The Phase of the Pacific Decadal Oscillation (PDO) and Sea Level Trends in the North Pacific

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Pacific Decadal Oscillation Climate Index

Positive phase
Negative phase

http://jisao.washington.edu/pdo/

Negative PDO trend since the start of the T/P/J era
PDO Imprint on the Mean Sea Level Rise pattern, NE Pacific

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PDO SST Index and Surface Height EOF's as of Oct. 01, 2013

The SSH principal component has much less short term variability than the conventional SST index

SSH provides a more robust index of the PDO state

Cummins, Lagerloef, and Mitchum (2005)
PDO Indices and Trends

SST PDO Index
SSH PDO Index

Relative 20-Year Trend (Global 3mm/yr Subtracted)

Negative trends a 3-6 mm/yr in the E. Pacific
Projection of PDO Index onto SSH

PDO Contribution to Pacific Seal Level Trend

(a) Aviso SSH trend
(minus 3mm/year global trend)

(b) PDO contribution
(product of PDO index trend and regression map)
PDO Trend Contribution Plus 3mm/y Global Trend

(a) Global trend plus PDO 1993–2009 (mm/yr)

Zero or slightly negative trends in the E. Pacific

Flip the PDO Trend Upside-down

How are NE Pacific sea level trends likely to behave when PDO changes phase, assuming the same trend of the past 20 years, but opposite sign.
Summary

- The “PDO Mode”, conventionally defined by the principal SST EOF, has a highly correlated SSH EOF mode, which is a robust SSH signal in the Pacific.
- The present “cold phase” began with the 1998 La Niña, resulting in negative trend of the PDO indices over the past 20 years.
- The PDO evolution dominates the North Pacific mid-latitude sea level trend of the past 20 years.
- This has offset the global sea level trend in the Eastern Pacific, resulting in near-zero or slightly negative sea level trend regionally.
- When the PDO again changes into an extended warm phase, Eastern Pacific sea levels could rise at 2 to 3 times the global average, affecting the west coast of North America.
Top(A): Relative SL rise = sea level trend minus 3mm/yr
Middle (B): regression coeff * PDO
Bottom: A - B
Projected PDO Indices onto Pacific Sea Level Trends