

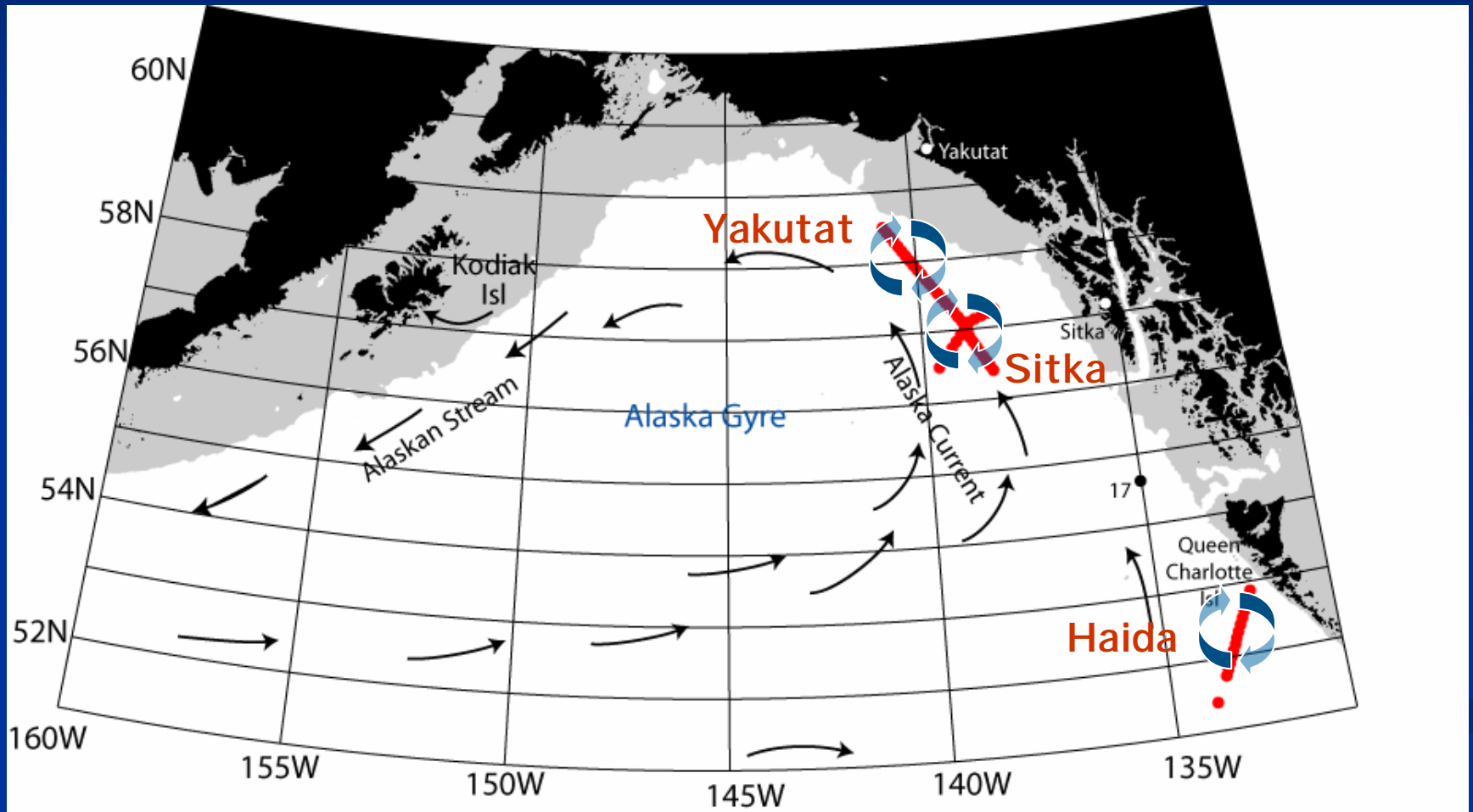
Eddies in the Eastern Gulf of Alaska

Carol Ladd,
W. R. Crawford, W. K. Johnson, N. B. Kachel,
P. J. Stabenro, F. Whitney

