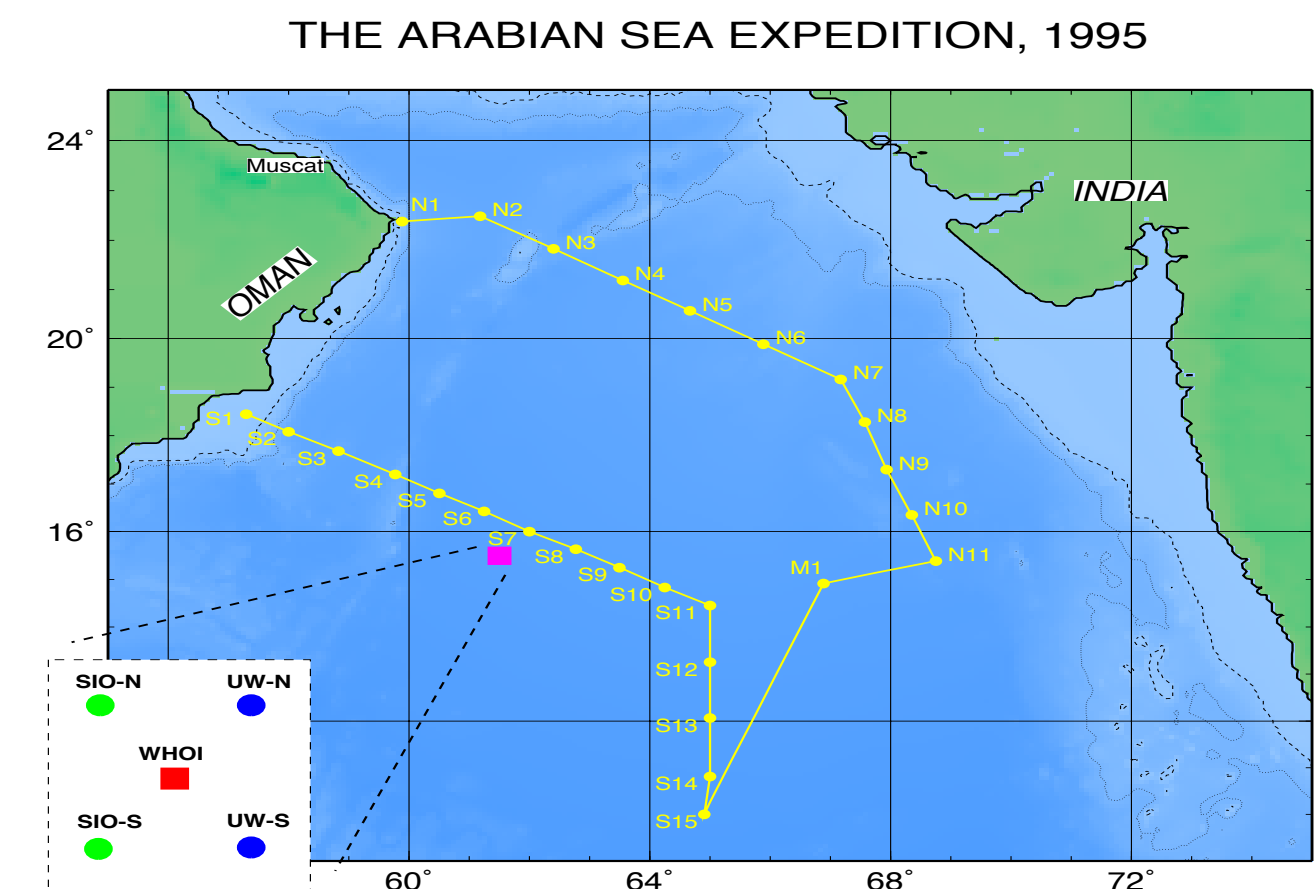


Regulation of Phytoplankton Biomass and Productivity in the Arabian Sea: A Review

