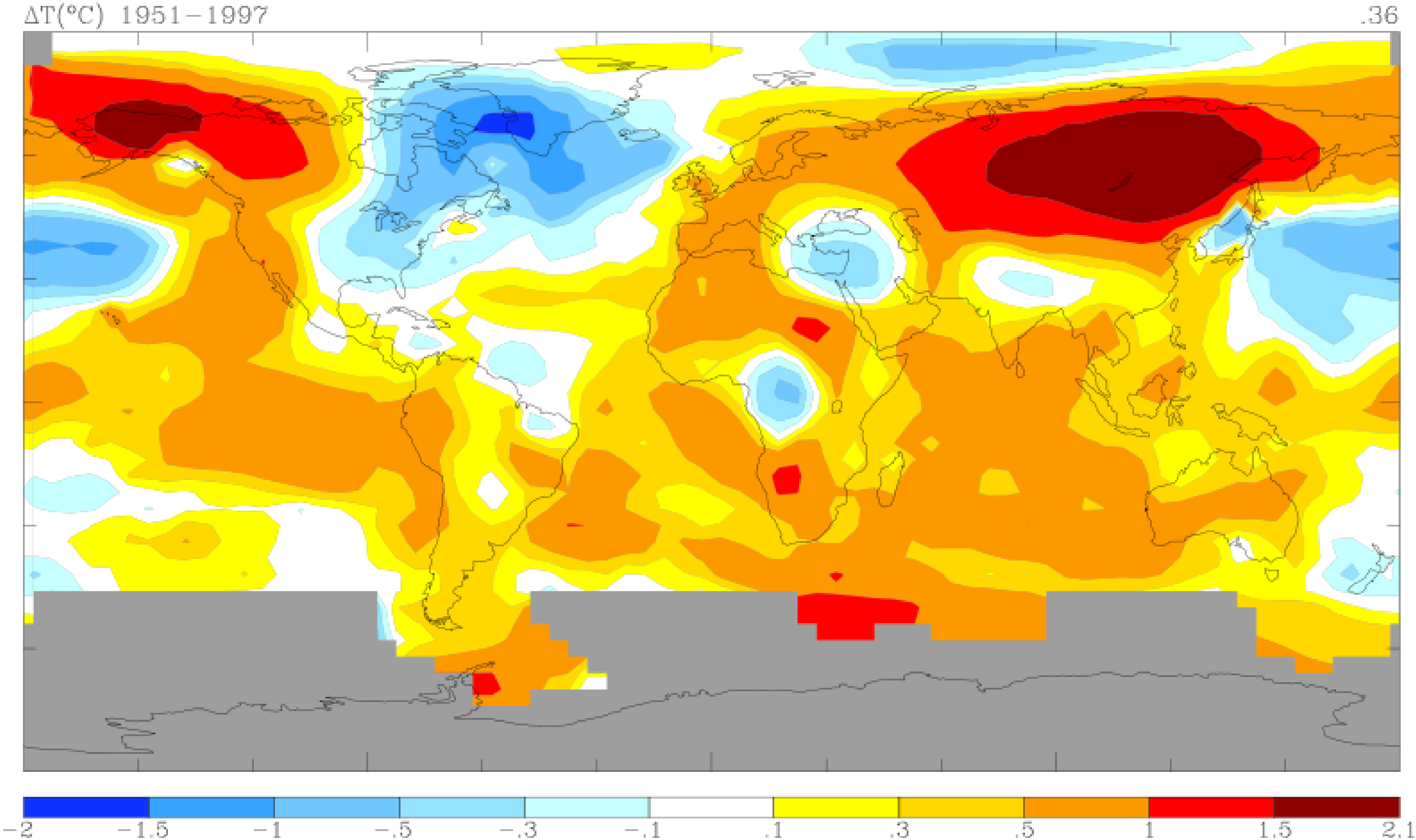
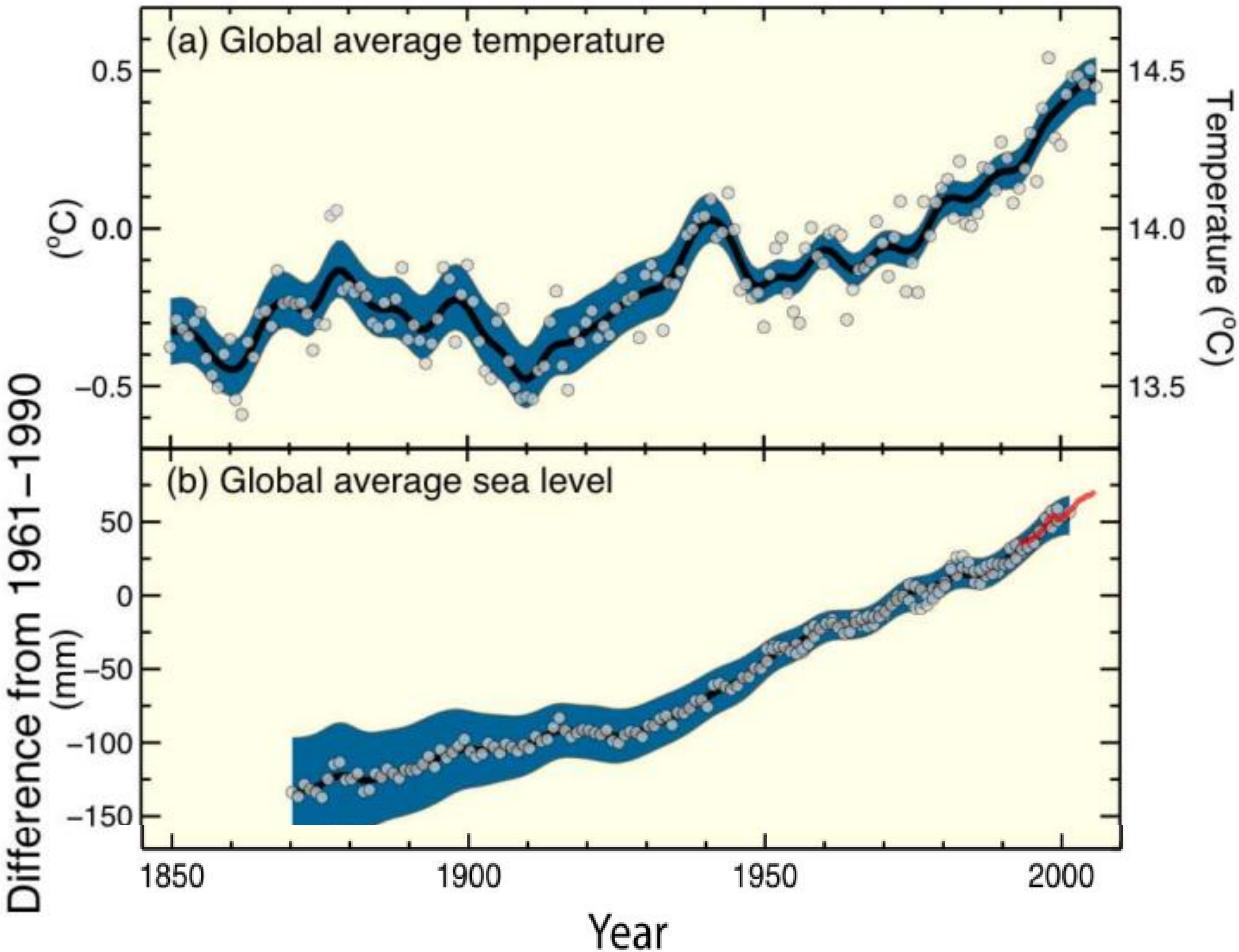
- What is sand?
- Where does it come from?
- Waves and wave energy
- How global climate change will influence waves and wave transport
- Dune types and formation
- Natural dune communities
- Introduced beachgrass and influence on beach and dunes
- Surf zone and sand dwelling organisms and food web
- Snowy plover biology
- Oregon beach law
- Field trip