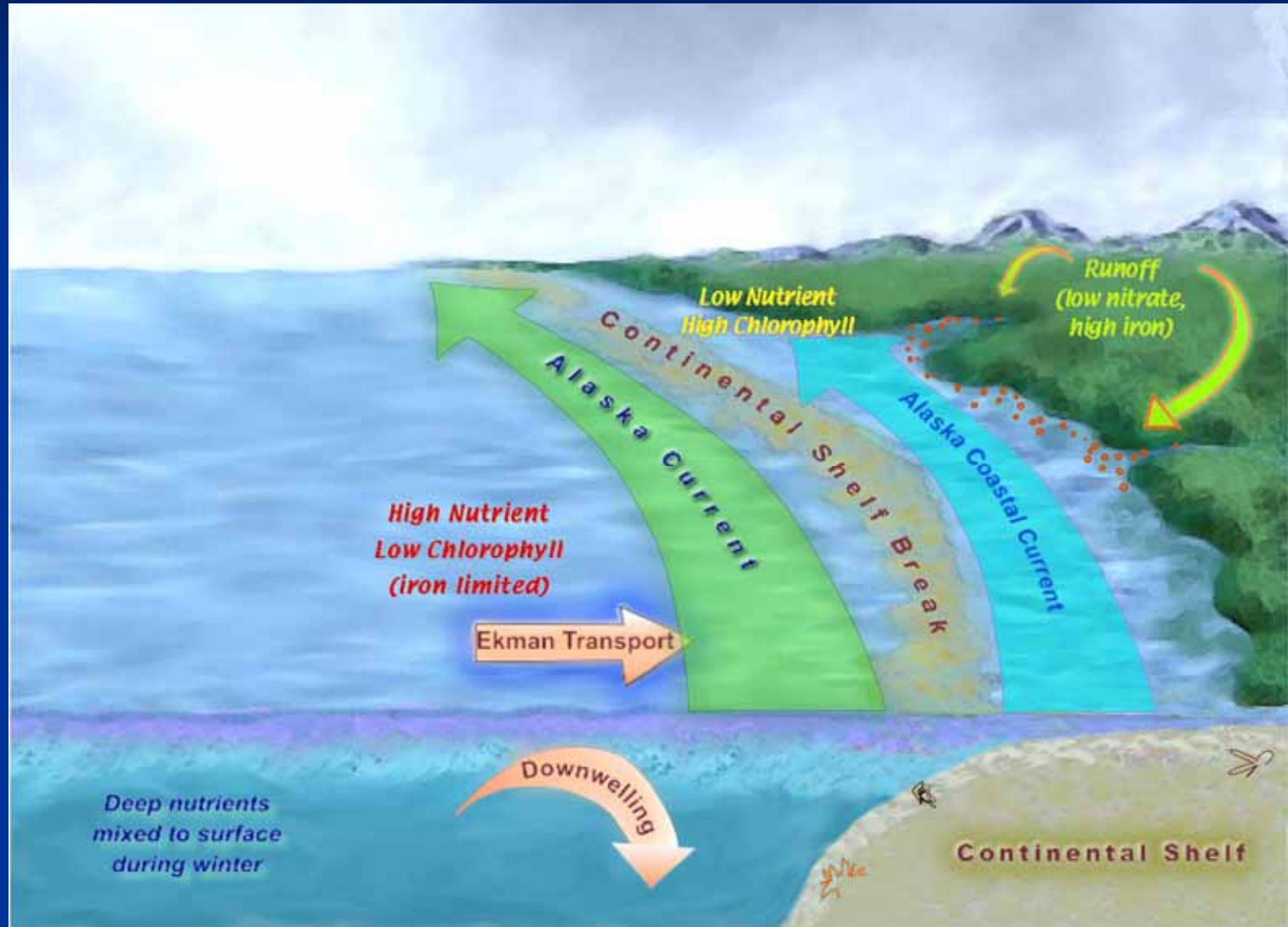
Pacific Marine Environmental Laboratory, NOAA, Seattle, WA
Institute of Ocean Sciences, Fisheries and Oceans Canada, Sidney, BC
University of Washington, Seattle, WA