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with contributions from

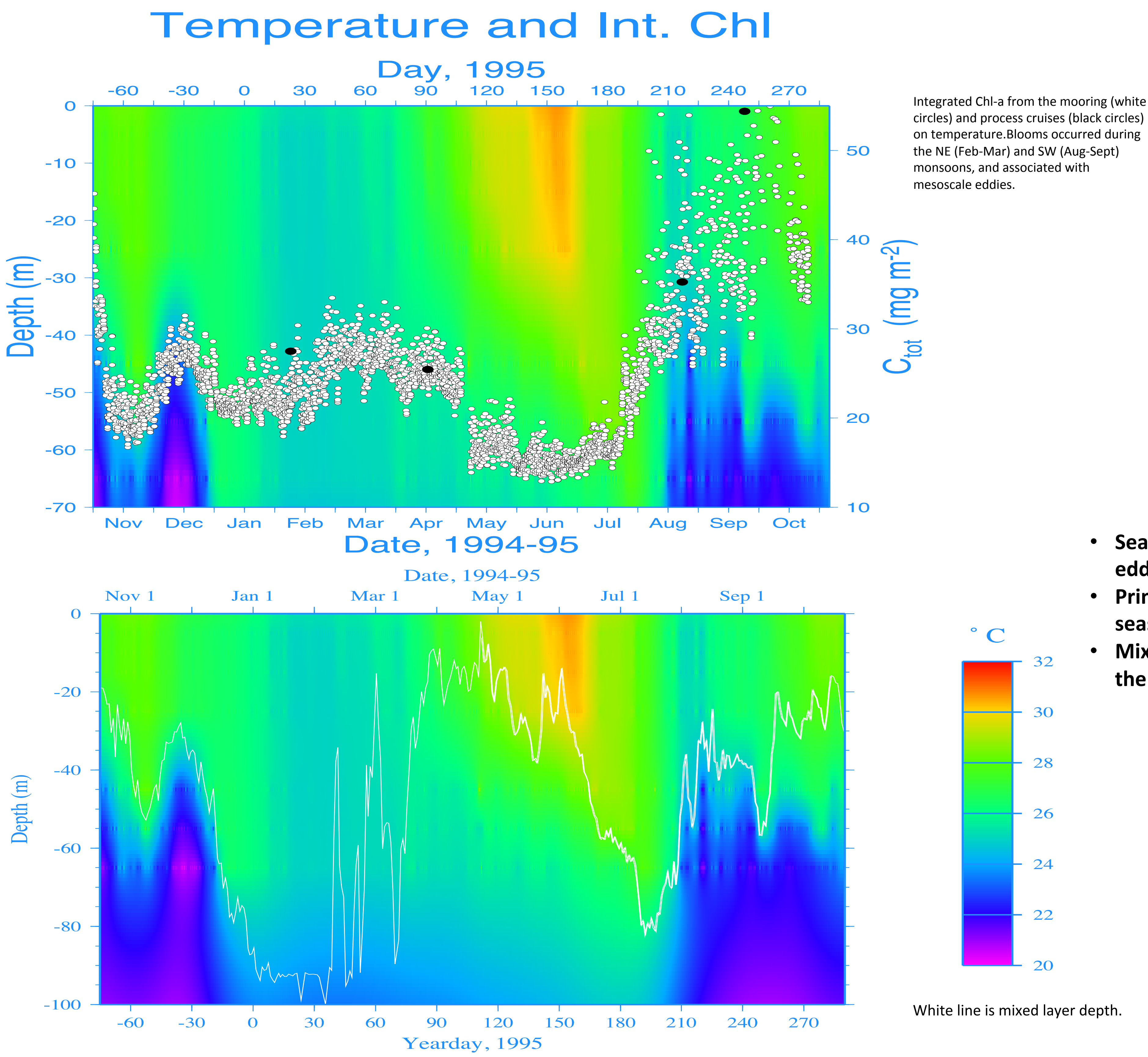
R. T. Barber, Duke University, Tommy D. Dickey, Ocean Physics Laboratory, Univ. California Santa Barbara, Chris Kinkade, NOAA Woods Hole, and R. A. Weller, Physical Oceanography Dept., Woods Hole Oceanographic Institution



Forced Upper Ocean Dynamics Experiment and JGOFS Arabian Sea Expedition, October 1994-December 1995

