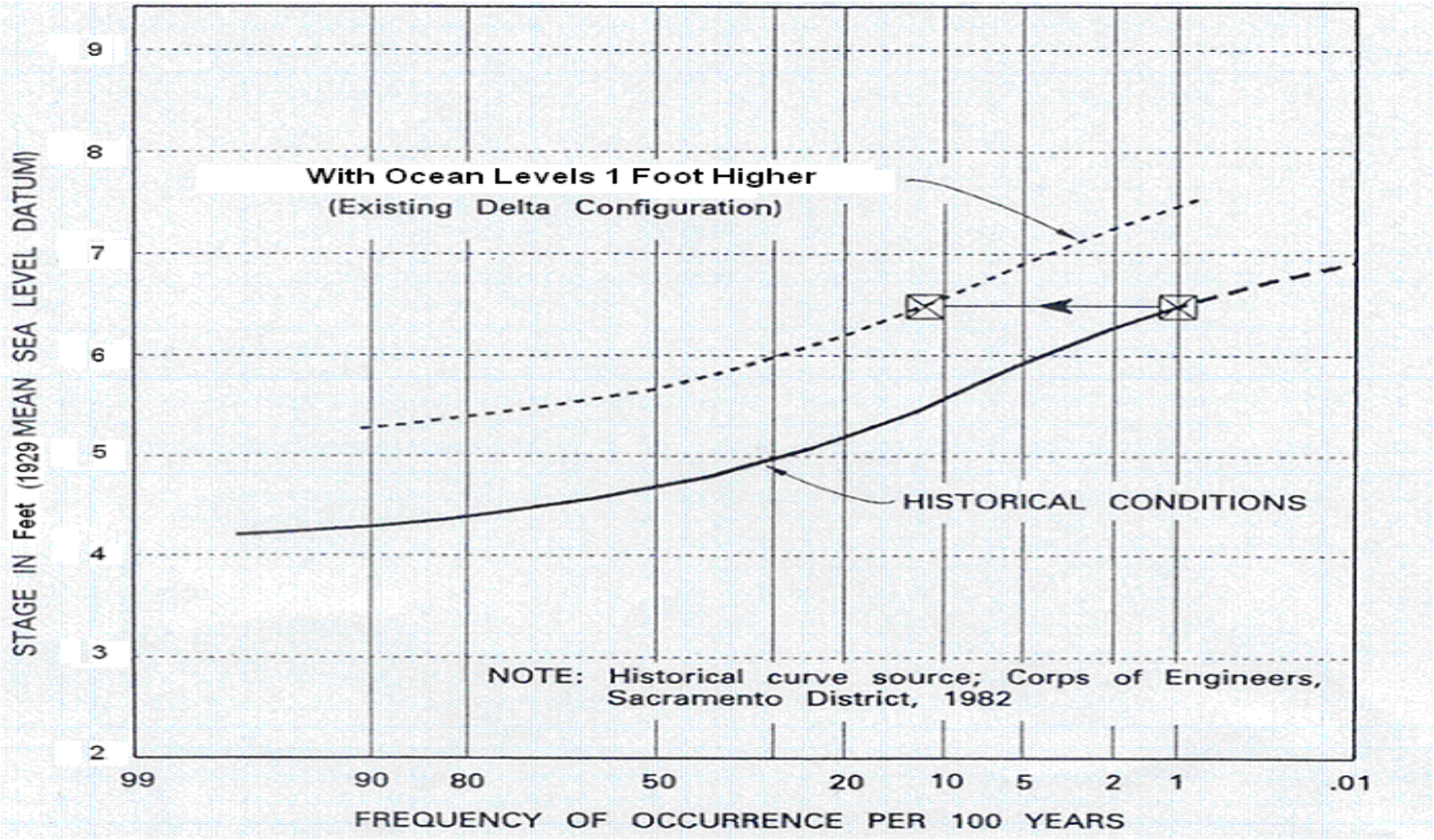
Source: IPCC 2007



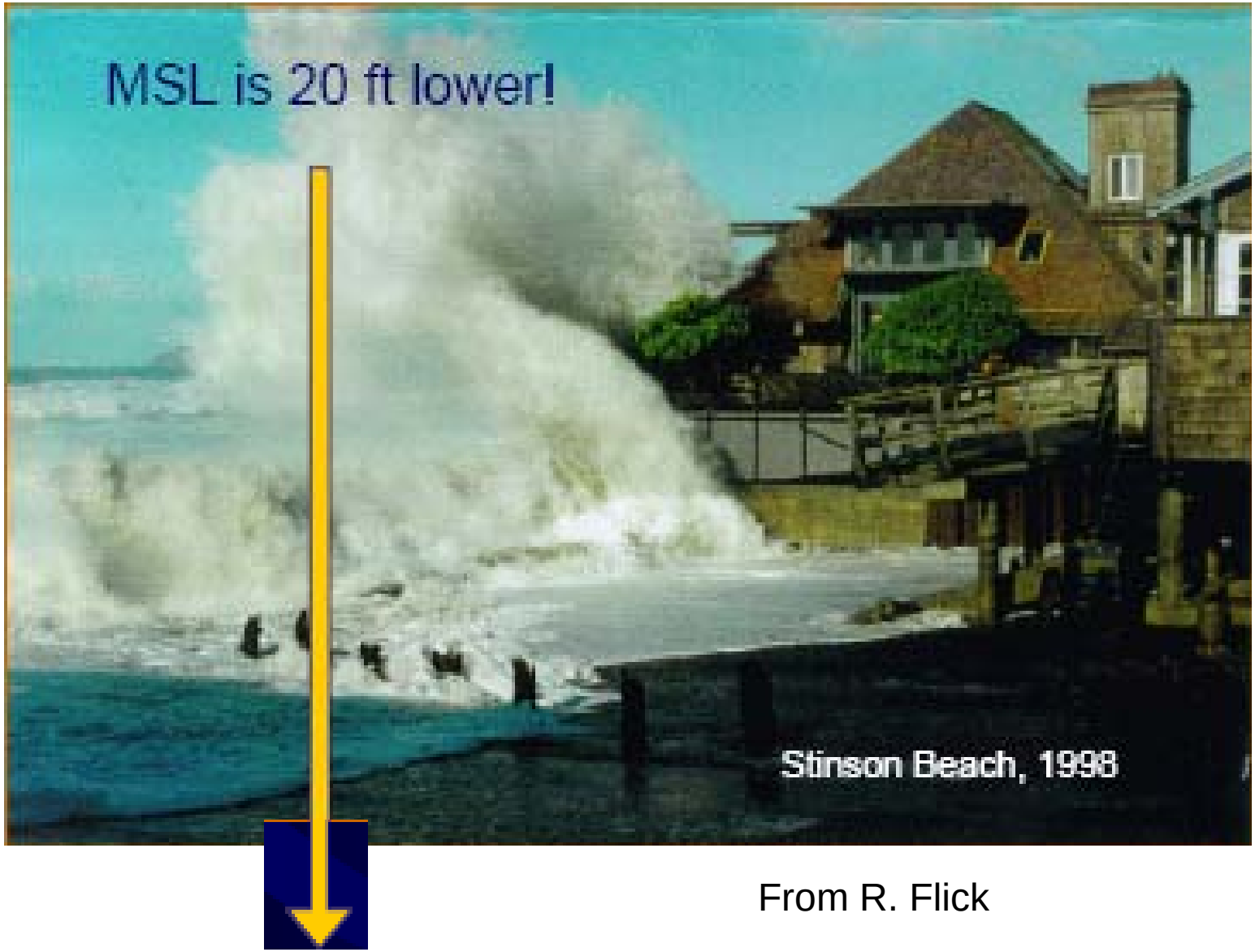
Sea Level Rise Projections Based on Air Temperatures from 12 Global Climate Models