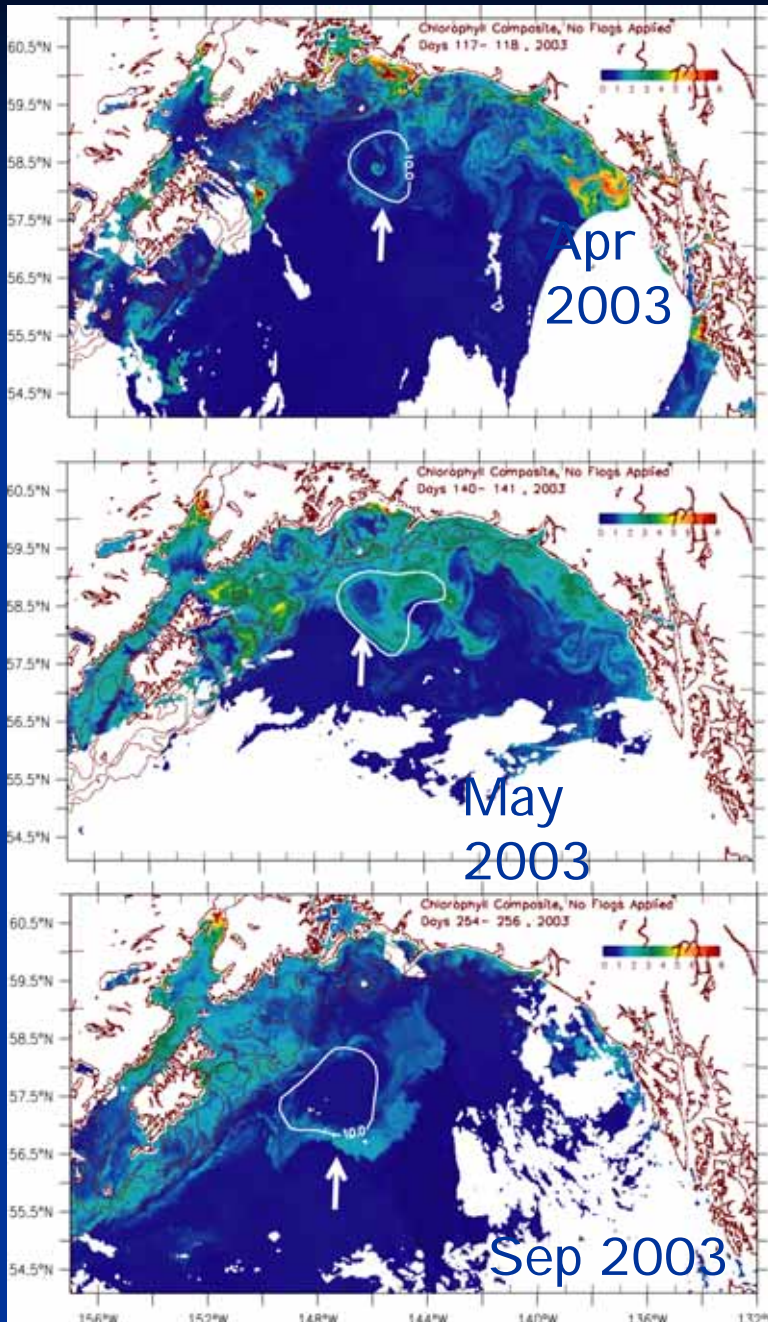
2005 EGOA Eddy Cruise



Nutrient Limitation in the GOA



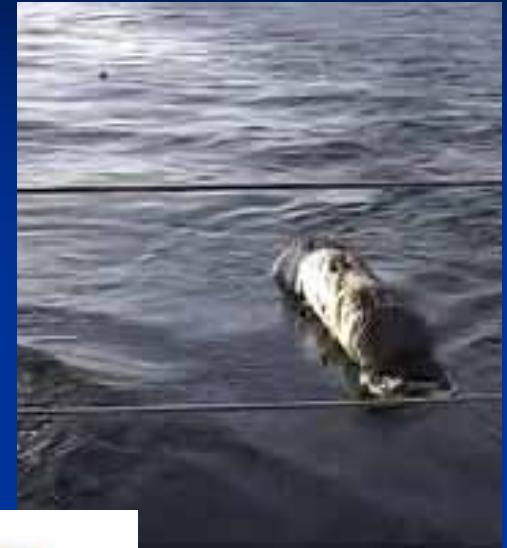
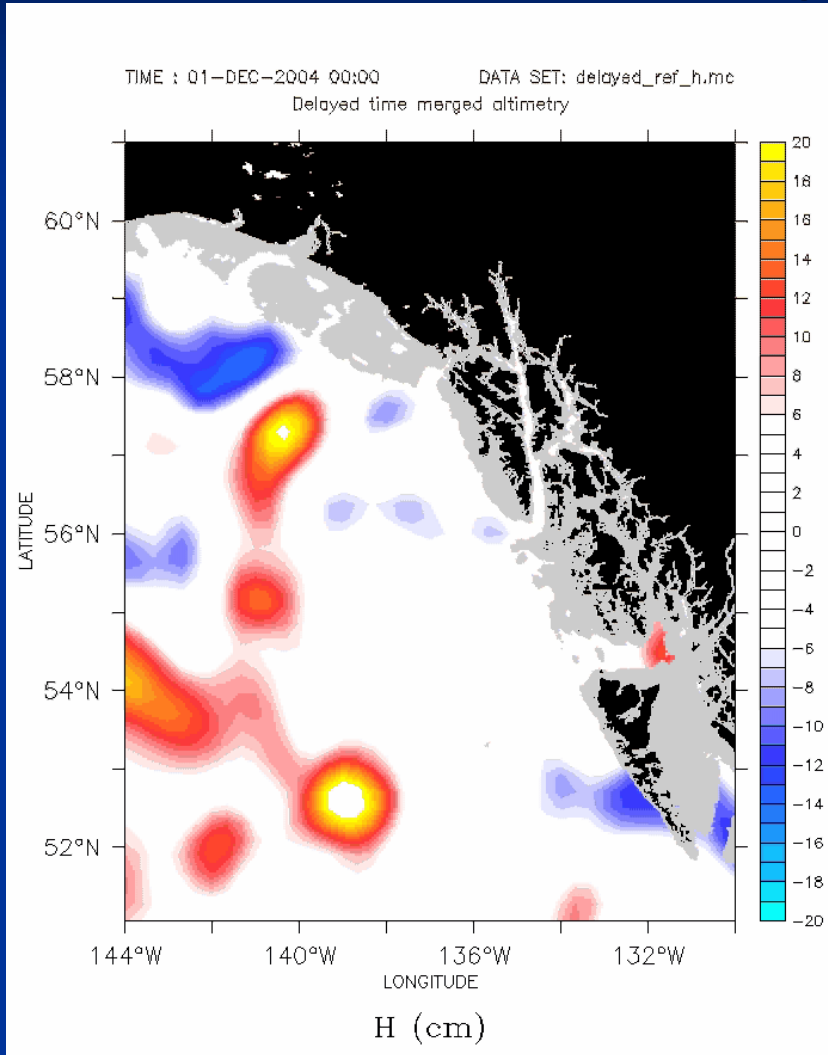
Chlorophyll



