



Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2014 Salish Sea Ecosystem Conference
(Seattle, Wash.)

May 1st, 8:30 AM - 10:00 AM

Observations of Flow and Mixing in Juan de Fuca Canyon

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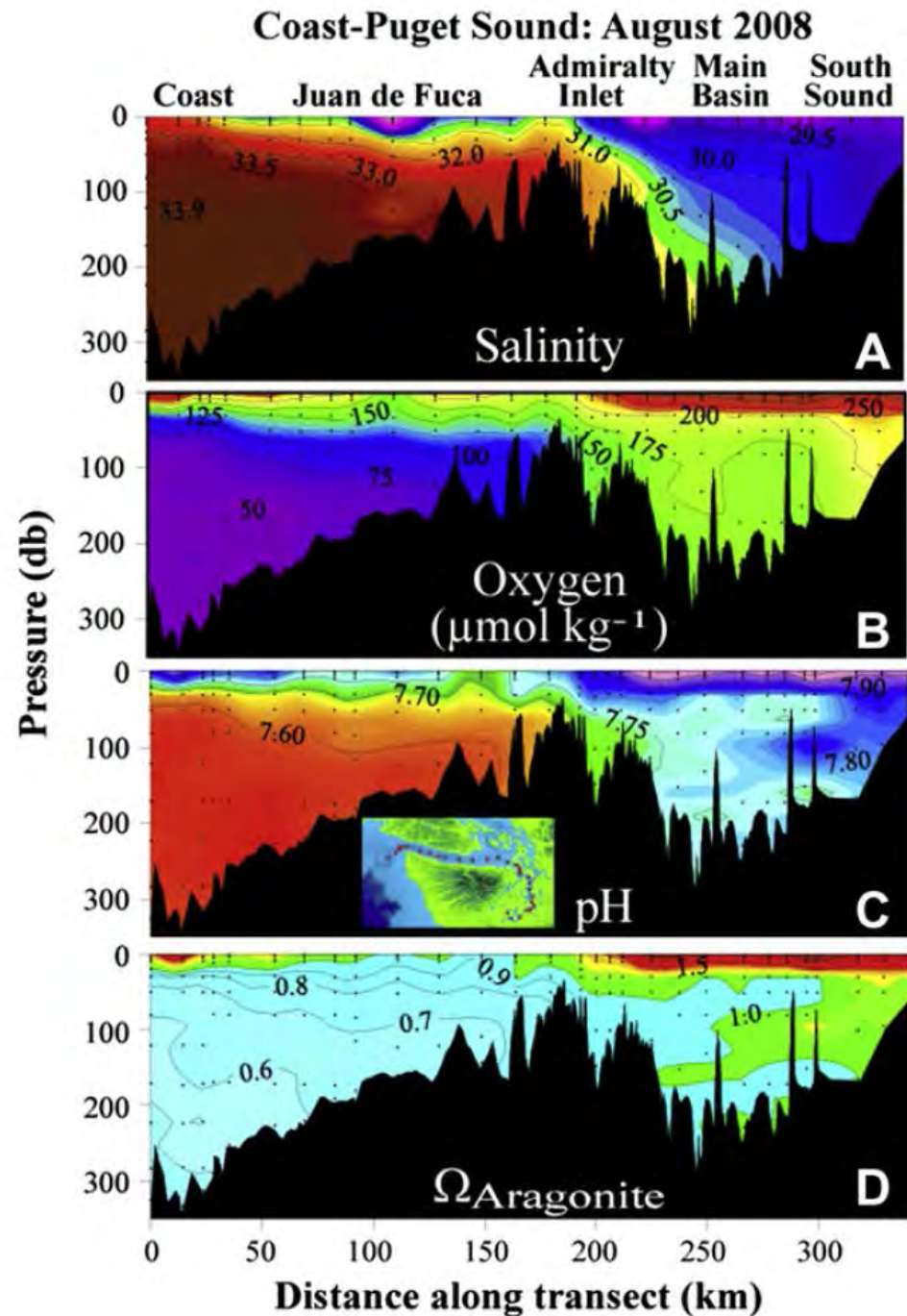
MacCready, Parker and Alford, Matthew, "Observations of Flow and Mixing in Juan de Fuca Canyon" (2014). *Salish Sea Ecosystem Conference*. 43.
<https://cedar.wwu.edu/ssec/2014ssec/Day2/43>

