

Presentation Outline



Importance of Estuaries

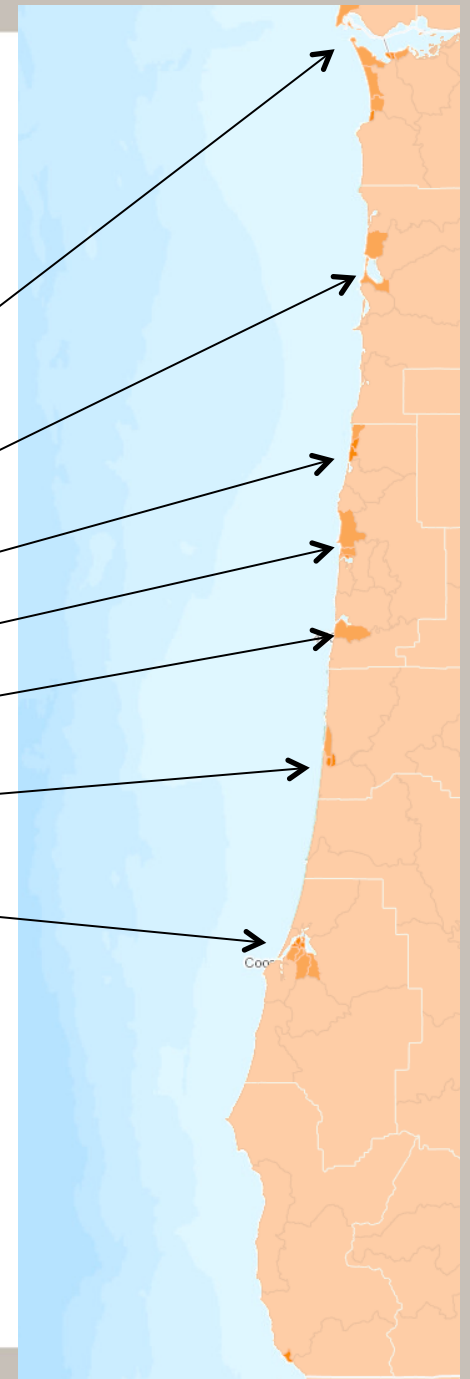
Infrastructure

Commerce

Recreation

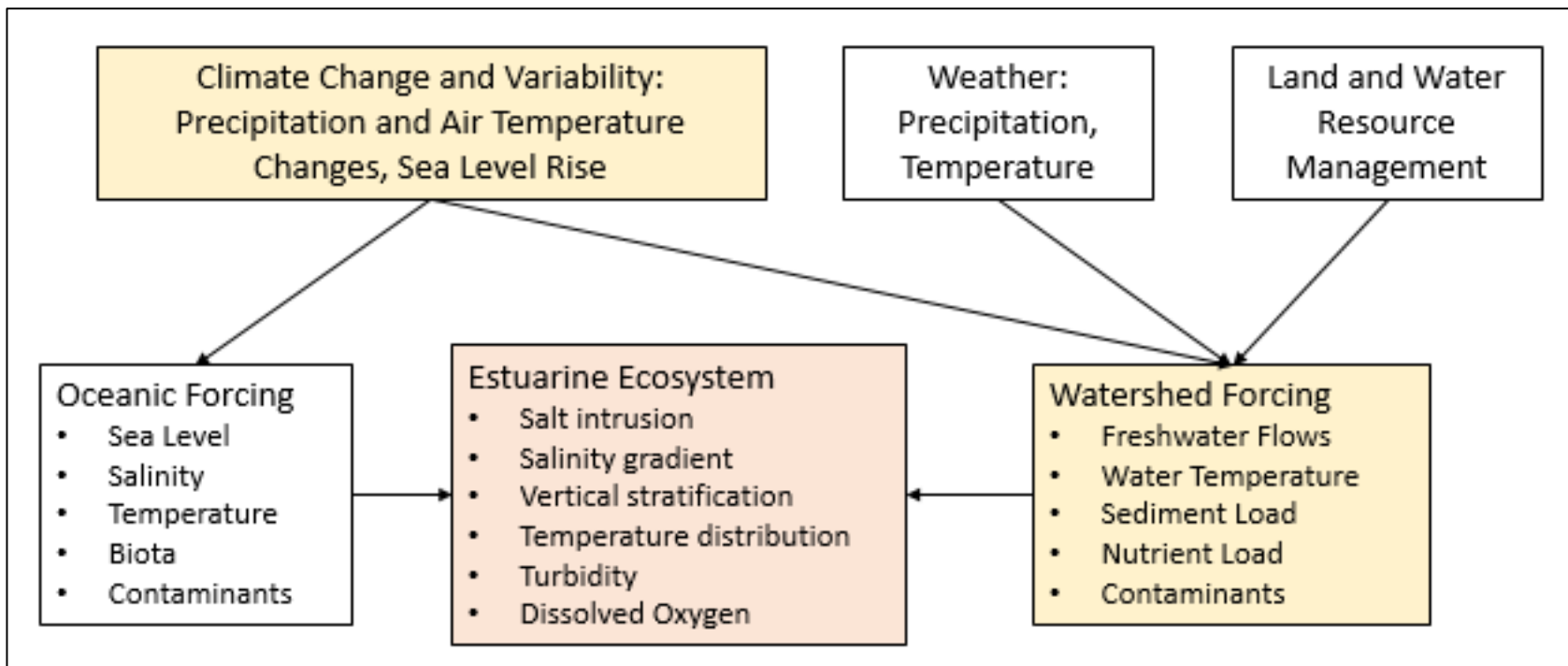
Ecosystem Services

- Columbia
- Tillamook
- Siletz
- Yaquina
- Alsea
- Siuslaw
- Coos Bay
- others...