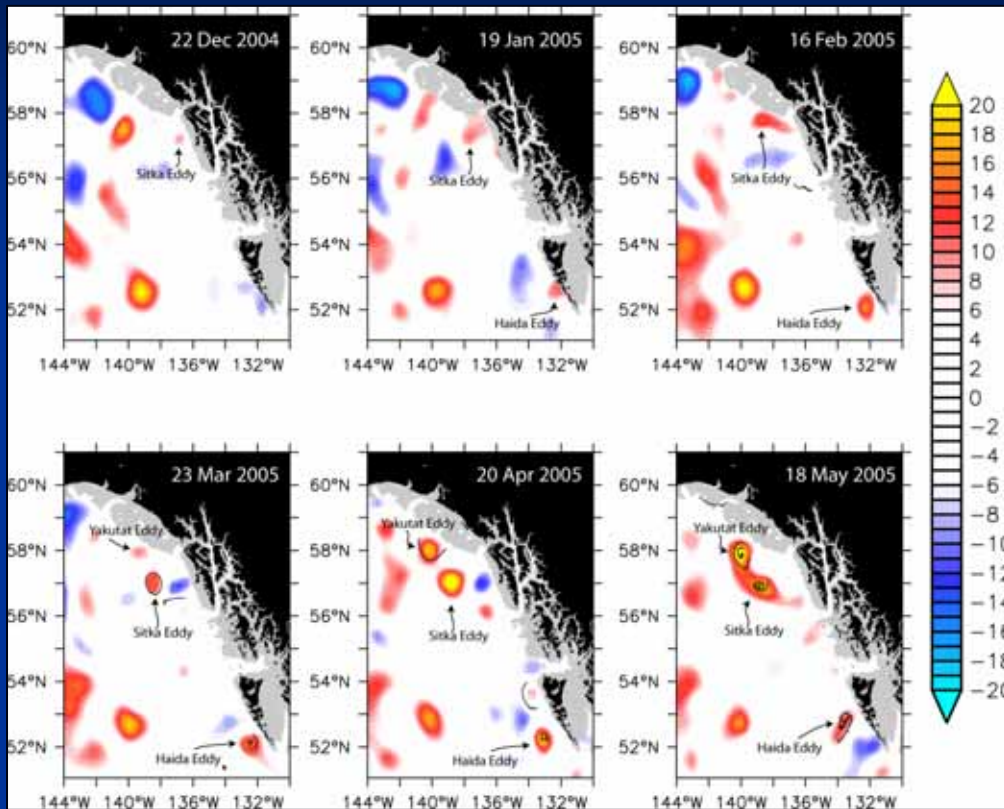
Influence of eddies on chlorophyll (phytoplankton) distributions may be due to:

- Advection of coastal chlorophyll into basin
- Vertical/horizontal processes within the eddy supplying macronutrients and/or iron to euphotic zone.

Eddy formation (drifter and altimetry data)

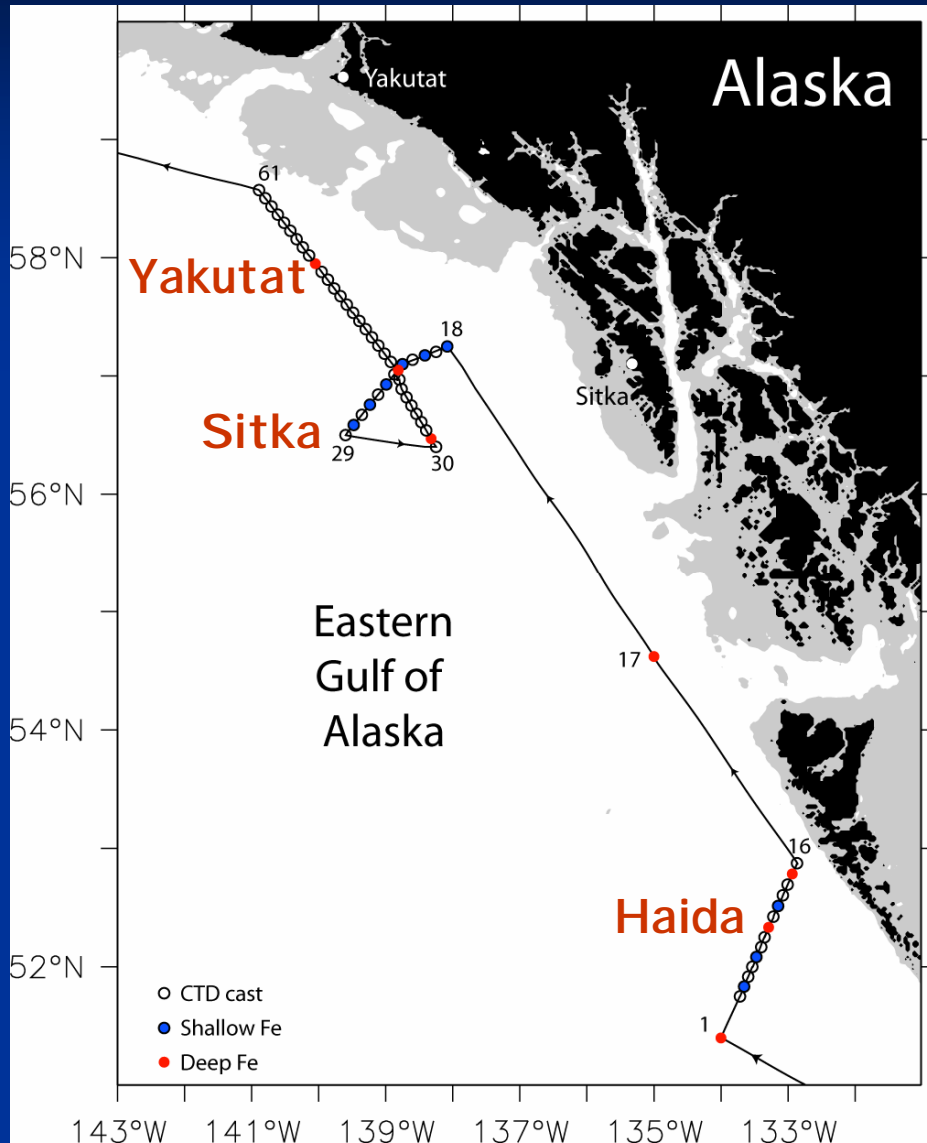


Eddy formation (drifter and altimetry data)