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The Headwaters of the Salish Sea:
Flow and Mixing
in
Juan de Fuca Canyon

Parker MacCready and Matthew Alford
University of Washington

The Issue:
Pacific water on the shelf exerts strong control over Salish Sea Productivity, Hypoxia, and Acidification

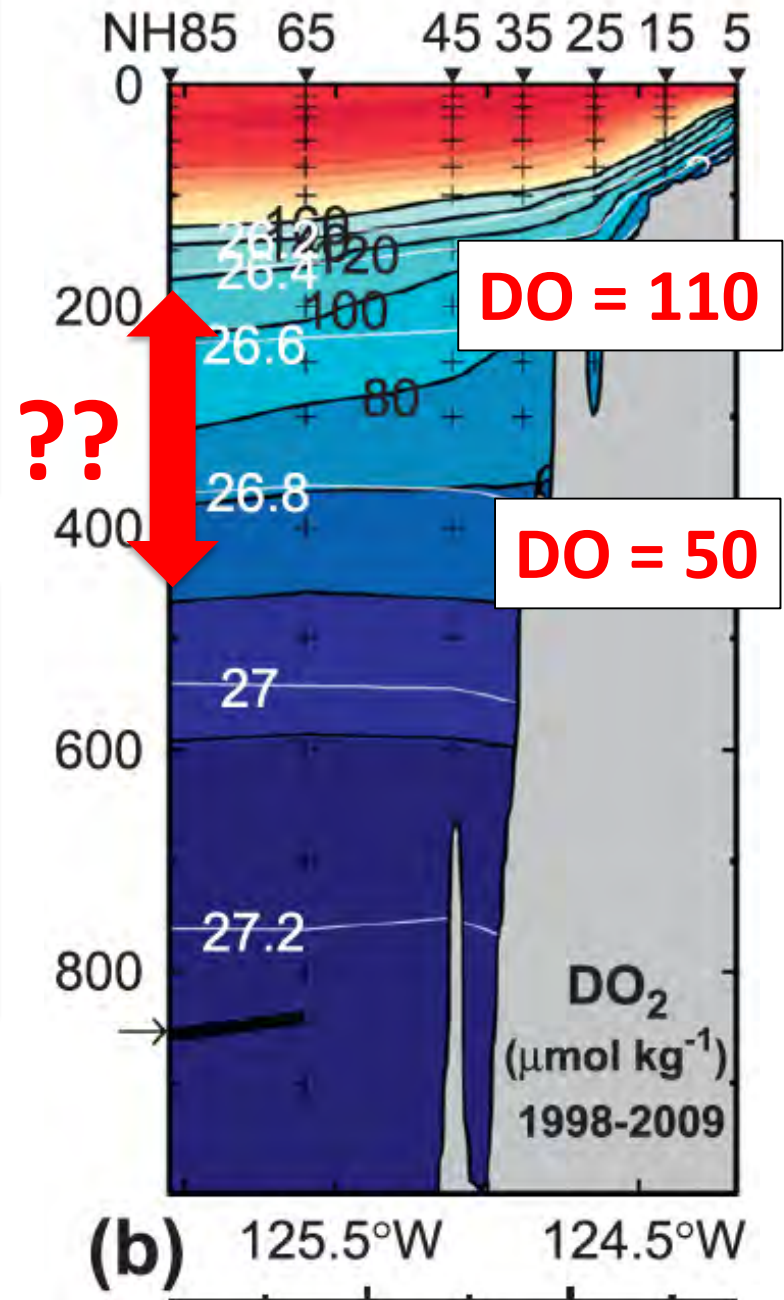


Feely et al. (2010) ECSS

Problem:

Pacific water properties vary strongly with depth

So to predict future change we need to know what sets the depth of water that is pulled into the system.