Estuarine Hydrodynamics

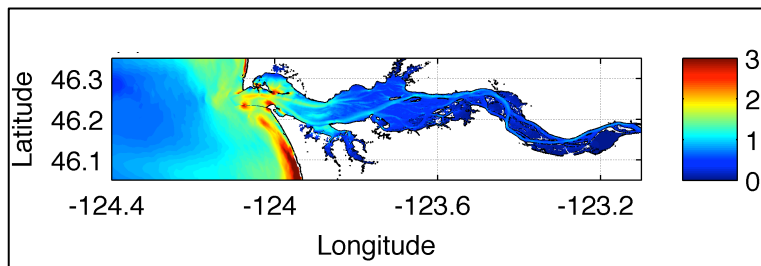
Complex network of contributing processes



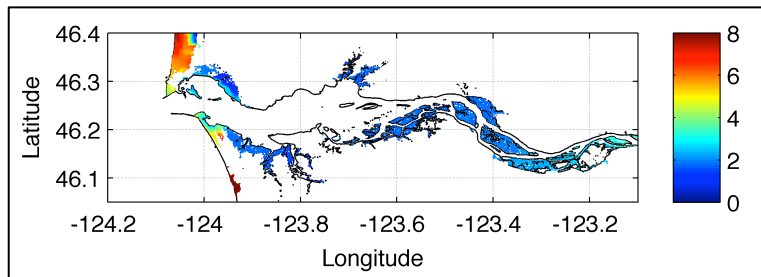
Estuarine Hydrodynamics

Barotropic hydrodynamics

Currents

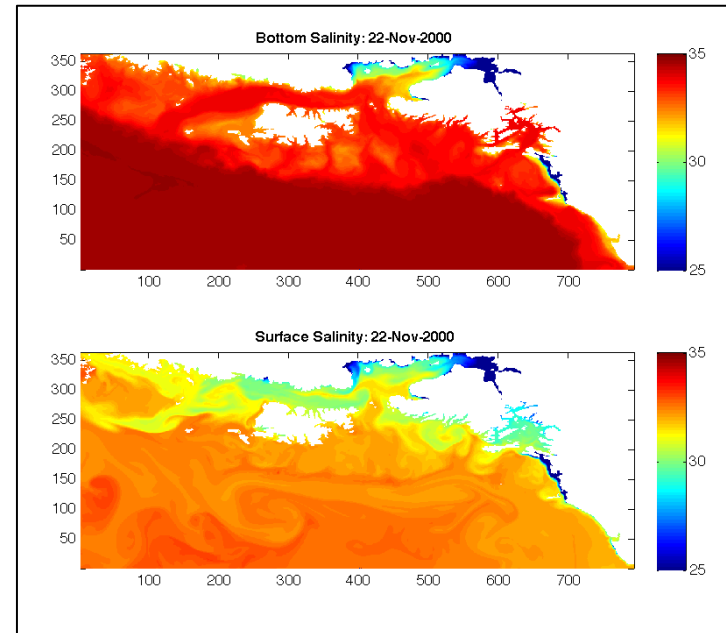


Water Levels → Flooding

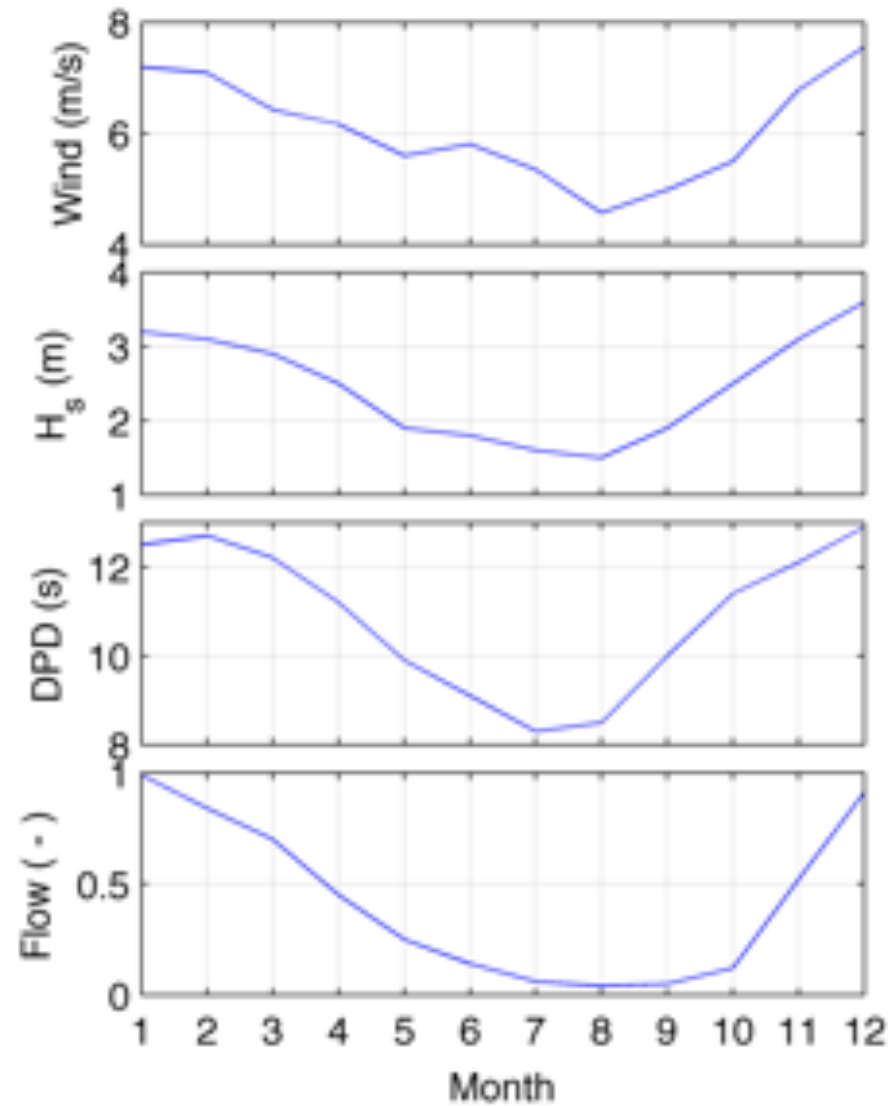


Baroclinic hydrodynamics

Temperature, Density, Salinity



Pacific Northwest Hydrodynamic Climate



How's the Water? (and how will it be...)

Can we quantify estuarine response to climate change?

How will mean water levels / currents change?

How will extreme events change (frequency, intensity, etc.)