Eddy formation date from altimetry	Dates Sampled	Age of eddy when sampled	
Haida	10 Jan 2005	28 Apr – 1 May 2005	3.5 months
Sitka	22 Dec 2004	2 May – 5 May 2005	4.5 months
Yakutat	23 Mar 2005	6 – 7 May 2005	1.5 months

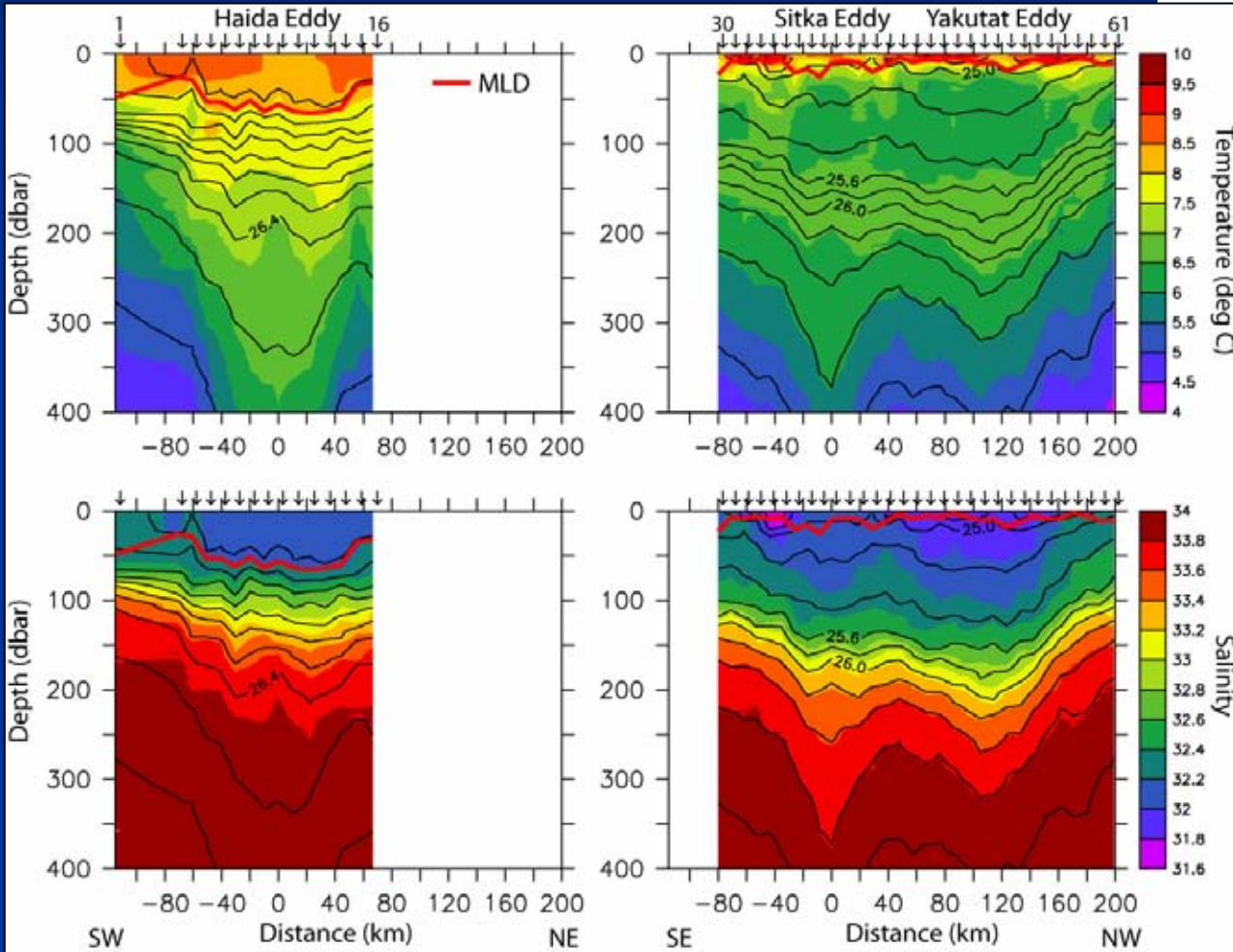
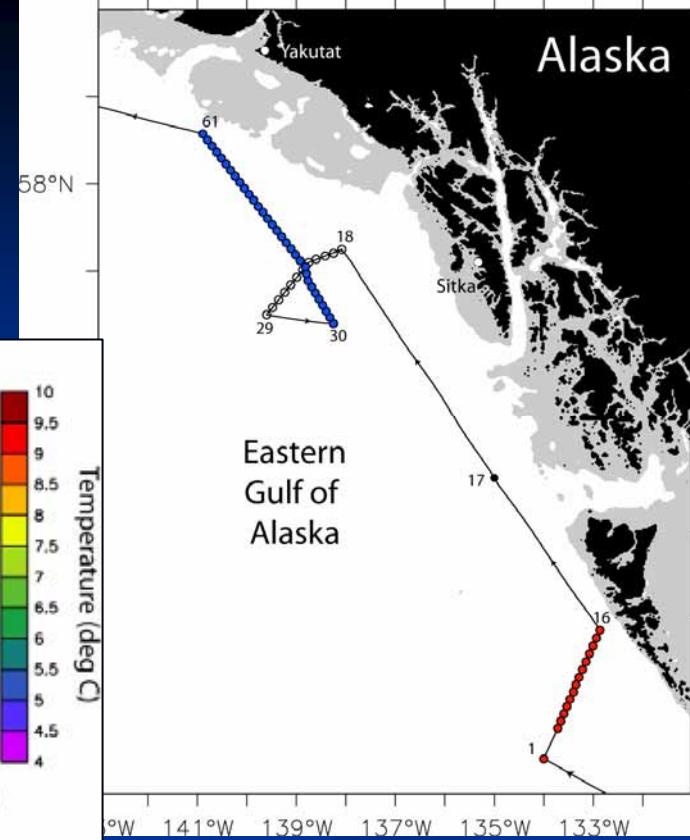
2005 EGOA Eddy Cruise