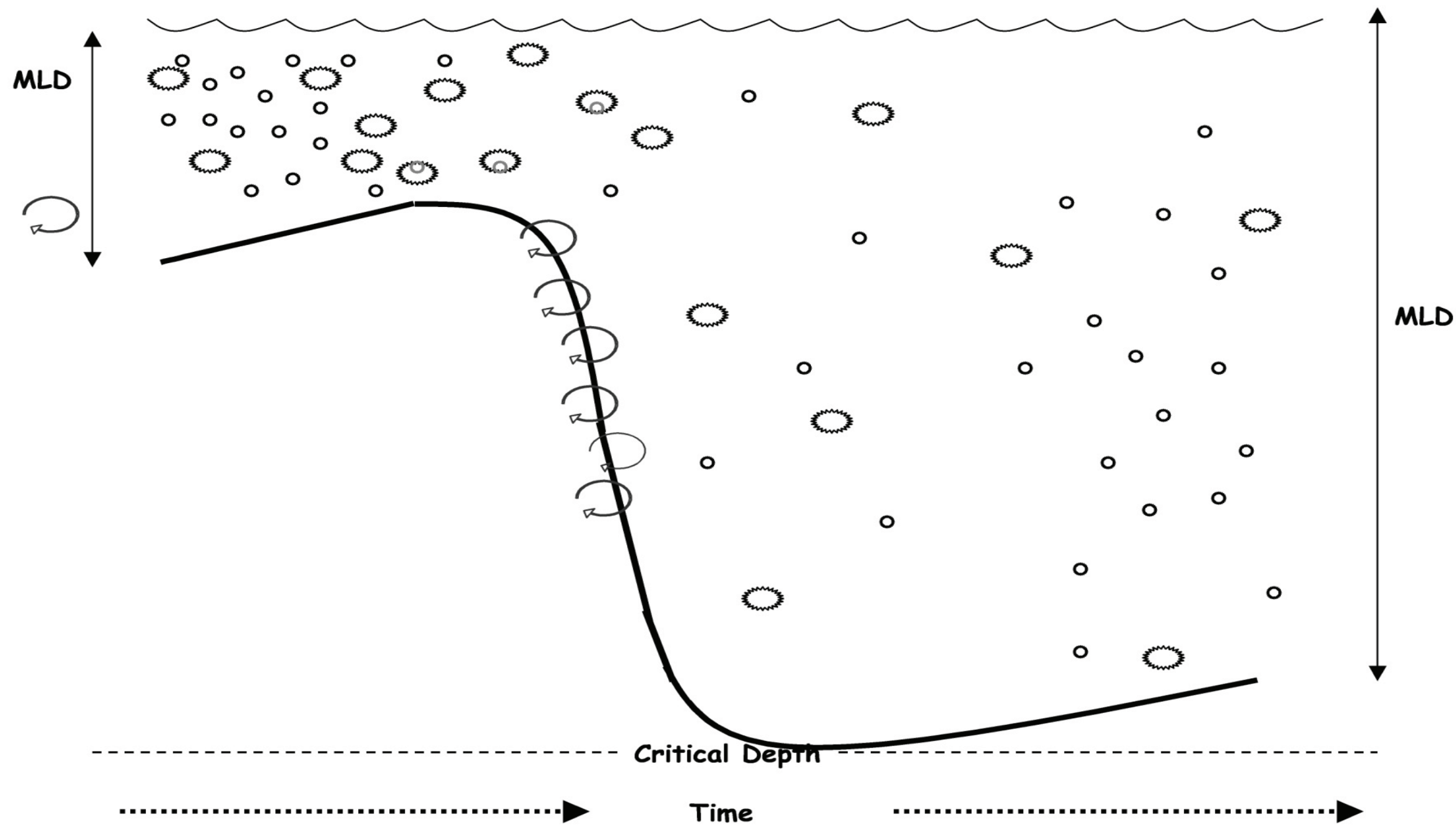
- Conclusions:
- The moderate biomass variability in the Arabian Sea is governed by vertical mixing and zooplankton grazing (the “Dilution Hypothesis”)
 - Vertical mixing in the Arabian Sea never exceeds the critical depth
 - Grazing a strong regulator of autotrophic biomass in the Arabian Sea; mixed layer depth affects grazers more than phytoplankton!