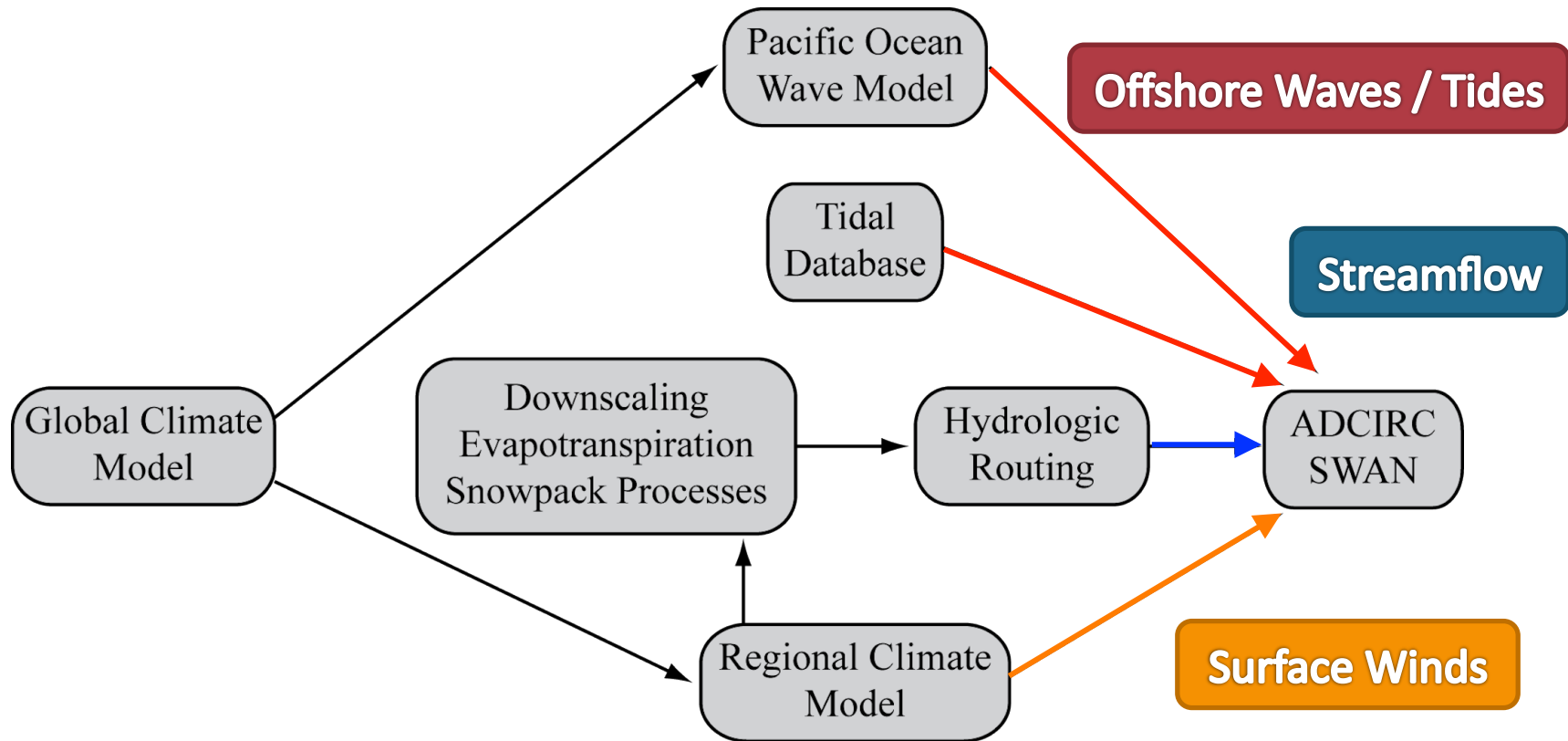
Oregon Sea Grant Project

Tillamook Bay, Coos Bay

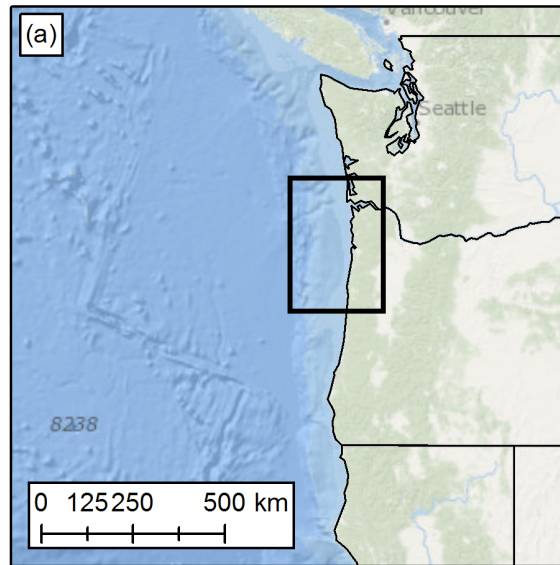
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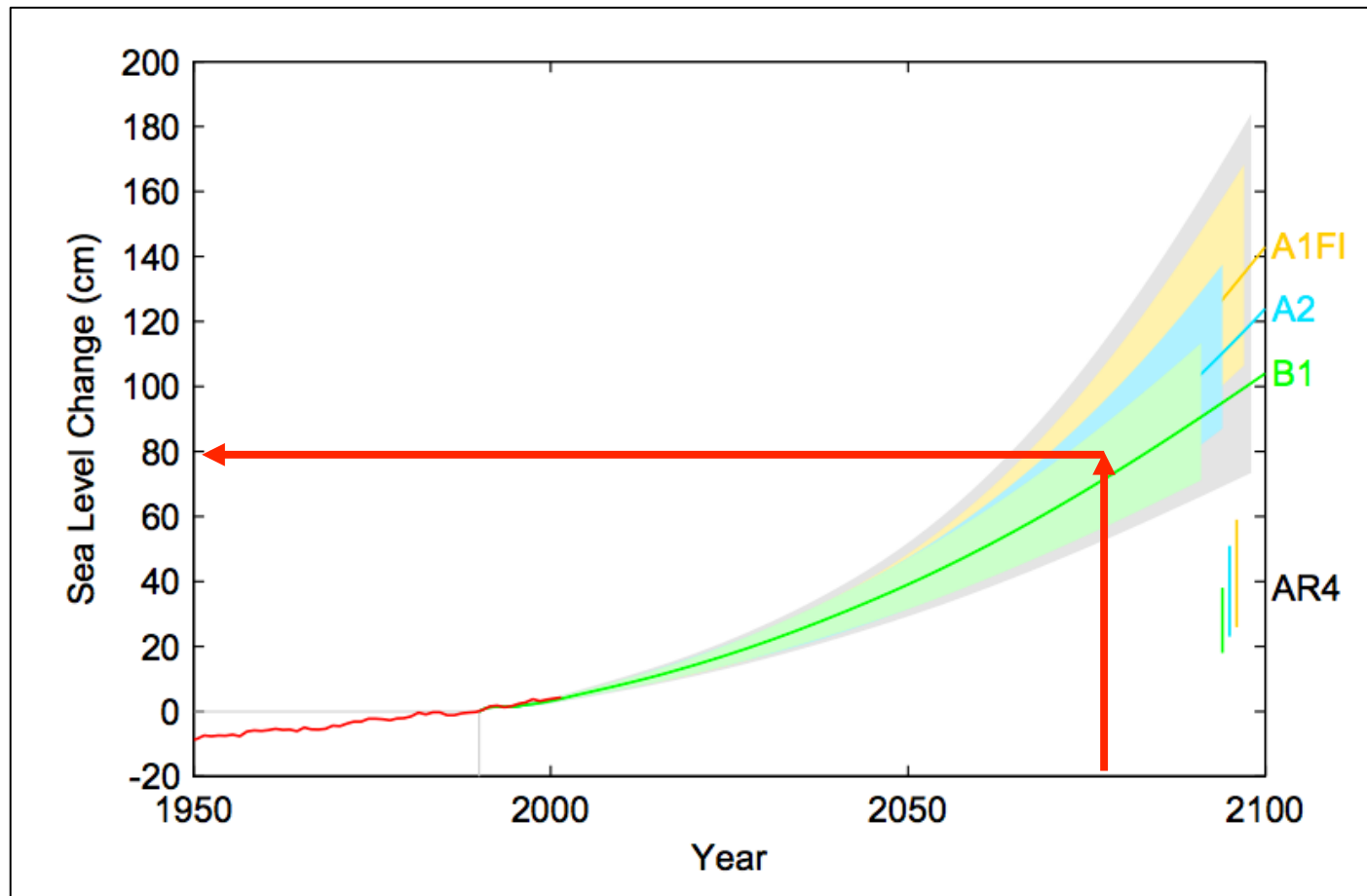
Computational Model Flow



Grid development



Sea Level Rise



Vermeer and Rahmstorf (2009)