- Deep Fe samples to 800m using Go-Flo bottles
- Shallow Fe samples (< 100 m) using plastic/Teflon pump and Teflon lined PVC tubing
- Surface Fe samples taken away from ship



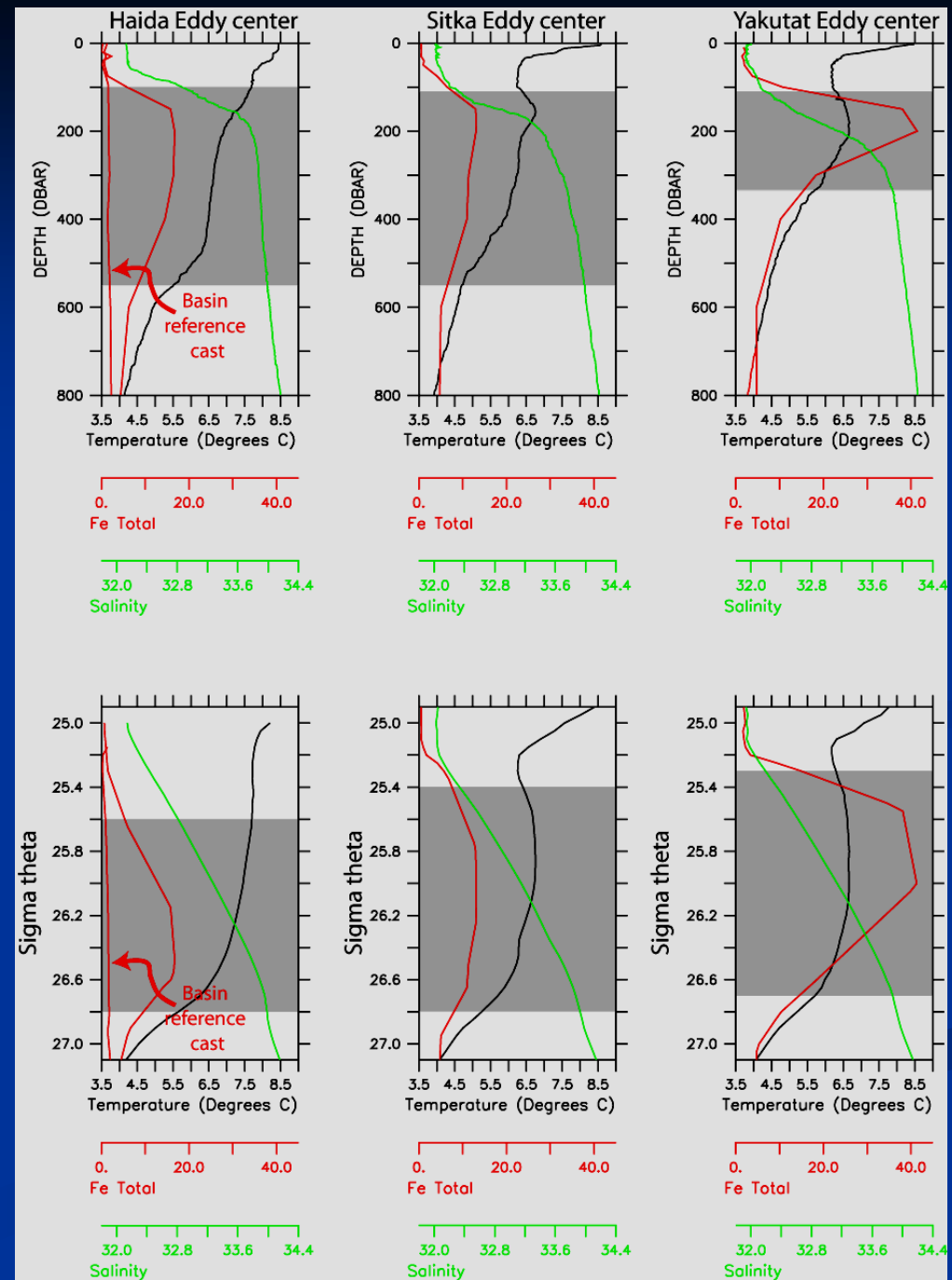