THE Delta
Map Area
SACRAMENTO
HOOD
North Bay Aqueduct
Barker Slough Pumping Plant
FAIRFIELD
SUISUN CITY
LOCKE
WALNUT GROVE
Mokelumne River
Sacramento Deep Water Canal
Sacramento River
RIO VISTA
ISLETON
LODI
Suisun Marsh
Grizzly Bay
Suisun Bay
Honker Bay
COLLINSVILLE
To San Pablo Bay & San Francisco Bay
PITTSBURG
ANTIOCH
CONCORD
STOCKTON
BRENTWOOD
WALNUT CREEK
BYRON
Clifton Court Forebay
SWP
CVP
Harvey O. Banks Pumping Plant
Jones Pumping Plant
South Bay Pumping Plant
South Bay Aqueduct
California Aqueduct
Delta-Mendota Canal
TRACY
San Joaquin River

Stage-Frequency Curve for Antioch, CA.

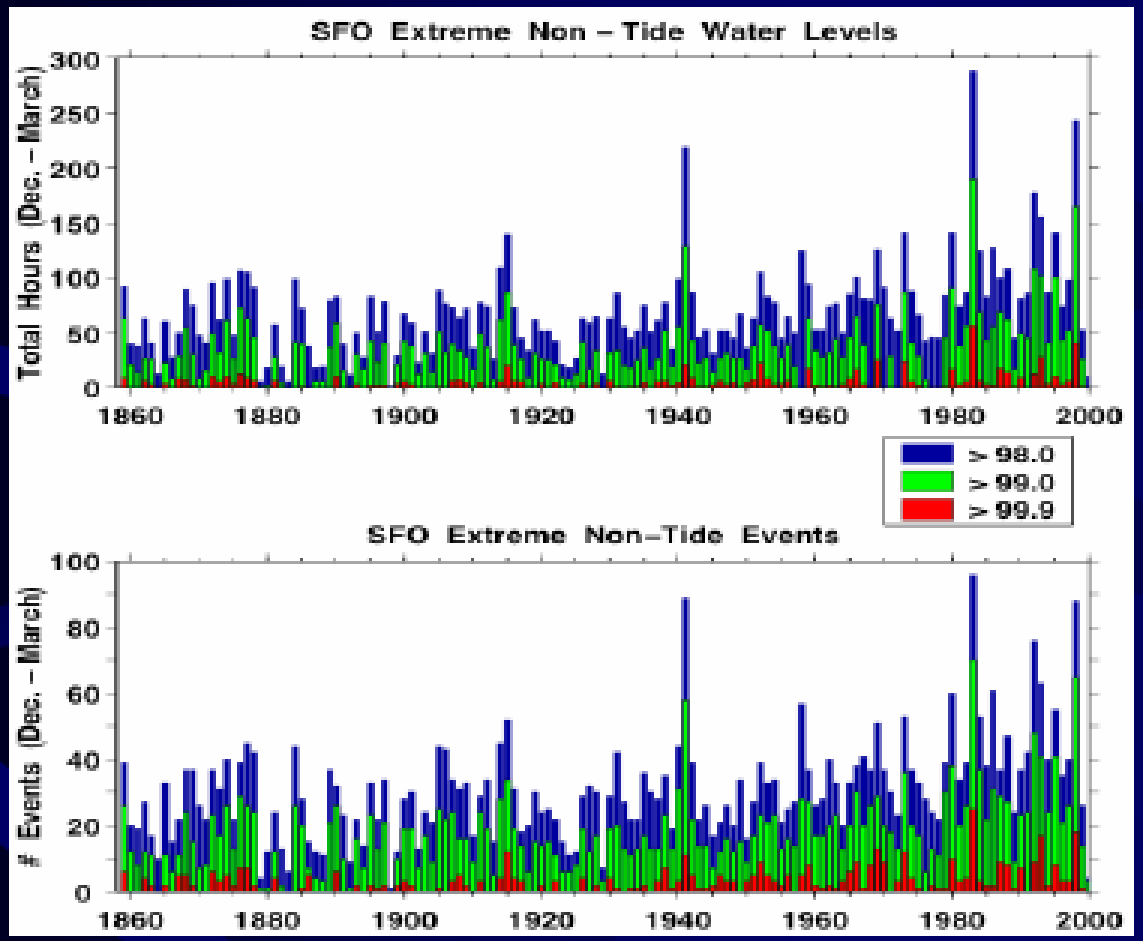


In California, Mean Sea Level Isn't Everything



From R. Flick

Long-Term Increase in Extreme Sea Levels

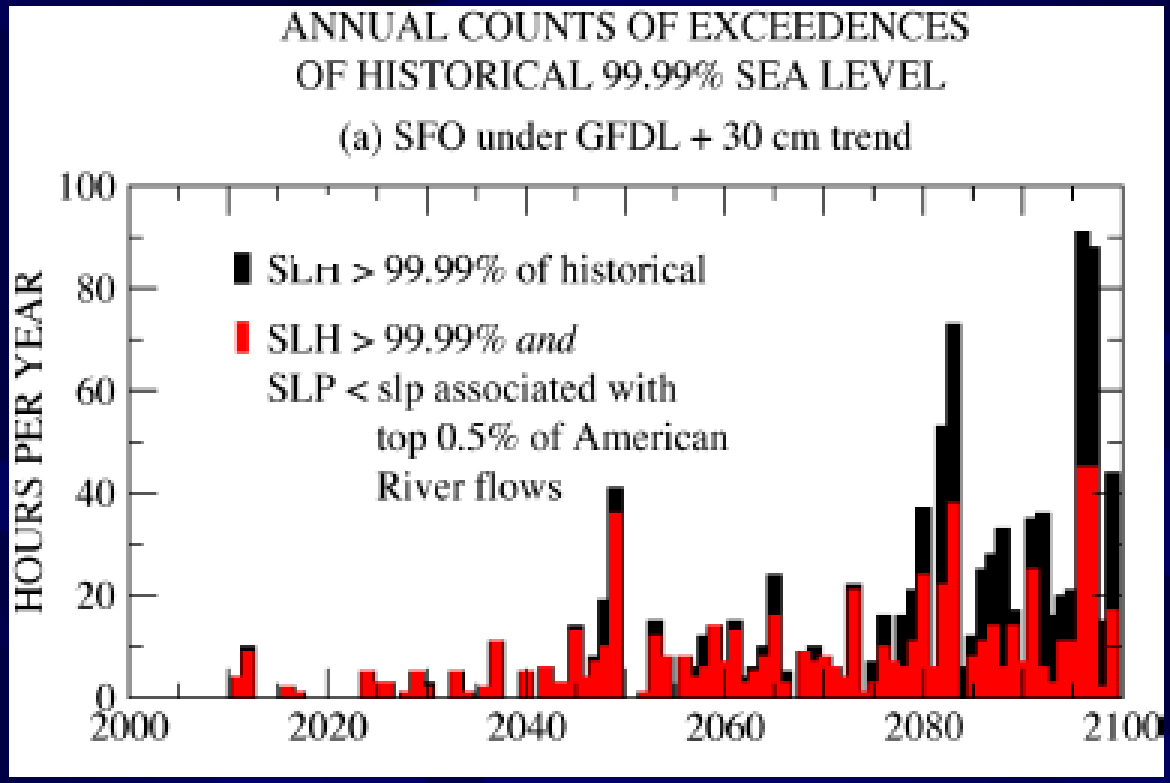


Based on the entire SFO tide gauge record, 1858-2000

Underlying MSL trend causes increasing duration and frequency of extreme water level events