Weather model

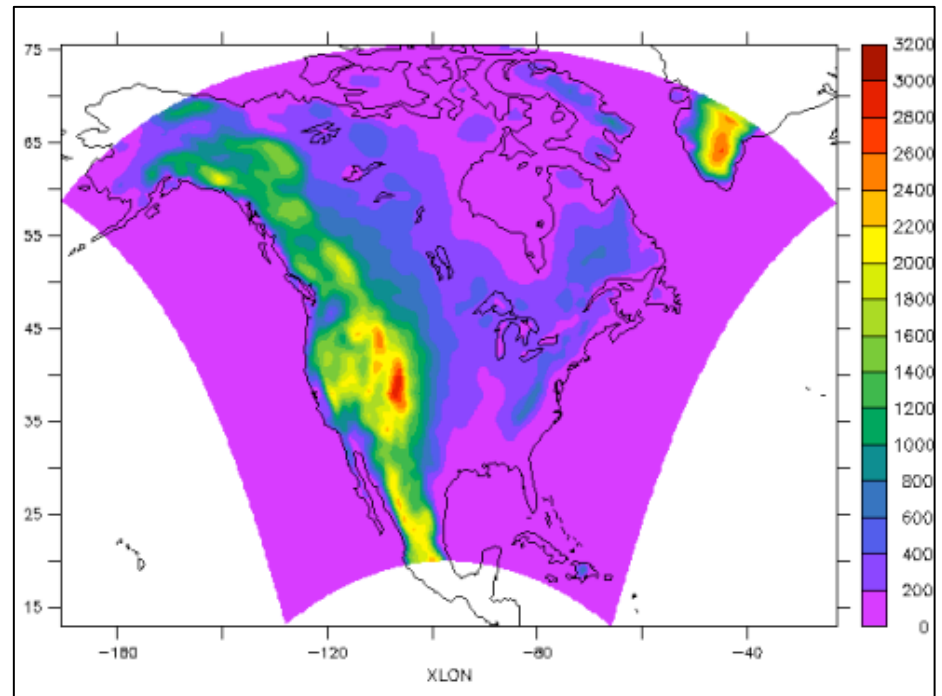
NARCCAP ccsm-CRCM

Sub-daily time step

Reasonable spatial resolution

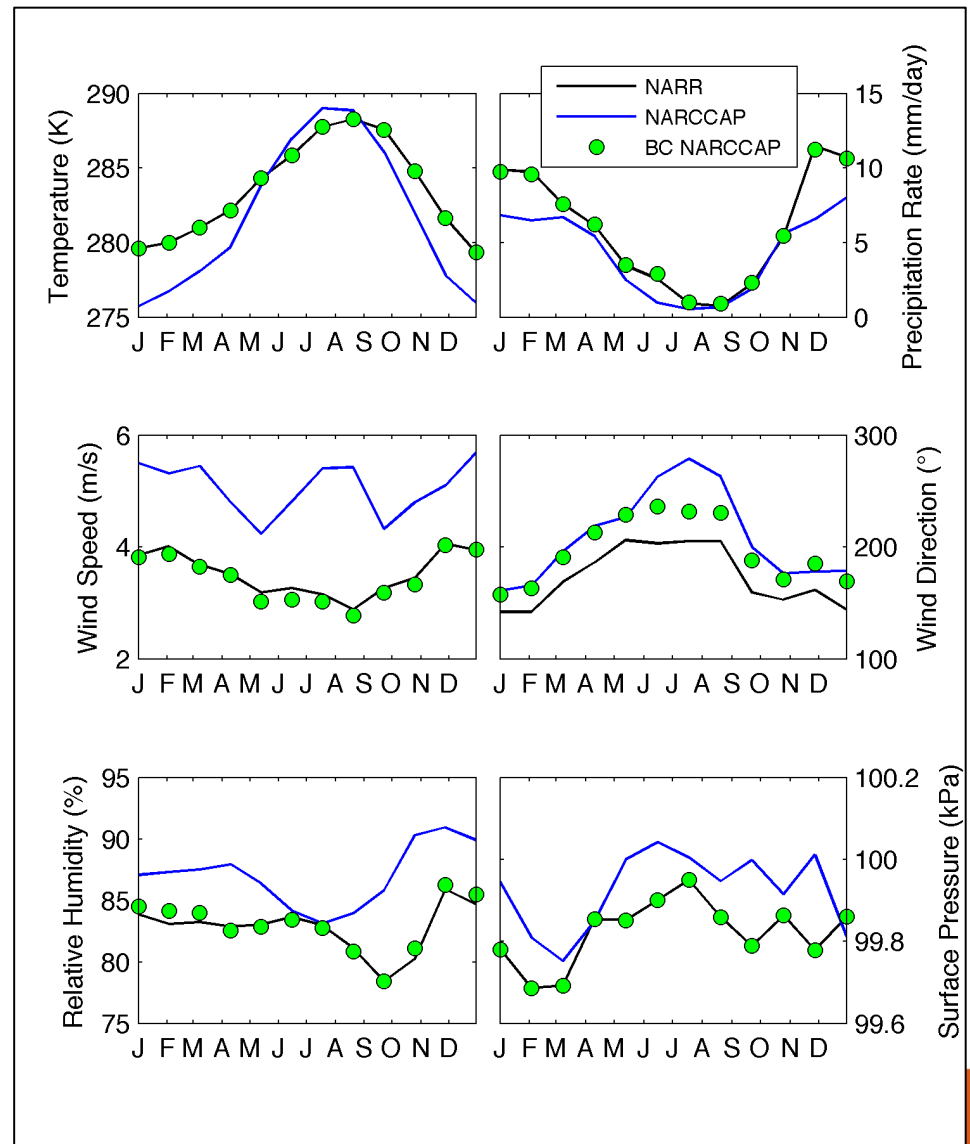
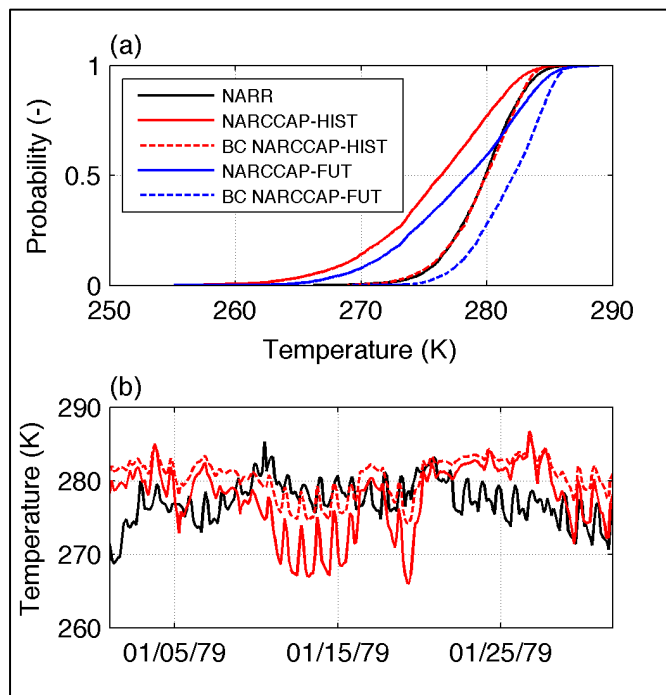
Offshore coverage