Temperature, salinity, density



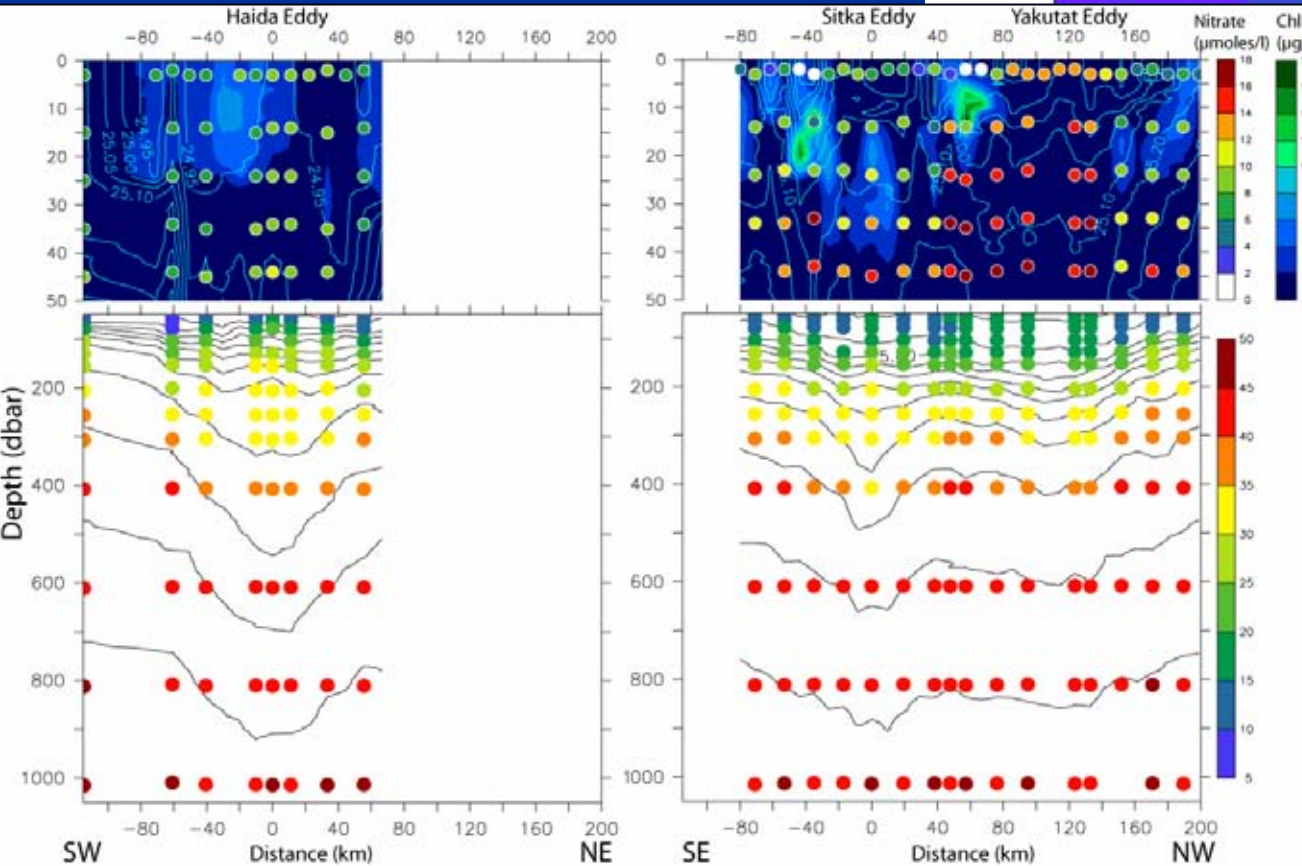
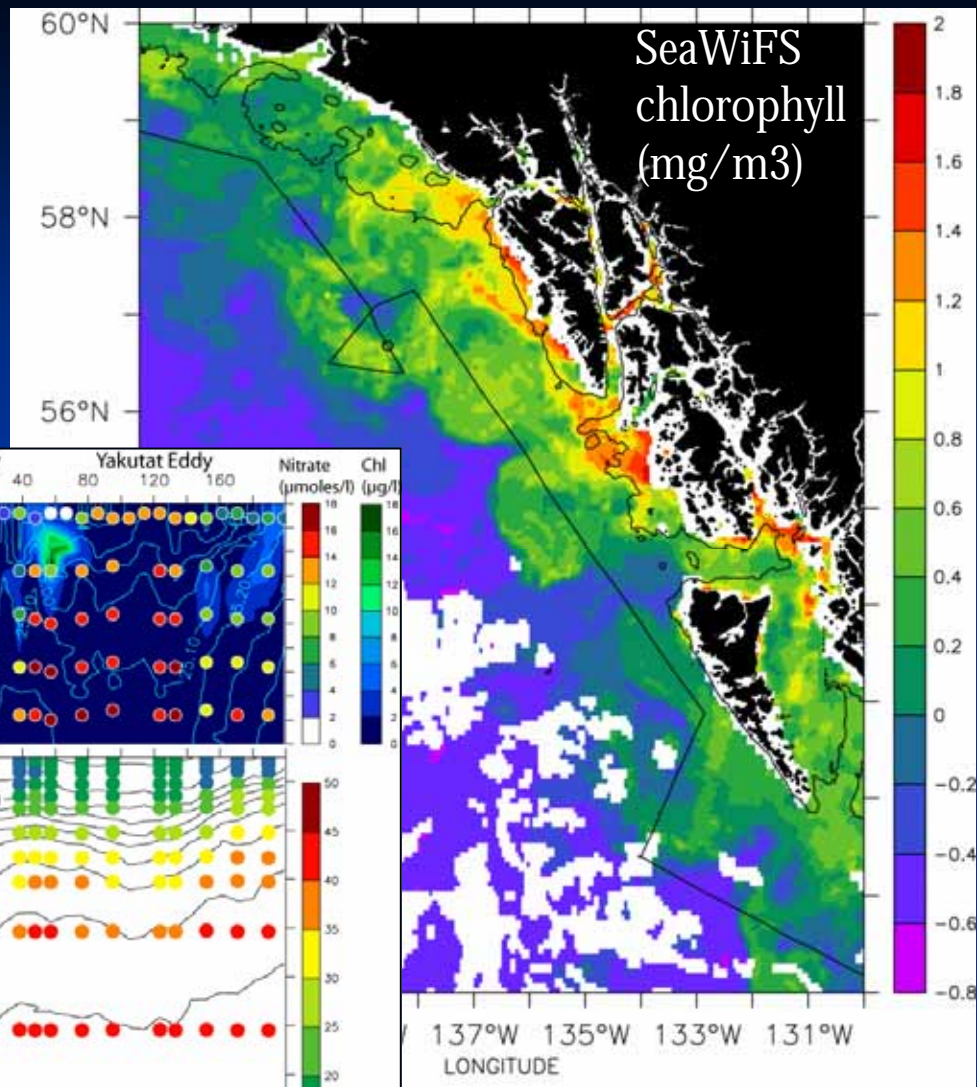
- MLD differences
- Salinity minimum in ring around Sitka Eddy
- Subsurface temperature maximum in Sitka and Yakutat eddies