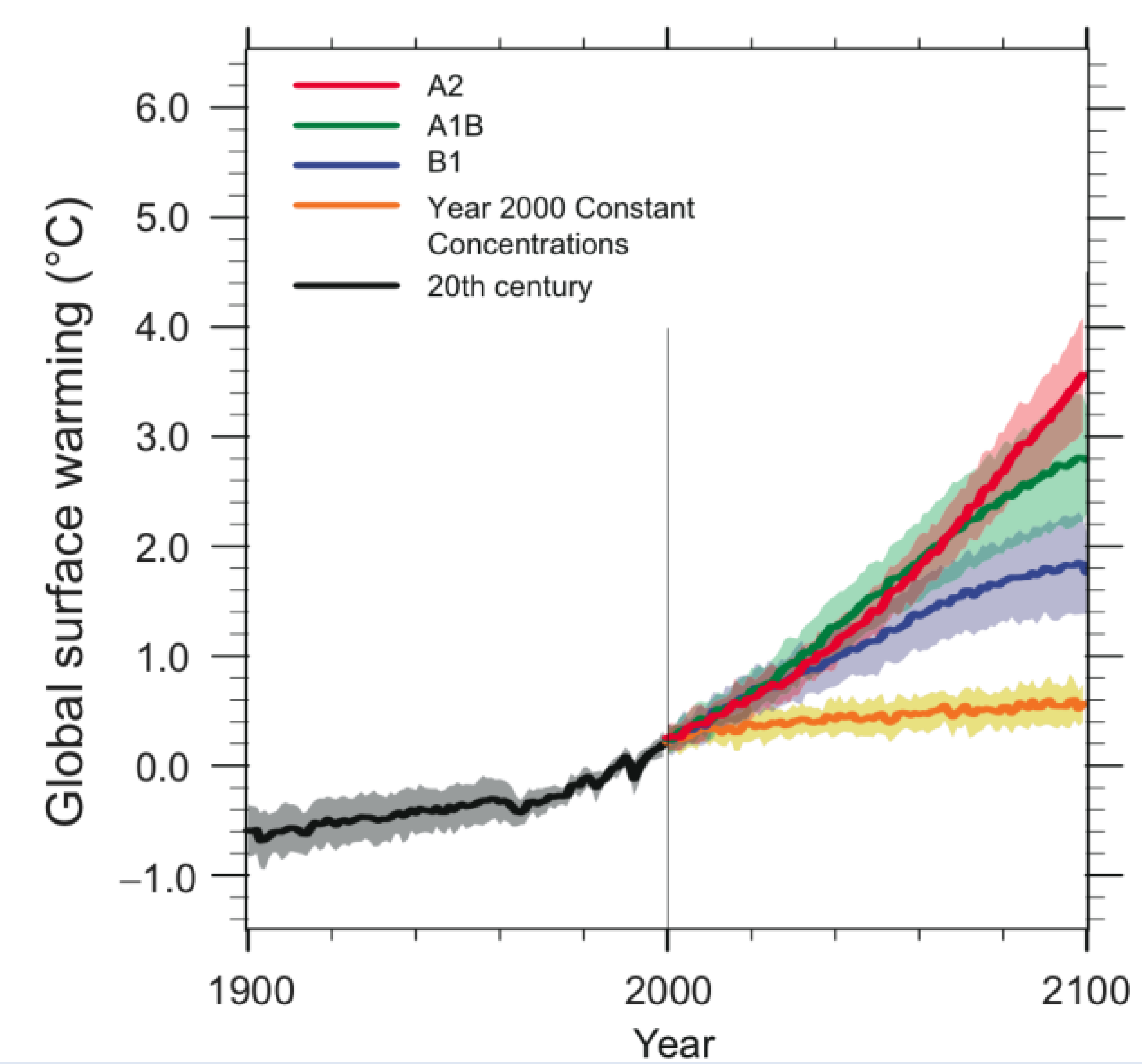

Photo Courtesy of Julie Hendricks



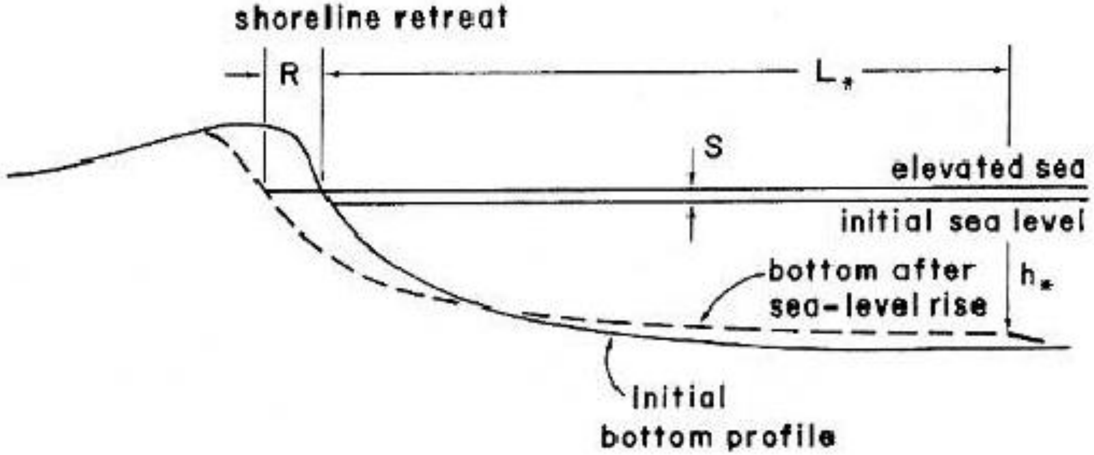
Surface temperature change for 1951-1997 based on local linear trends. (Proc. Natl. Acad. Sci. 95, 4113-4120, 1998).

Changes in Temperature, Sea Level and Northern Hemisphere Snow Cover




A2
A1B
B1
Year 2000 Constant Concentrations
20th century
Global surface warming (°C)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
–1.0
1900
2000
2100
Year

Coastal Response to Sea Level Rise (simplest expression of response)



(Bruun 1962)

$$R = \frac{1}{\tan\beta} S$$

$$where \tan\beta = 0.02 - 0.04$$

Note $\tan\beta$ = *beach slope, R=shore retreat, S = sea level rise.*

For the Oregon Coast:

$R = \sim 25*S$ to $50*S$

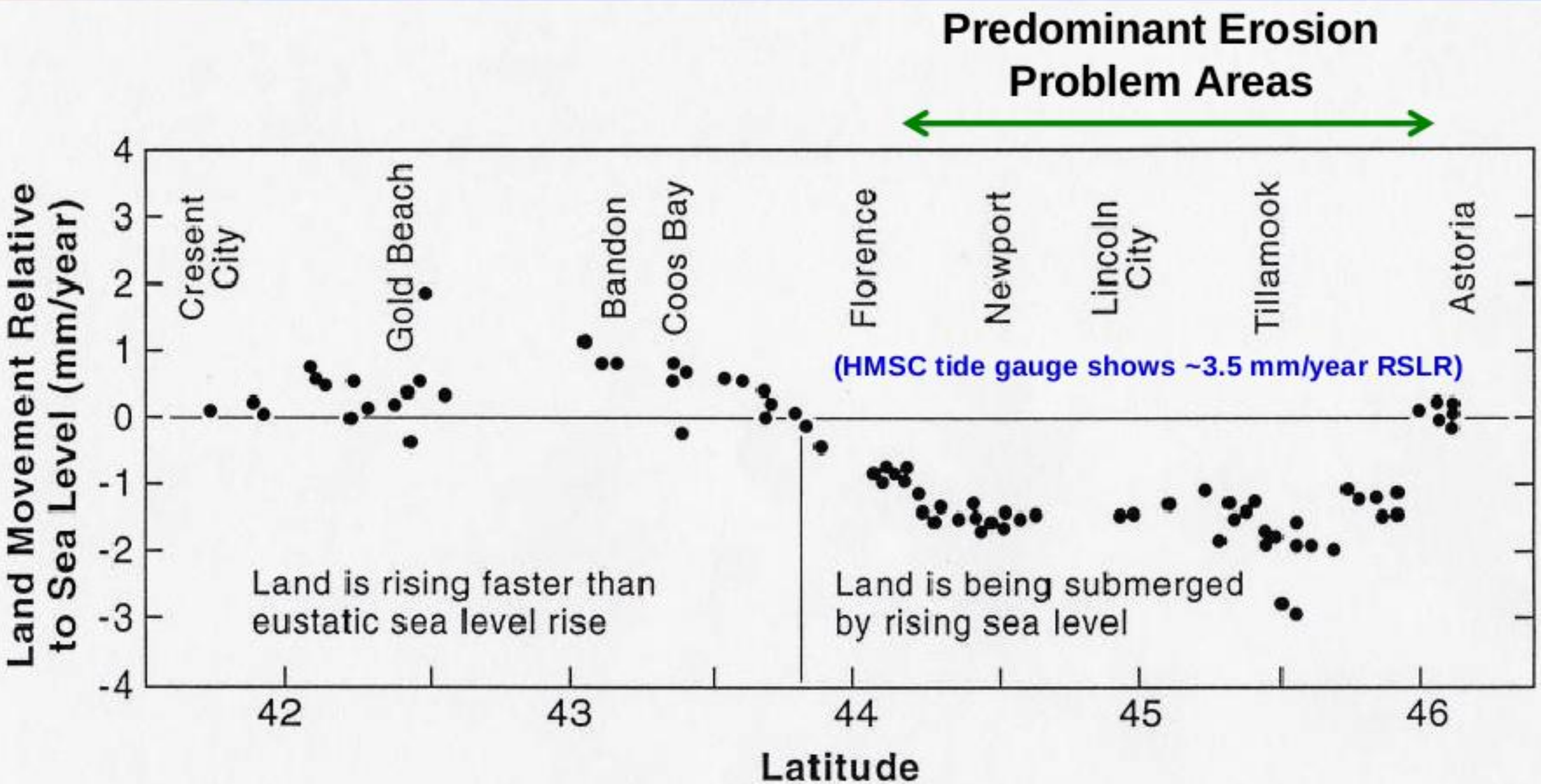
Assuming SLR is ~0.4 m

R = ~10 (33 ft) to 20m (66 ft) retreat

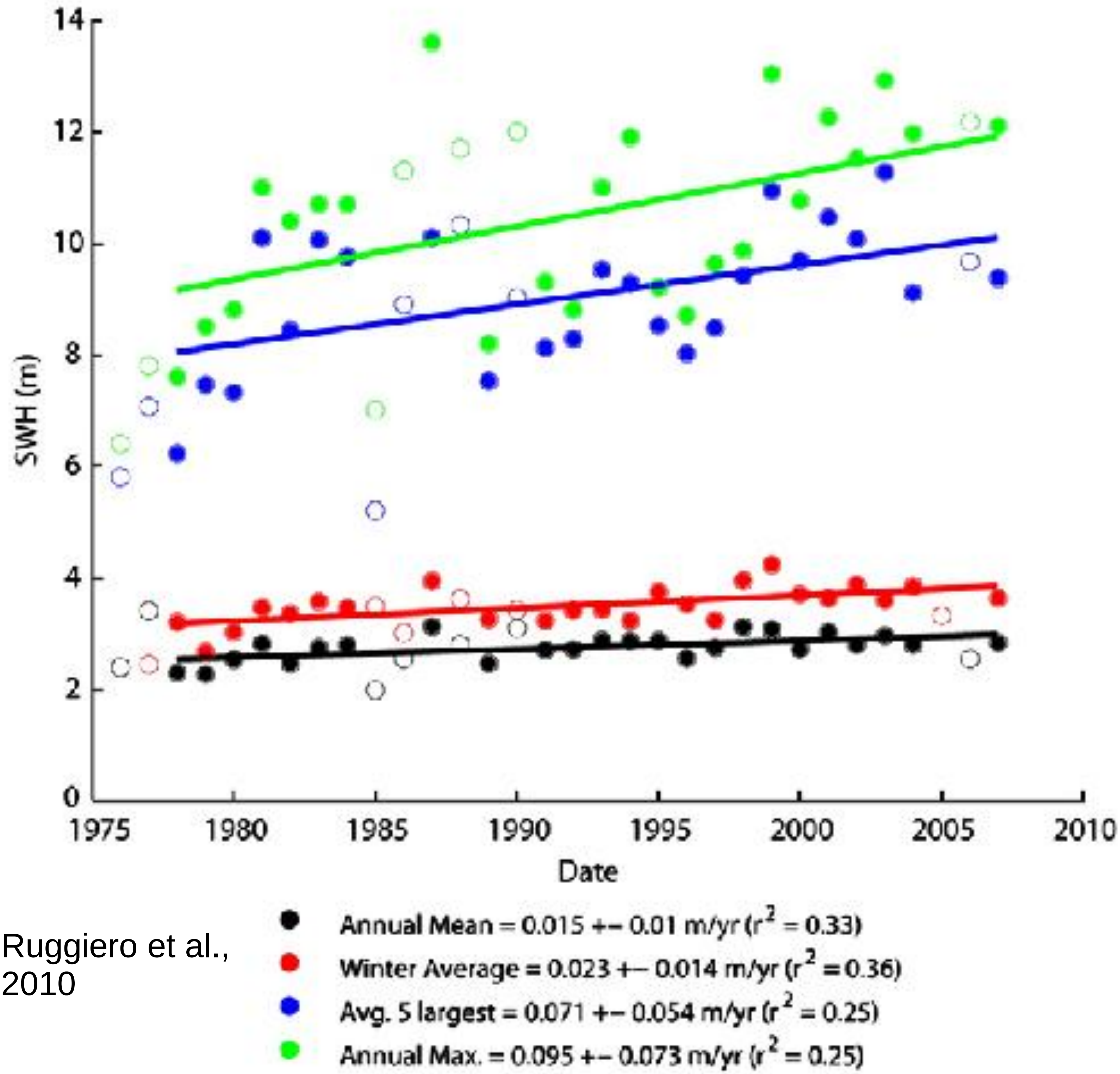