1979-1999 and 2040-2070

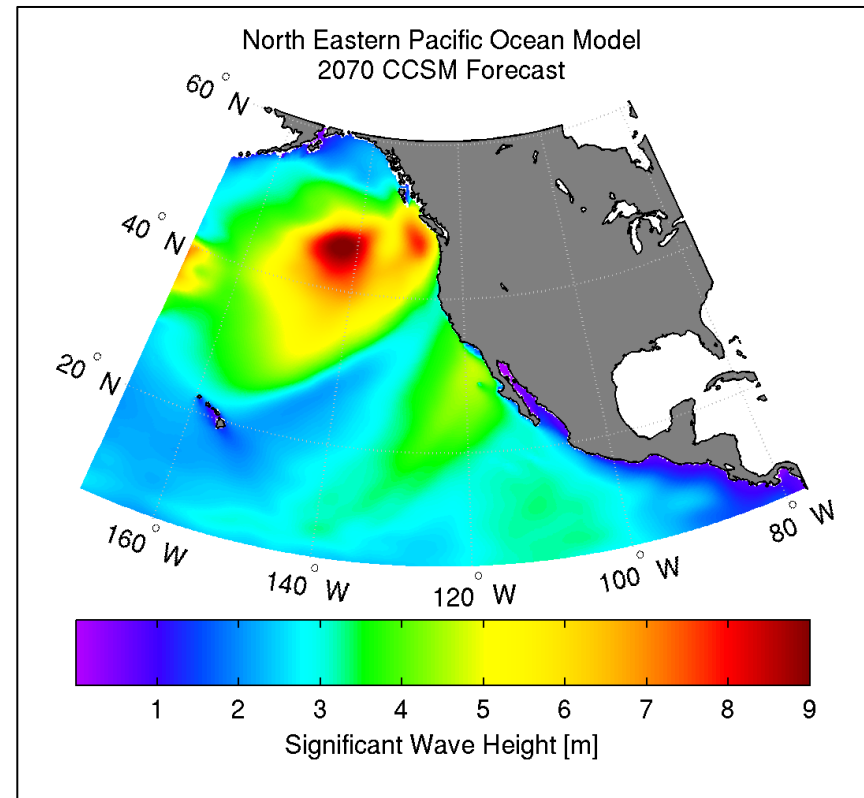
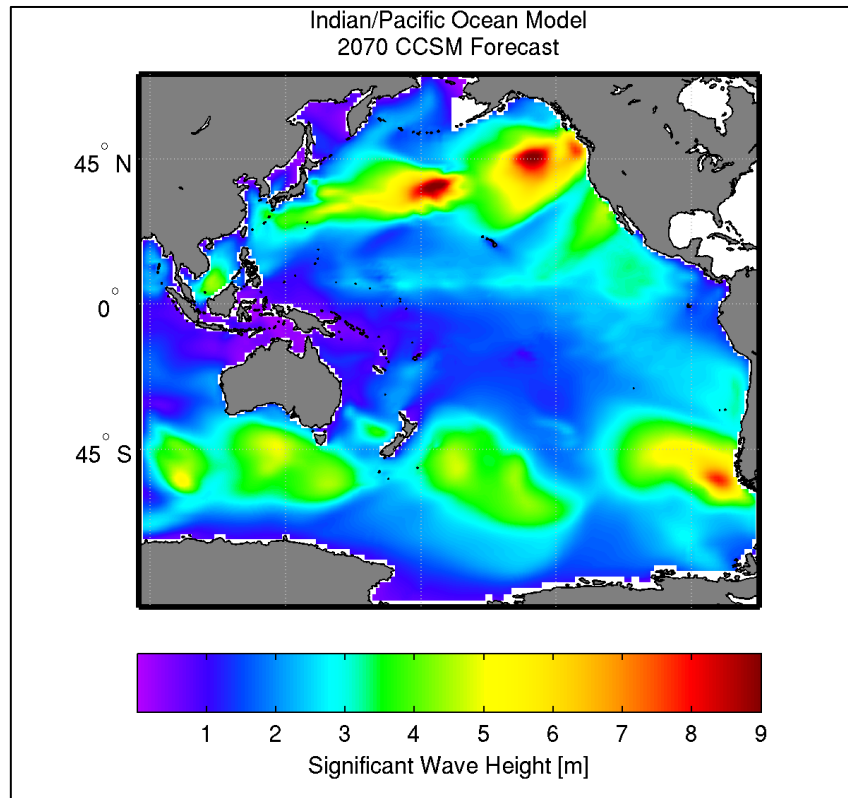