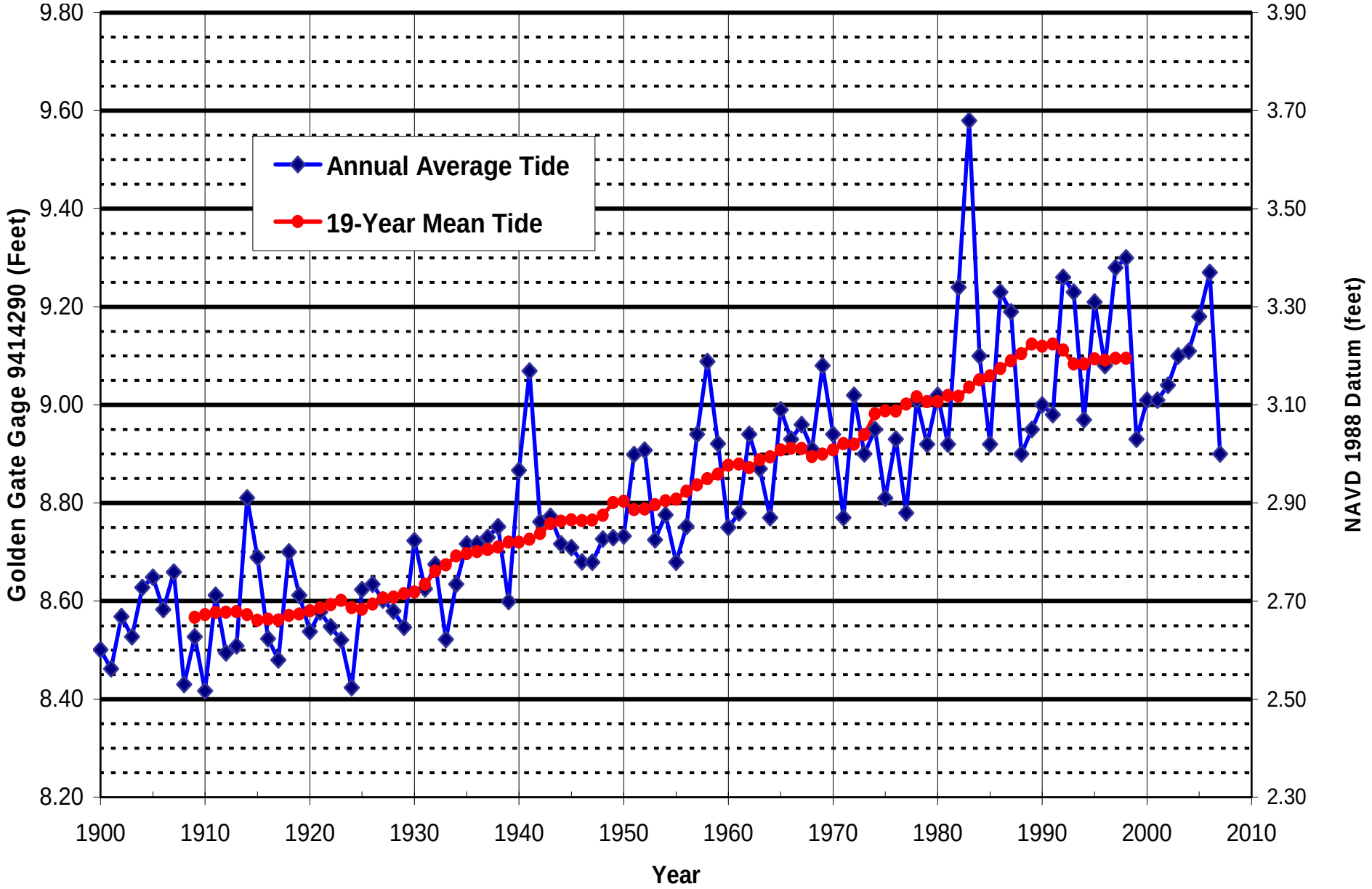
(Bromirski, Flick, and Cayan, 2003, "Storminess variability along the California coast 1858-2000," *Journal of Climate* 16(6))

Projected Incidence of Extremes



High river flows commonly occur during extreme storm surge, increasing risk to the San Francisco Bay/Delta levy system

(Cayan, Bromirski, Hayhoe, Tyree, Dettinger, Flick, 2007, "Climate change projections of sea level extremes along the California coast," *Climatic Change*, 28 pp, in press)



Updated Through 2007

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