Iron

- Iron at center of eddies typical of coastal water
- Iron at 200m in center of Yakutat eddy > 2x higher than other eddies (source of iron from sediments suggesting eddy formation on the shelf?)
- High iron in Sitka & Yakutat eddies coincident in depth with subsurface temp maximum suggesting that the source of the temp max is coastal.

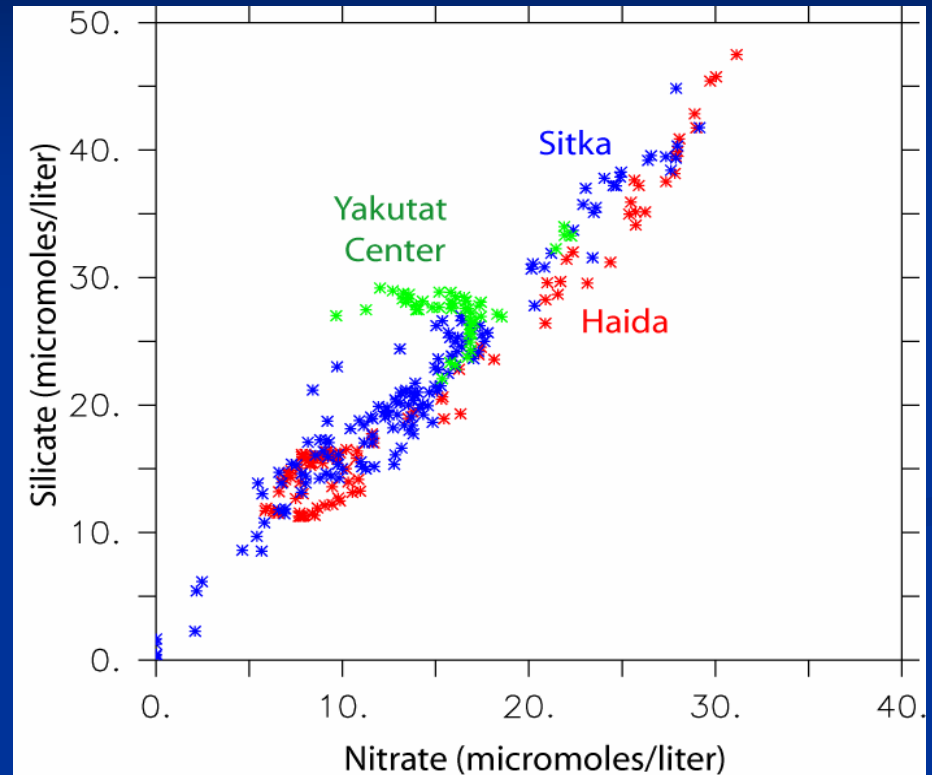


Nitrate and Chlorophyll



Silicate vs. Nitrate

- Silicic acid lower per unit nitrate in Haida eddy (due to influence of California Undercurrent water?)
- High silicate in low salinity waters at center of Yakutat eddy indicate riverine input.



Summary

- Nutrient signatures of three eddies were quite different from each other, suggesting differing biological activity and/or differing formation regions and source waters.
 - Yakutat eddy formed on the shelf in relatively shallow water (~200m); pre-bloom.
 - Sitka and Haida eddies formed in deeper offshore water; post-bloom.
- High silicic acid and low salinity suggests that the source of the Yakutat eddy surface waters may be heavily influenced by river runoff.

Summary

- Iron measured in the Yakutat eddy was higher than any previous GOA eddy measurements; peak iron measured at 200m suggests a sediment source.
- Temperature inversions occur throughout the subarctic North Pacific (i.e. Uda, 1963; Ueno & Yasuda, 2000, 2005). The coincidence of the high iron signature in the eddies with the temperature max implies:
 - Eddies may be a source of T_{\max} water.
 - Ventilation of the T_{\max} layer may provide a source of iron to the surface.
 - Interannual variability of eddy activity and T_{\max} ventilation could influence iron supply to the surface and productivity in the basin.

Thank you