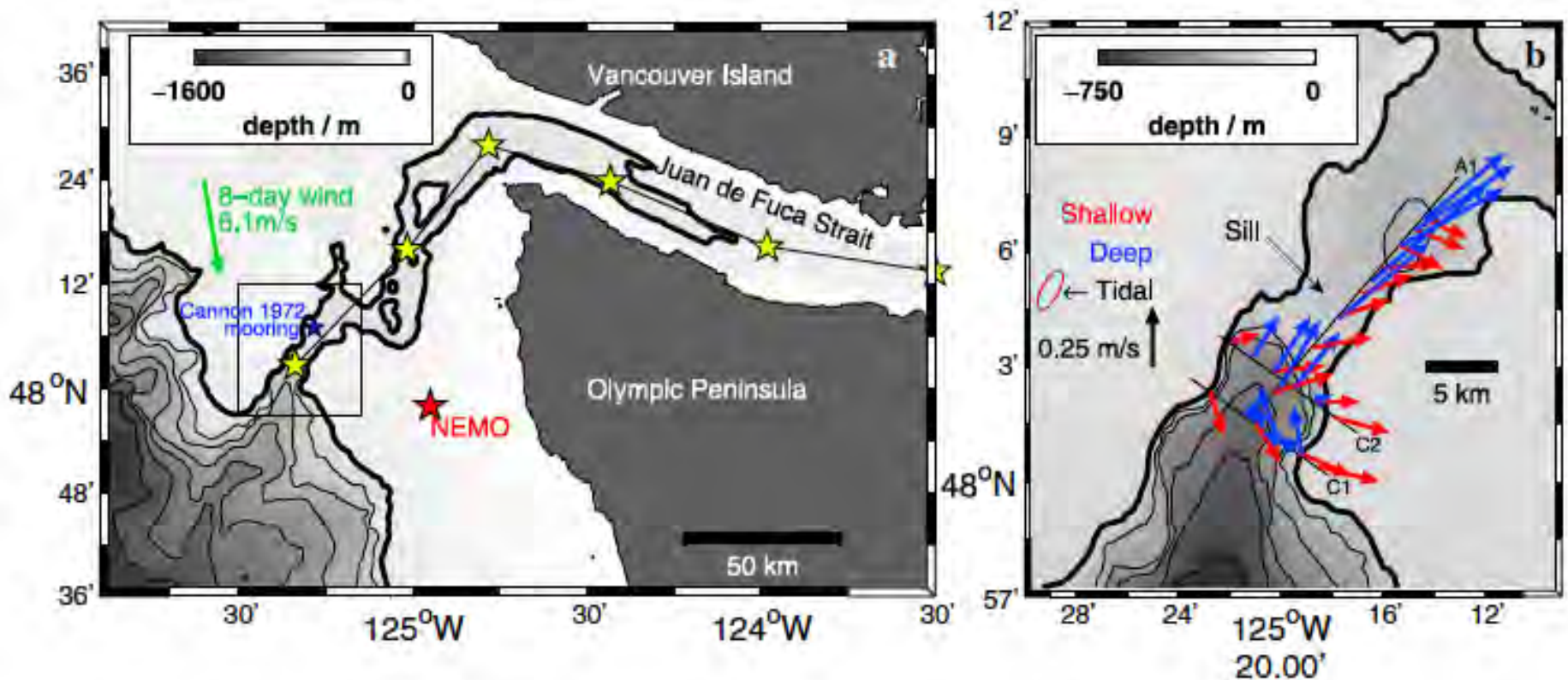


Pierce et al. (2012) JPO

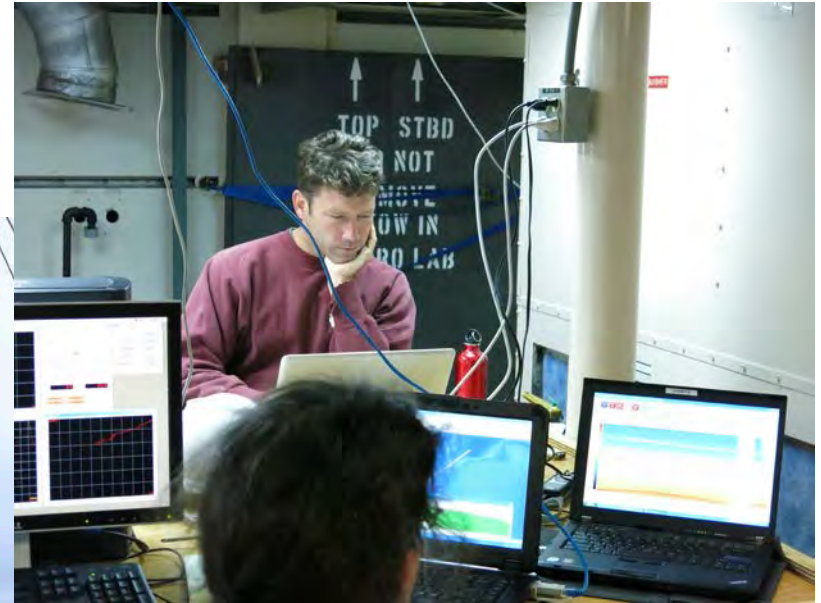
Guess (Hickey & Banas 2008):