Weather model

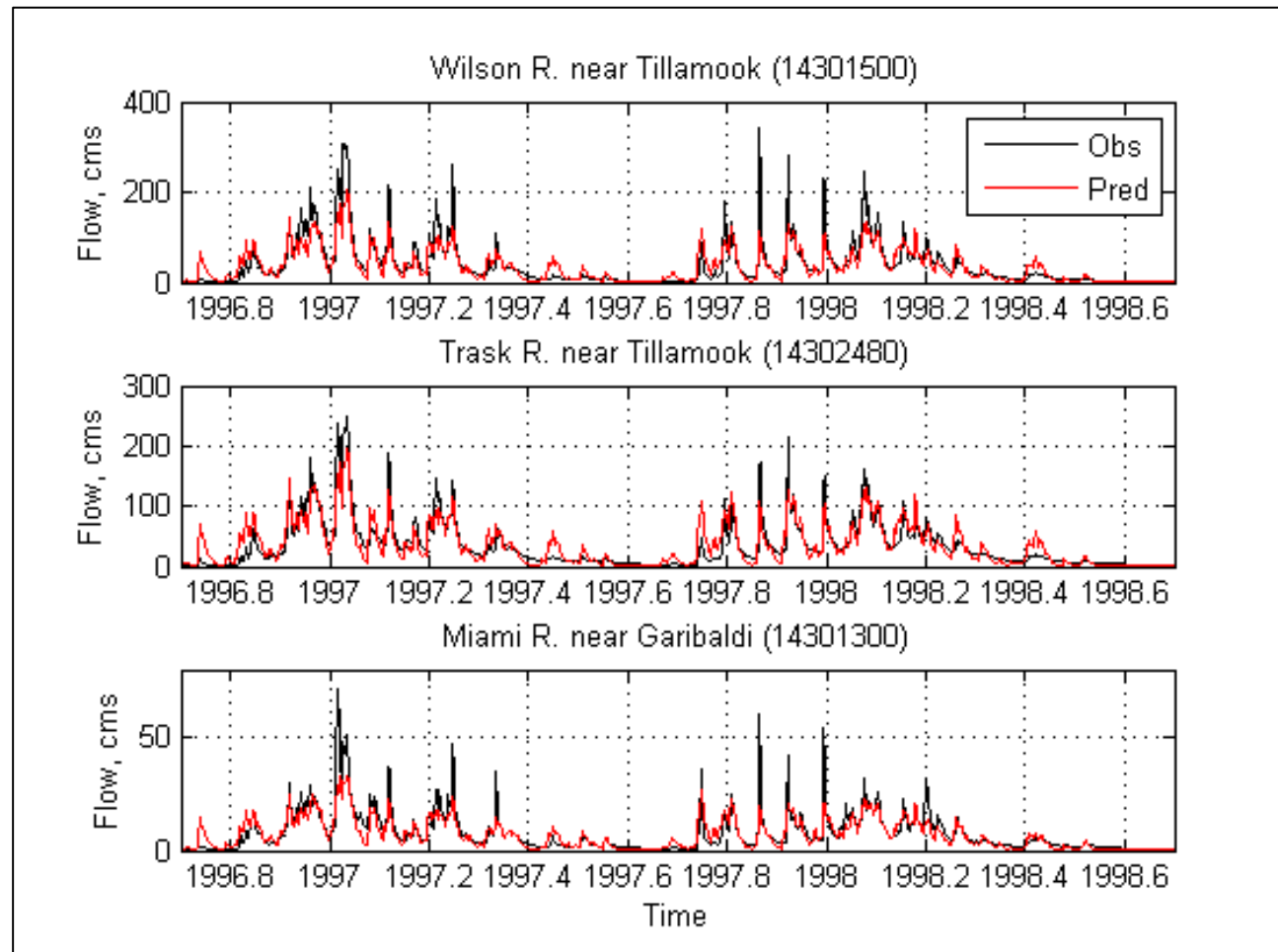
Bias-correct NARCCAP to NARR



Offshore waves



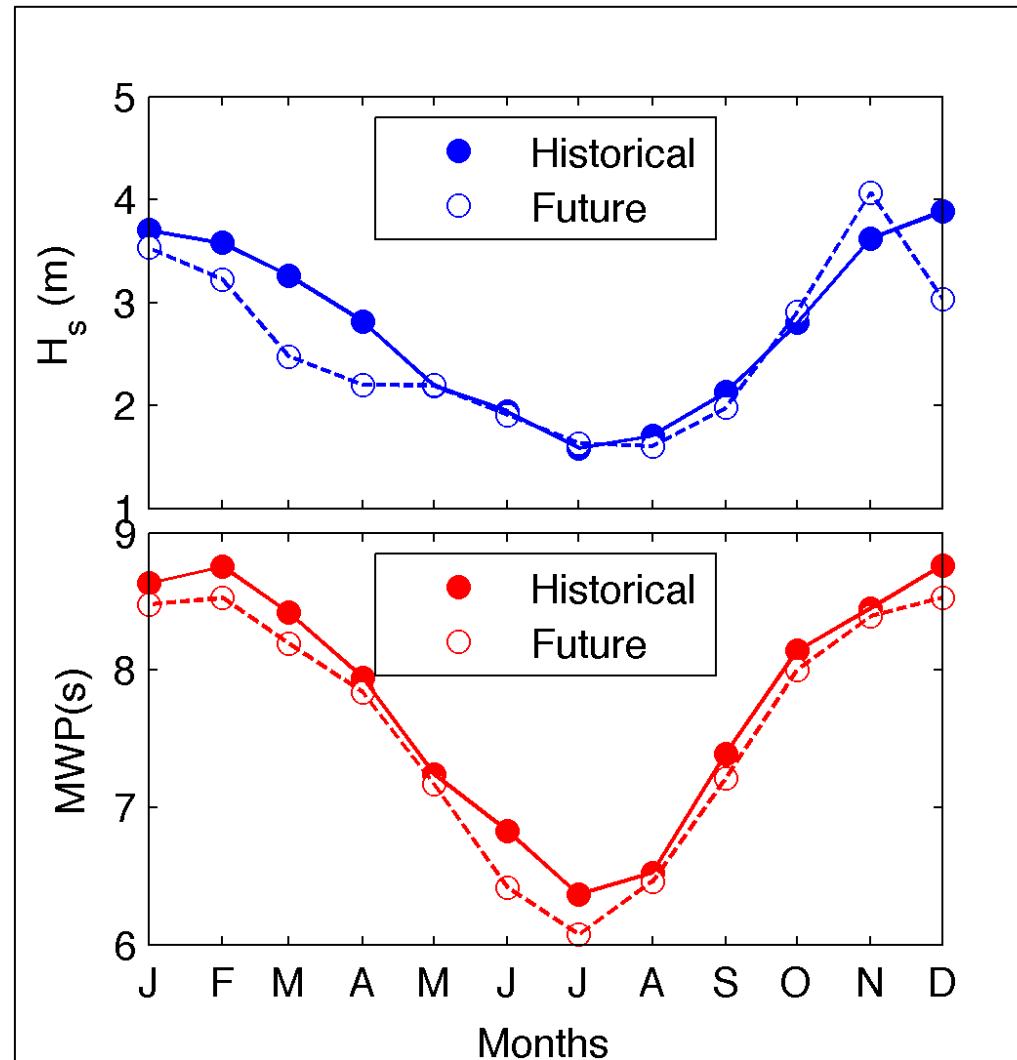
Streamflow



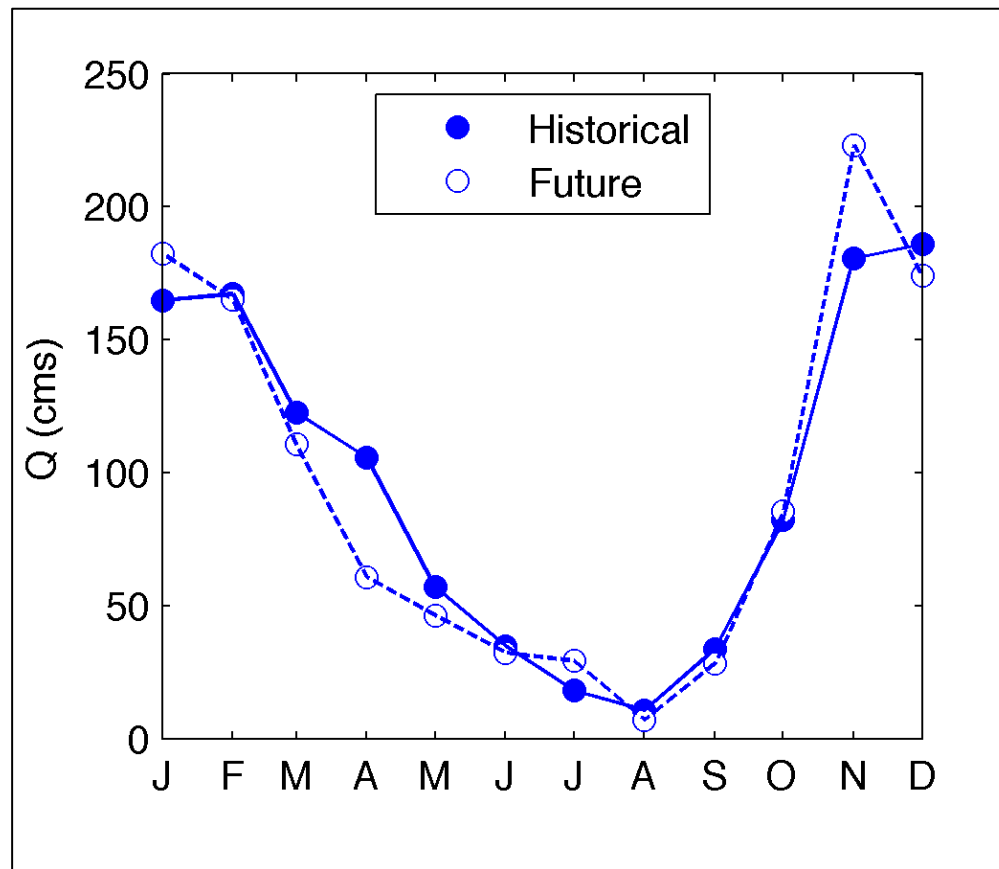
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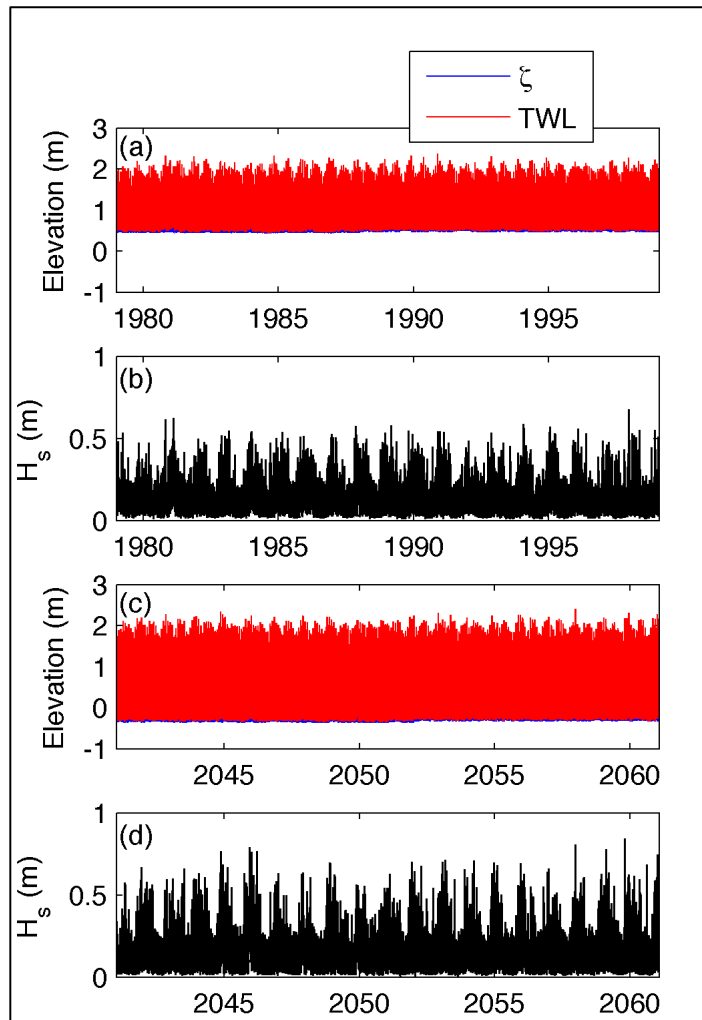
Changes in mean offshore wave climate