Assuming SLR is ~1.4 m (worst case)

R = ~35 (115 ft) to 70m (230 ft) retreat

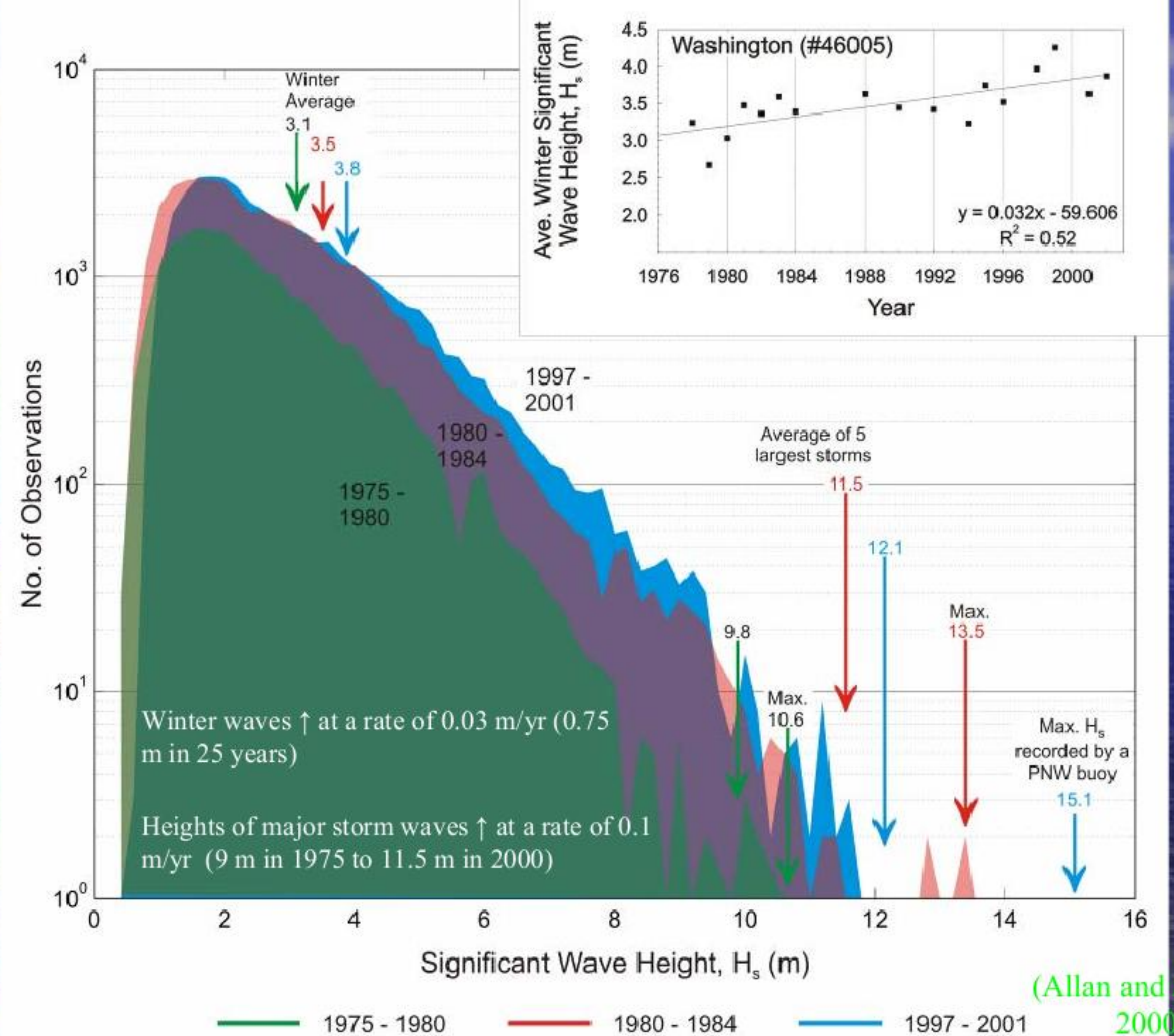
Along-coast variations in relative sea level determined by surveyed bench marks