Juan de Fuca Canyon may be an important pathway for deepest water

=> We made observations in April 2013



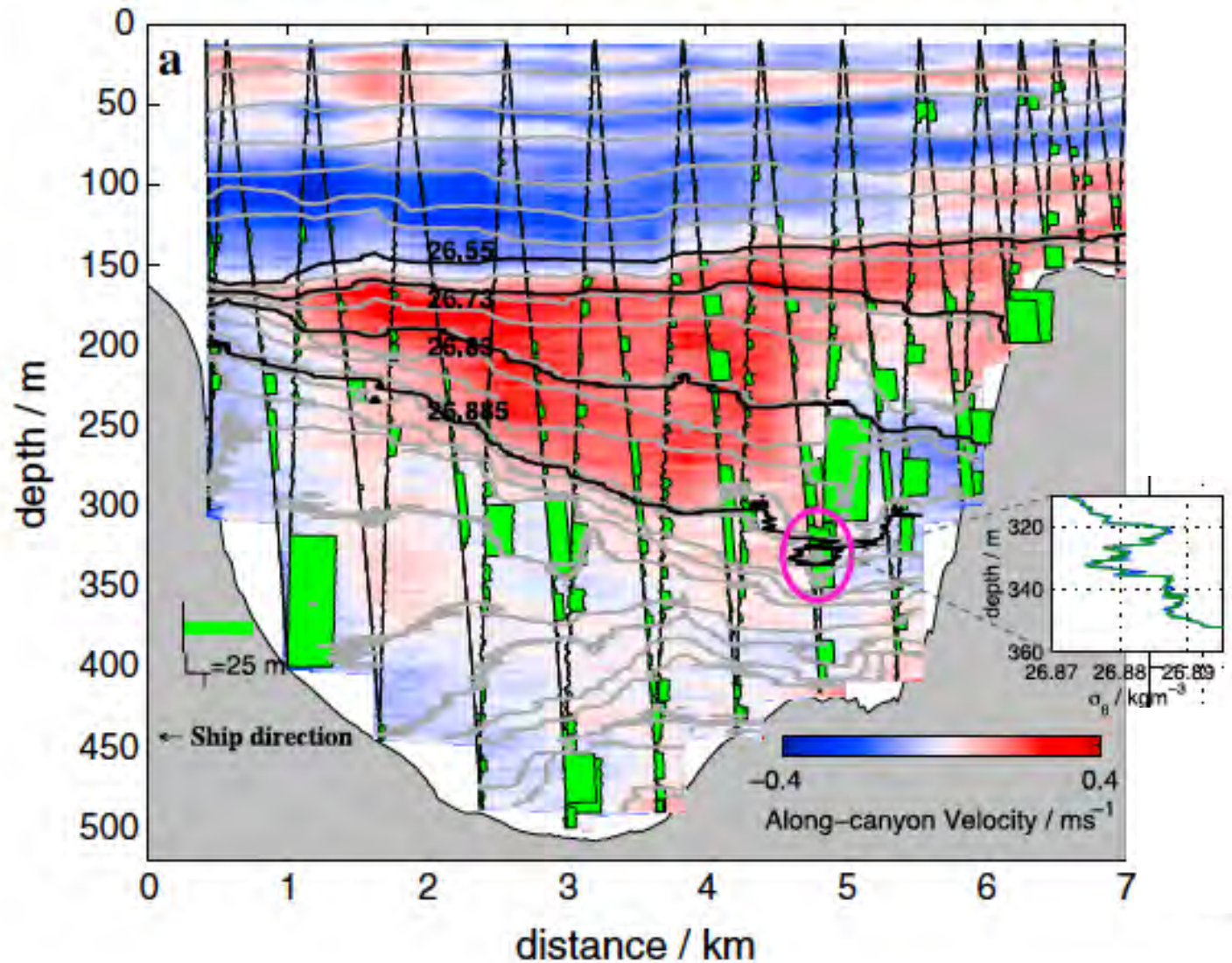
