What a drag!
A new method to measure mixing in an estuary

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Estuaries

> Bodies of water where fresh water from rivers mixes with salty water from the ocean

Puget Sound
Estuaries are important

- Recreation
- Food
- Ships/ports/trade
- Biological diversity
- Sewage disposal
Hypoxia (low oxygen)

Depleted oxygen in deep water caused by decomposing organic matter.
Hood Canal

Bottom oxygen in June 2006

News headlines

> “Hood Canal fish suffocate”
  - Seattle PI (Sept. 20, 2006)

> “FDA advises against eating some Hood Canal oysters”
  - Seattle PI (Aug. 10, 2007)

> “People helping to suffocate Hood Canal, scientists say”
  - Seattle Times (July 1, 2008)
Reasons for worsening low oxygen

Human impacts

> Agricultural runoff
> Septic runoff
> Land use changes

Natural sources

> Incoming water has low oxygen and high nitrogen
> Insufficient mixing*
Mixing

Mixing brings oxygen to the deep water

> But mixing is hard to measure...
New method

> Measure the drag instead of the mixing

> Requires a huge number of measurements

> Requires fewer measurements
Research cruise

Three Tree Point
March 2009

Seattle
Tacoma

R/V Clifford A. Barnes
Research cruise
Research cruise

> Large pressure variation is a sign of mixing
Computer model

Top view of velocity and vorticity (darker colors indicate mixing)

Tidal currents make the water in the model move
Why care?

- Hypoxia (low oxygen) is a sign of an unhealthy estuary.

- Hood Canal’s hypoxia is worsening.

- Using new technology we are able to learn more about mixing — one of the processes that affects hypoxia.
Impact of global warming

> Increases stratification

> Our method will allow long-term monitoring of hypoxic estuaries
Importance of ARCS

- Incentive to attend the UW
- Financial help for housing and a summer off to teach
- Builds confidence
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Thank you!