Changes in mean streamflow



Changes in water levels



Multi-decade time series is generated at every model grid point

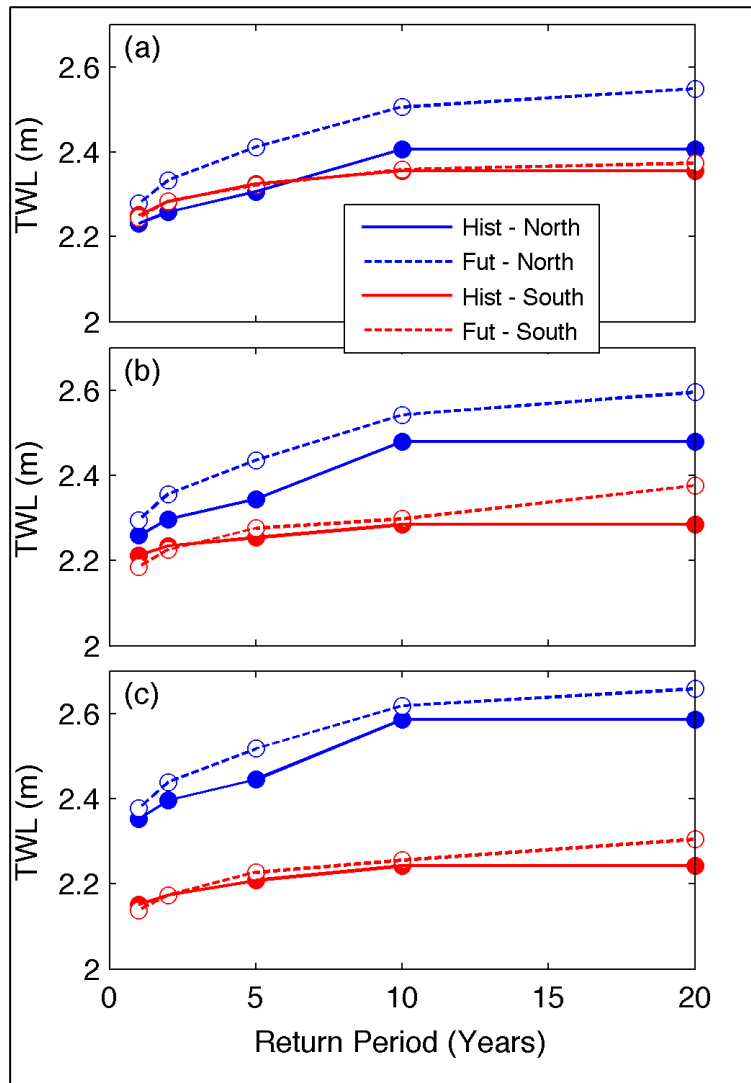
These virtual 'tide gages' allow for exploration of hydrodynamic response

Changes in extreme water levels

Deeper Water



Shallower Water



Moderate TWL increases
(on top of the sea level rise
component)

For both historic and future
run → substantial spatial
variations in water levels.

Presentation Outline



Final Remarks

Estuaries can have spatial variations in water levels

Estuaries can respond non-linearly to sea level rise

Flooding products based on 'bathtub' approaches do not capture these effects