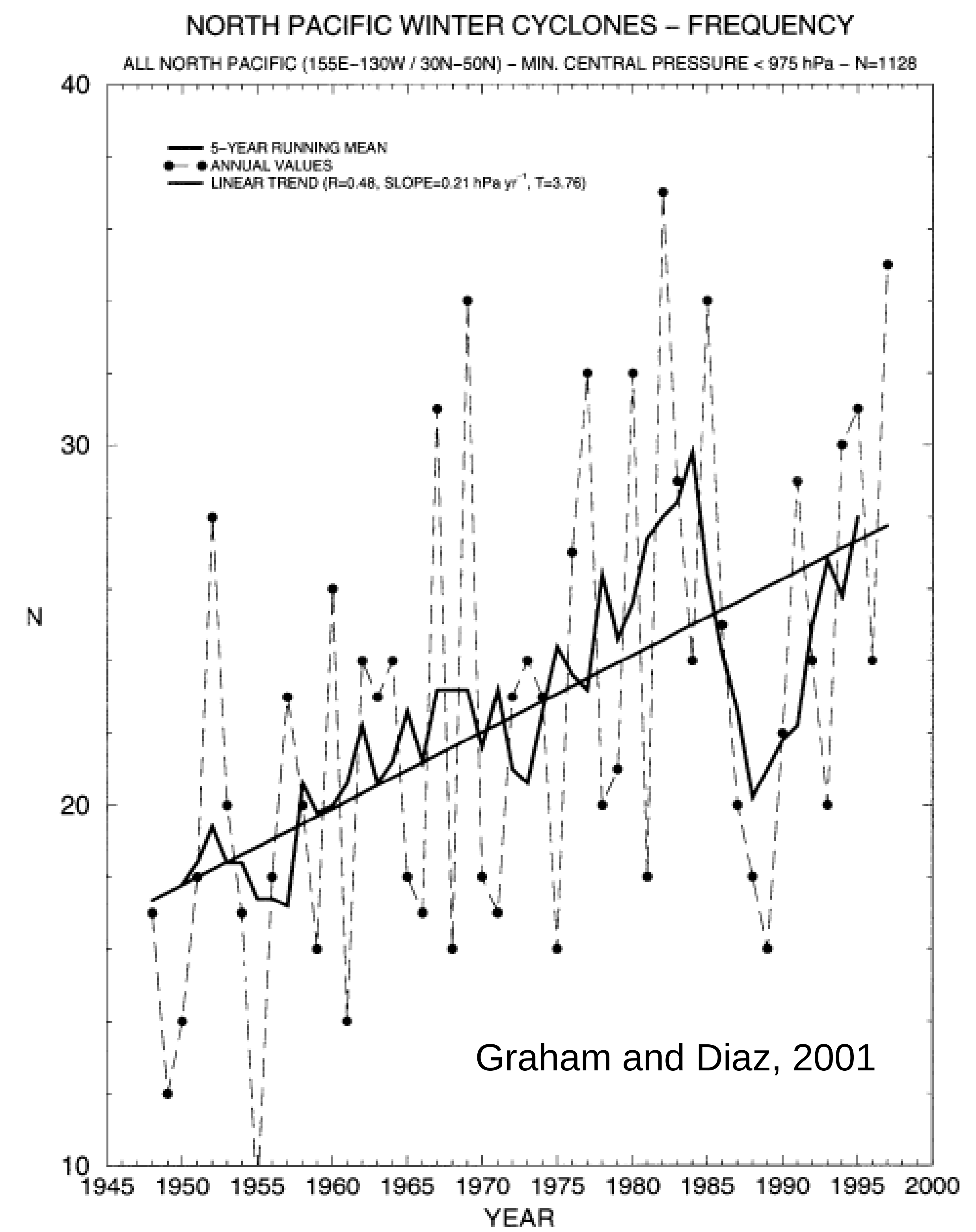
(Vincent, 1989; Komar and Shih, 1993)