SWIMS Instrument Package



On the fantail of the
RV Thomas G.
Thompson

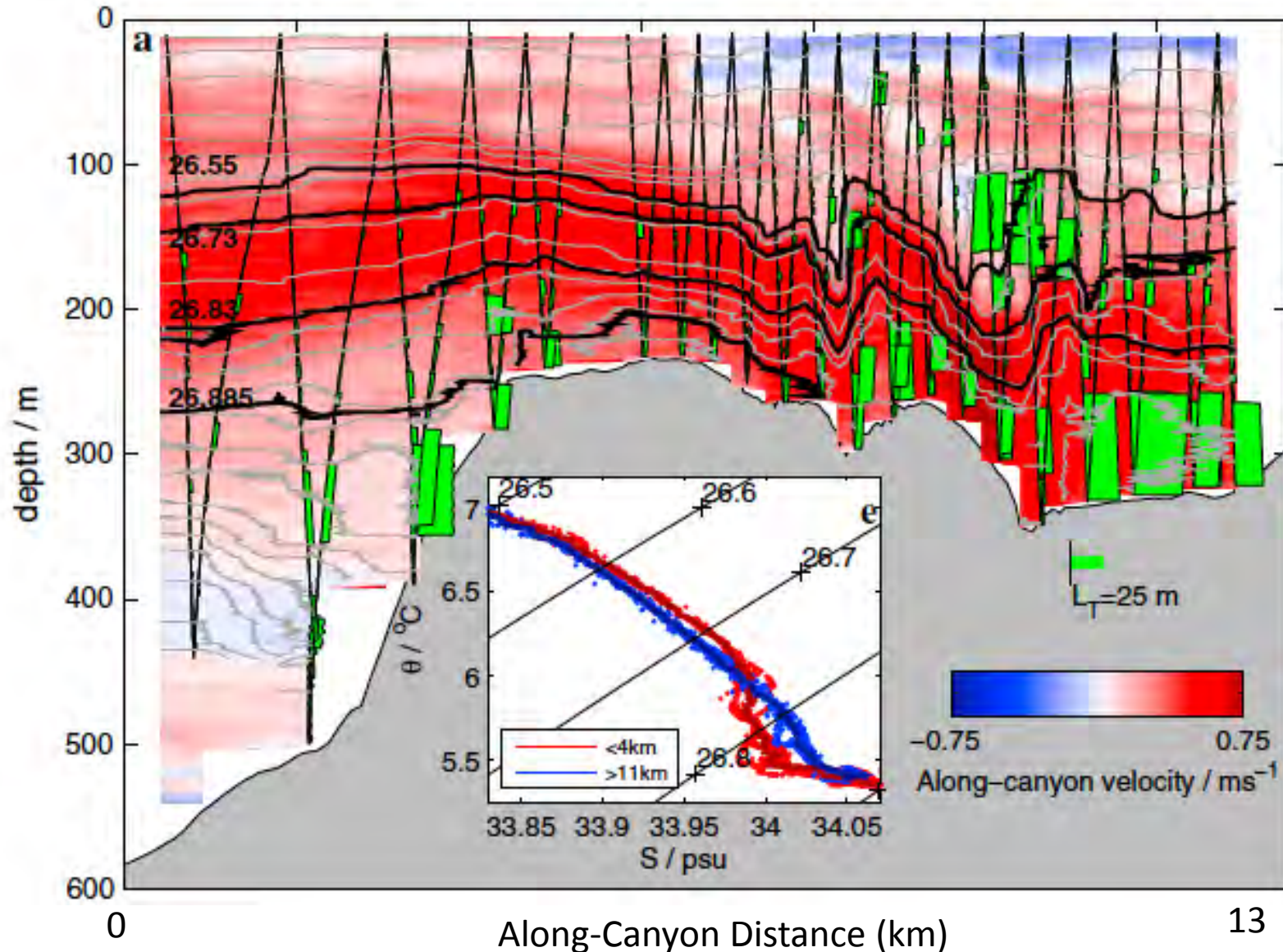
Cross-Canyon Section:

We found strong inflow of deep water

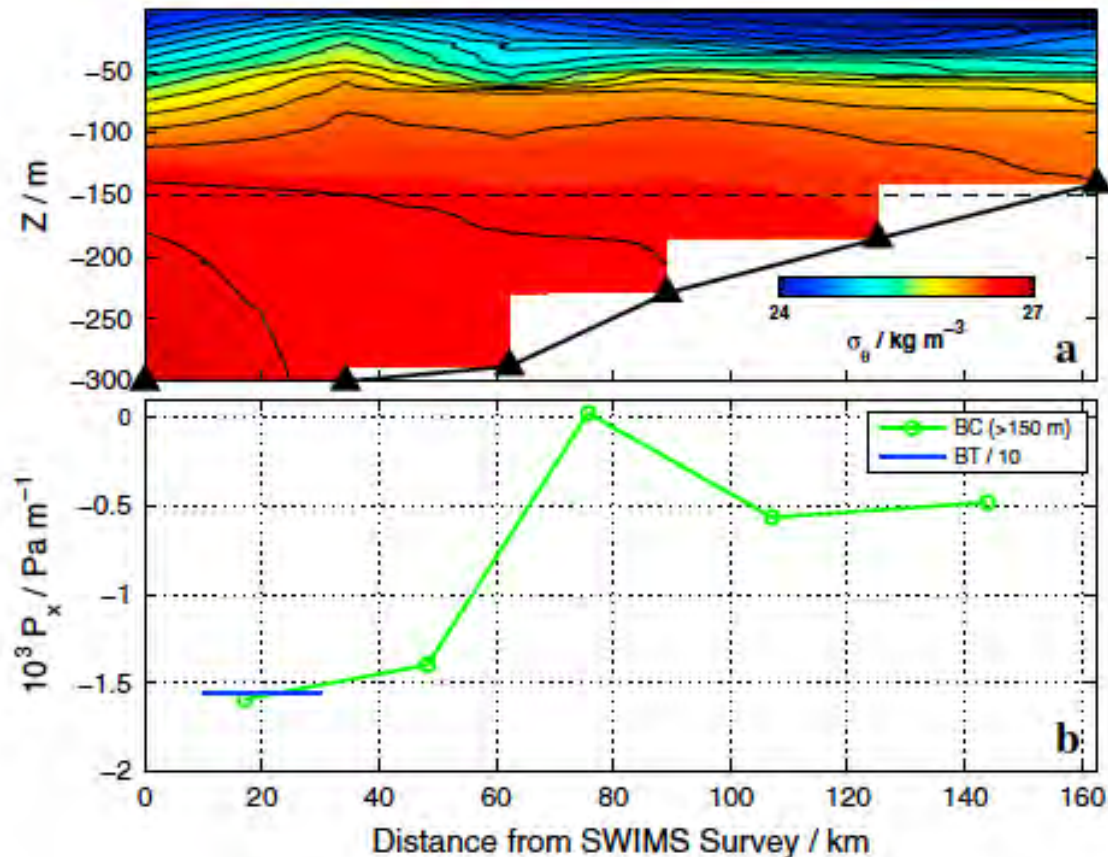


Along-Canyon Section:

We found large lee waves and mixing

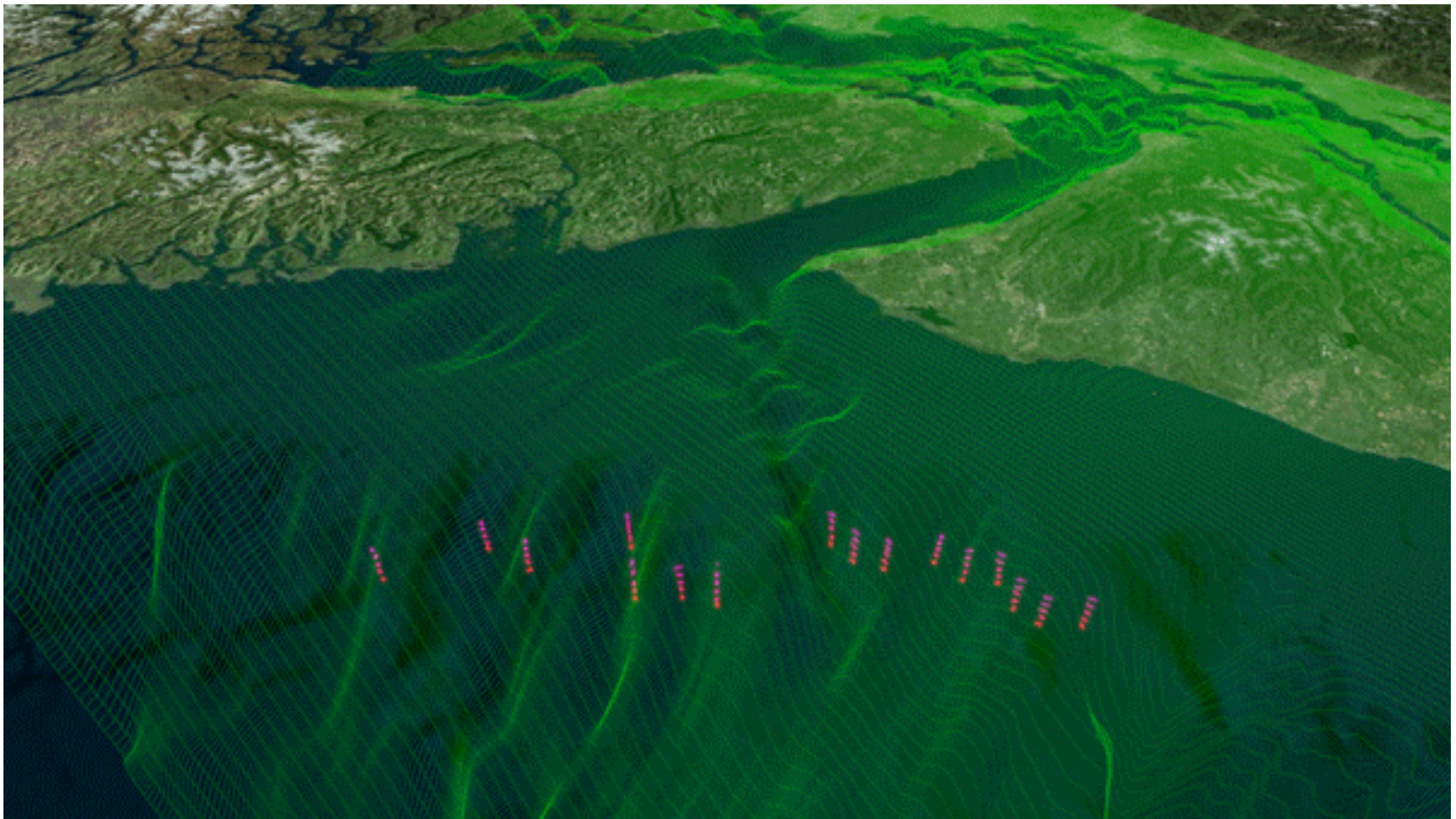


What forces the inflow? => Wind from the North



Alford, M. H., and P. MacCready (2014), Flow and mixing in Juan de Fuca Canyon, Washington. *Geophys. Res. Lett.*, **41**

These results mean that the JdF Canyon flow is a critical process to include in our numerical models



Simulated drifter tracks using ROMS, and visualized with Microsoft Research tools
See talk by Rob Fatland, Friday 11 AM, S-9F

Summary

- Juan de Fuca Canyon appears to be a pathway to bring relatively deep Pacific water into the Salish Sea (higher N, lower DO and pH)
- Up-canyon flow is forced by upwelling-favorable winds
- We observed a transport of $200,000 \text{ m}^3 \text{ s}^{-1}$, easily enough for the Salish Sea “estuarine circulation” (like an undersea Amazon River!)