## Projections of Ocean Properties along the Washington Coast Related to Environmental Health

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### Background ocean circulation

#### Large scale

#### coastal



GLOBEC northeast Pacific program

# Objective

Evaluate Pacific Northwest coastal ocean responses to climate change:

- a few decades into the future
- related to environmental health

# Approach

- IPCC model output diagnostics
- ocean dynamical downscaling

## Regional Ocean Modeling System (ROMS)

- Domain: 45°N-50°N, 127°W-123°W,
- Vertical layers: 60 layers
- Horizontal resolution: 3km
- Forcings (atmosphere and lateral boundary): from IPCC models MIROC and CCCMA
- Bottom topography: etopo2
- Runoff: monthly climatology
- Tides: 8 constituents
- 2001-2011("present") vs 2030-2040 ("future")

#### currents at 25m



### meridional transport anomalies (Sv)

 $\int_0^{500m} \int_{127w}^{123w} v dx dz$ 



### Juan de Fuca eddy statistics



#### J d F Eddy probability distribution functions



#### **Changes** in total surface heat flux and Tau



### Changes in Latent heat flux and Tau





125.0°W

-18

-20

123.0°W

124.0°W





.0"₩ 125.0"₩ 124.0"₩ 125.0"₩

### summary

- changes in summer (July) are more consistent across different forcing cases than changes in winter (January): surface currents, surface heat flux and wind stress anomalies
- both forcings indicate stronger poleward flow in the future in the southern part of the domain; changes in the central domain vary with season differently
- both forcings suggest no significant changes in some measures of the Juan de Fuca eddy statistics
- summer stratification increases (decreases) in the future under MIROC (CCCMA) forcing, cross-model difference is due to salinity effects

### Caveats

thus far only two climate models were used to drive the ocean dynamical downscaling

computed differences between two decades, but have not considered decadal variability embedded in climate models

forced ocean-only runs can introduce errors to air-sea interaction processes