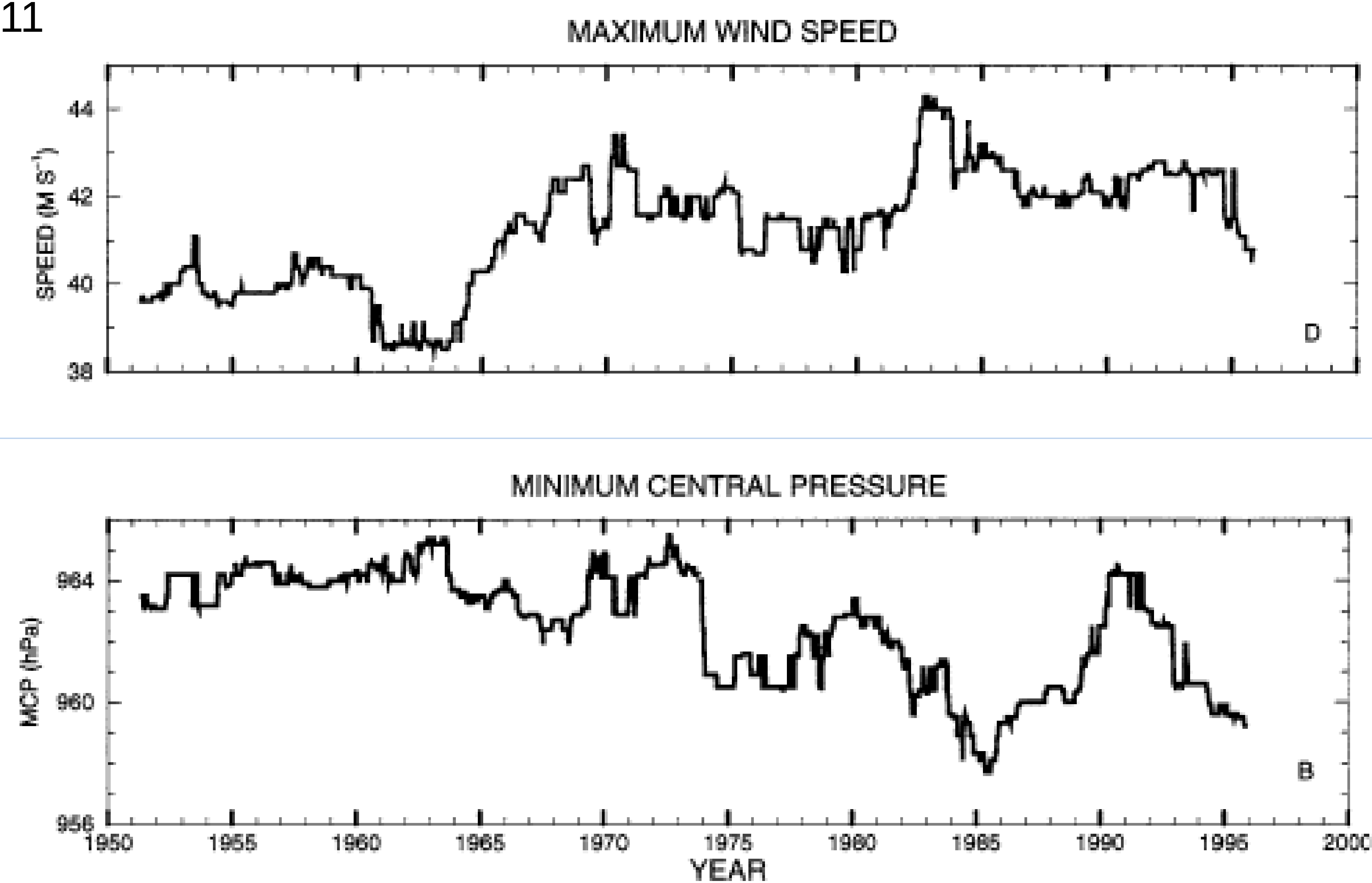


Ruggiero et al., 2010

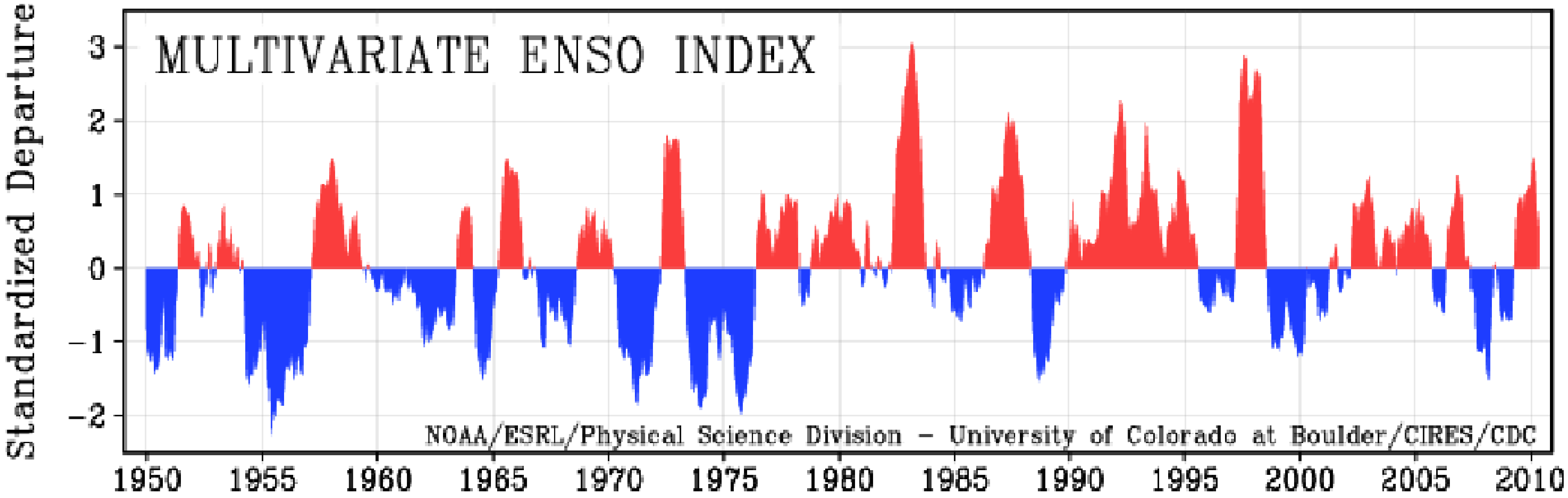


(Allan and Komar, 2000; *2006*)

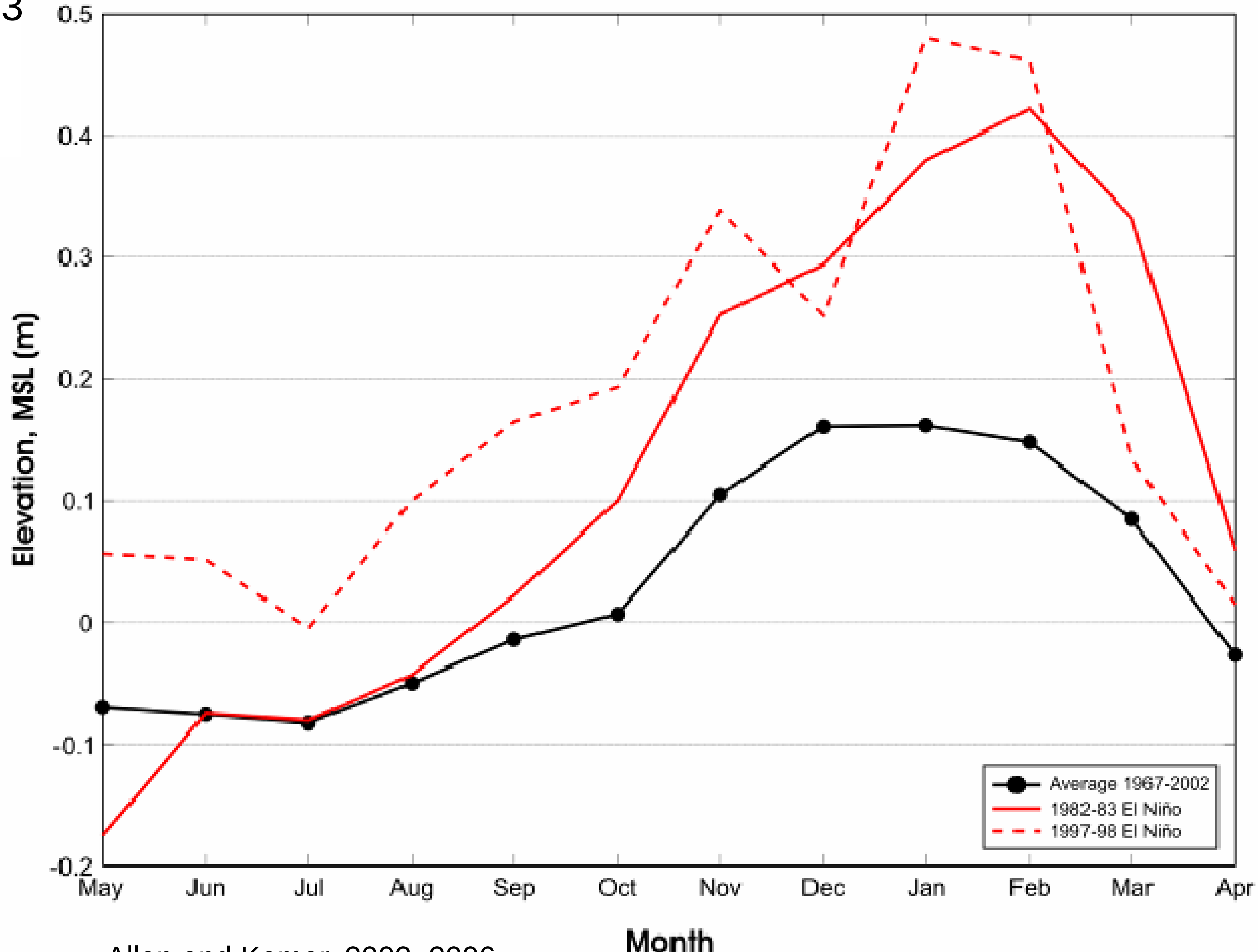

NORTH PACIFIC WINTER CYCLONES – FREQUENCY
ALL NORTH PACIFIC (155E–130W / 30N–50N) – MIN. CENTRAL PRESSURE < 975 hPa – N=1128
5–YEAR RUNNING MEAN
ANNUAL VALUES
LINEAR TREND (R=0.48, SLOPE=0.21 hPa yr⁻¹, T=3.76)
N
YEAR
10
20
30
40
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Graham and Diaz, 2001



Graham and Diaz, 2001

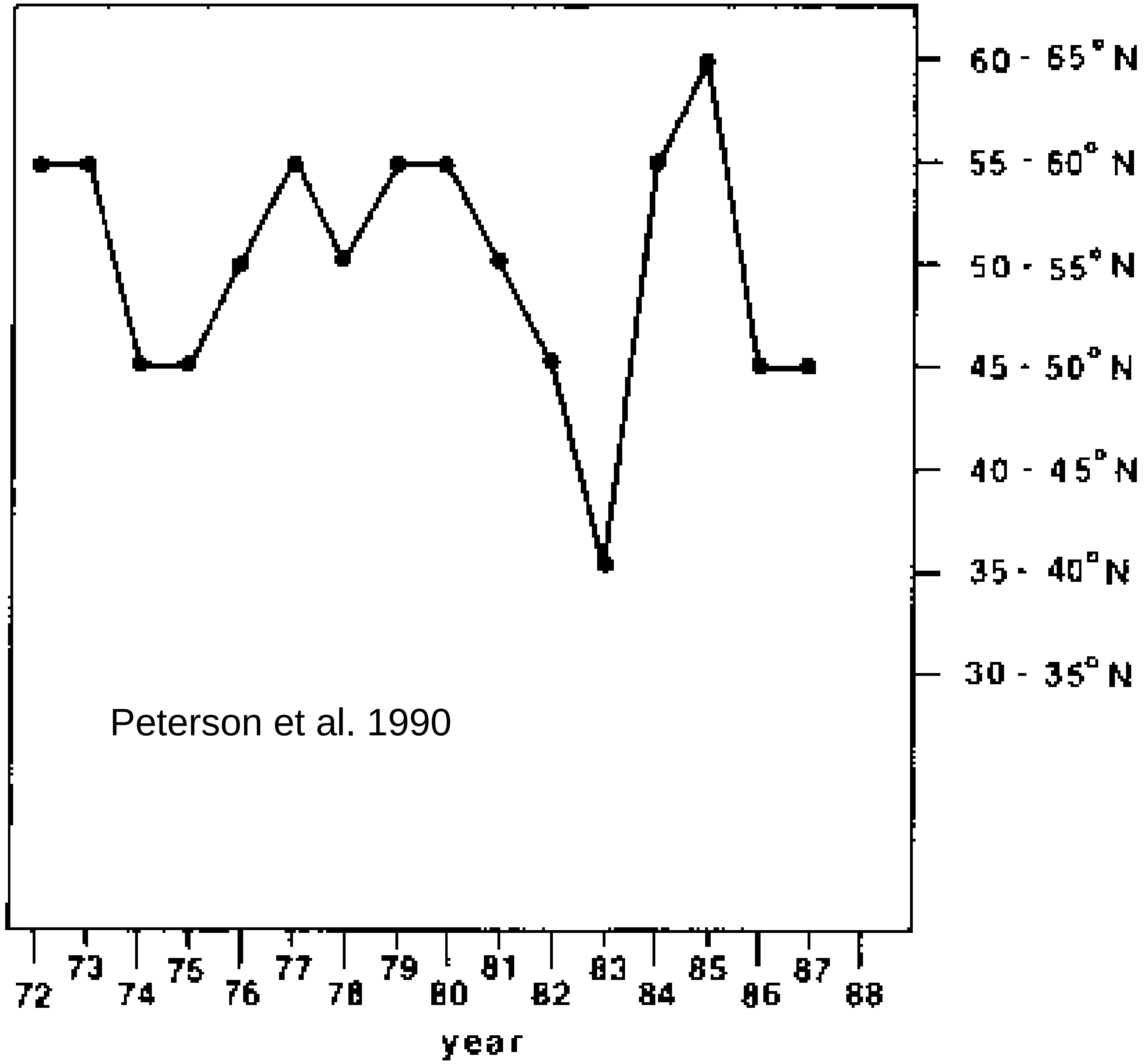


http://www.esrl.noaa.gov/psd/people/klaus.wolter/MEI/index.html

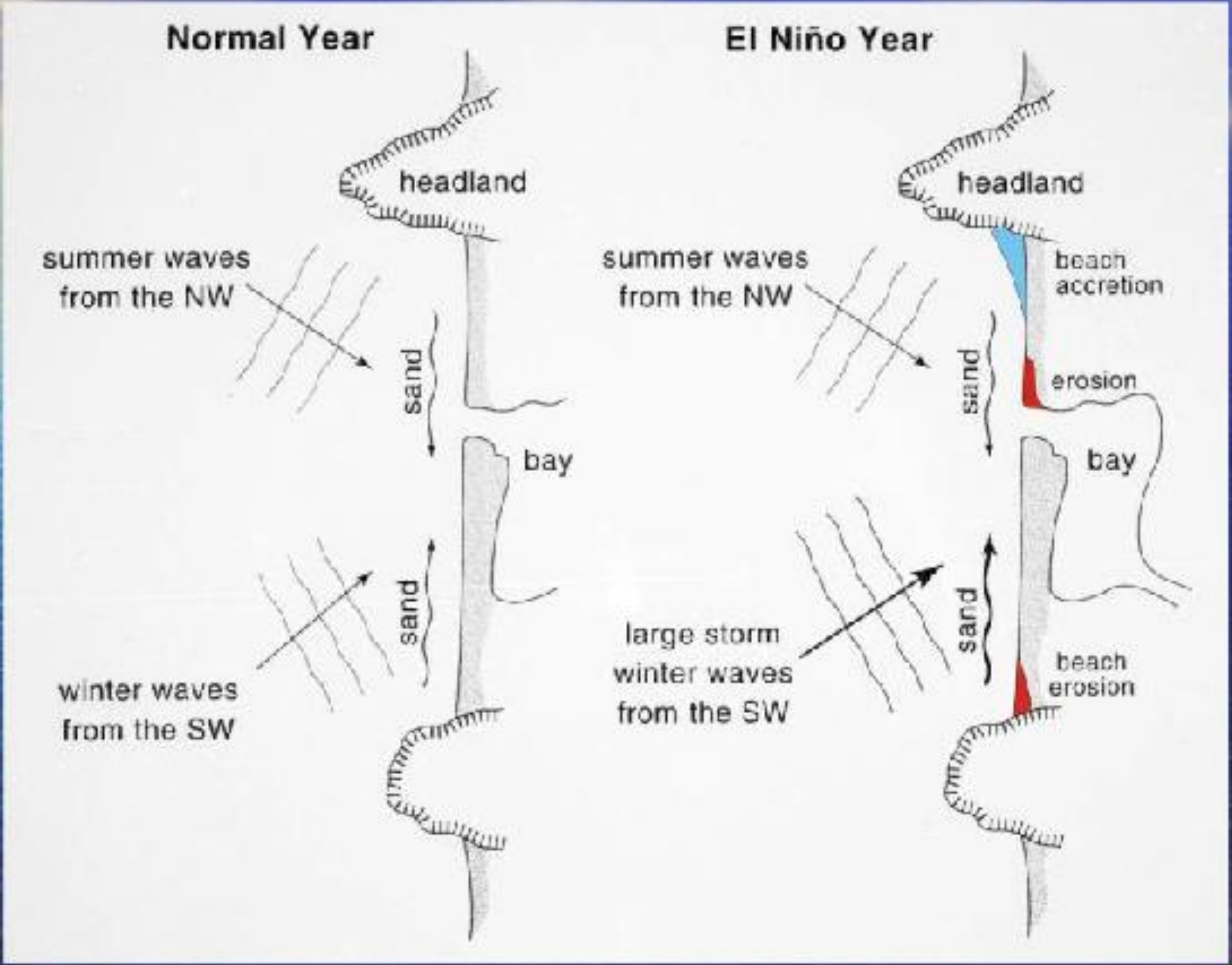


Allan and Komar, 2002, 2006

WINTER STORM TRAJECTORY (D,J,F)
(average latitudinal zone of landfall)



Alongshore Movement of Beach Sediments ("Hot spot erosion" due to changes in storm tracks)



(Komar, 1997)


Photo Courtesy of Julie Hendricks

Proceedings of the National Academy of Sciences 1998. 95: 4113-4120.

Komar, P.D. and S.M. Shih. 1993. Cliff erosion along the Oregon coast – a tectonic-sea level imprint plus local controls by beach processes. Journal of Coast Research 9(3): 747-765.

Ruggiero, P., M. Buijsman, M., G.M. Kaminsky, G. Gelfenbaum. 2010. Modeling the effects of wave climate and sediment supply variability on large-scale shoreline change. Marine Geology 273(1-4): 127-140.

Allan, J.C. and P.D. Komar. 2006. Climate controls on US West Coast erosion processes. Journal of Coastal Research 22(3): 511-529.

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Websites:

http://www.esrl.noaa.gov/psd/people/klaus.wolter/MEI/index.html