Observations

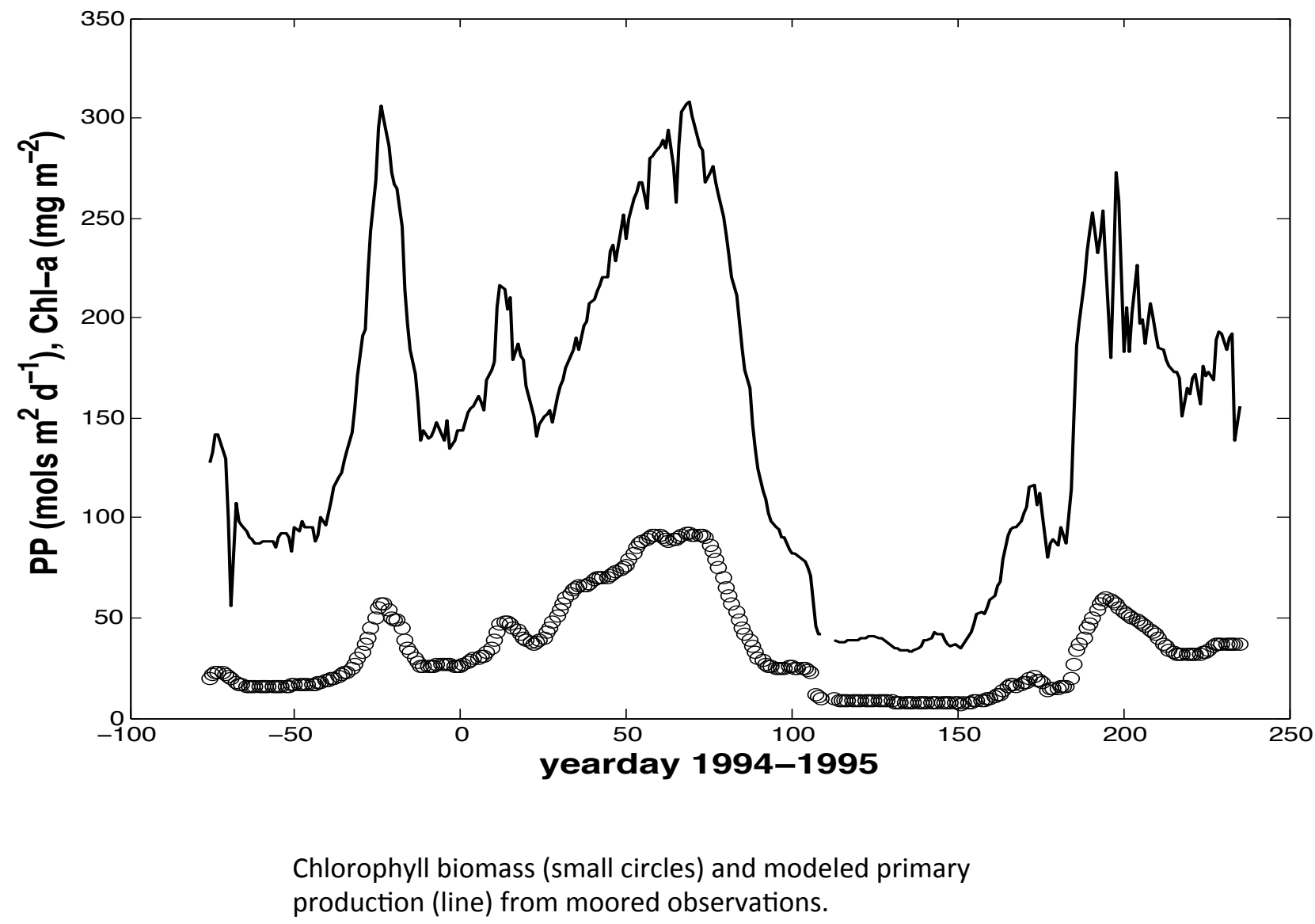
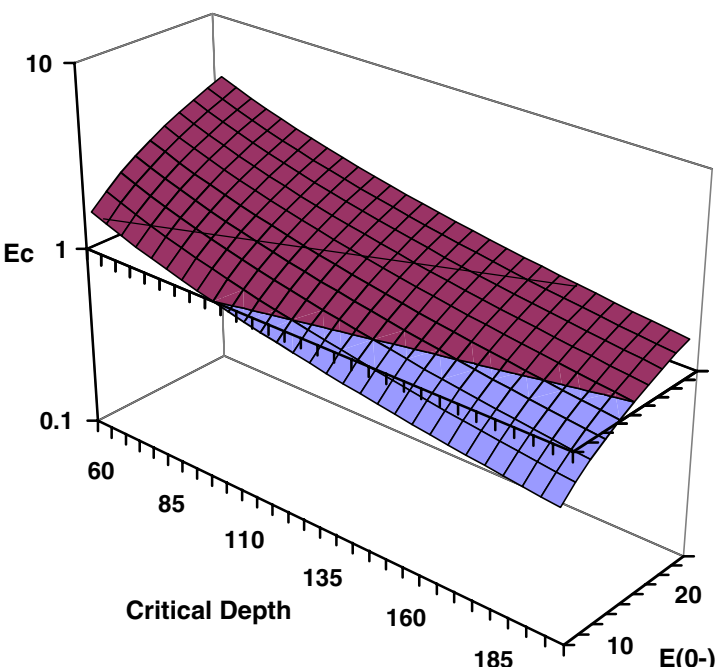


- Seasonal cycle dominated by monsoons (NE, SW), with within-season mesoscale eddy effects.
- Primary production (C-assimilation) far exceeds changes in Chl-a biomass, seasonally.
- Mixed layer depths (MLDs) regulated by monsoons; never exceed estimates of the critical depth.

Interpretation



Cartoon showing the interrelationships among mixed layer (ML) depth, phytoplankton (small circles), and grazers (larger circles). Vertical mixing never exceeds the critical depth. A deepening ML will dilute phytoplankton and grazers equally, but phytoplankton respond more quickly. See Marra and Barber (2005).



Key References

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- Grazing is the dominant regulator of phytoplankton biomass; Mixed layer depth affects grazers more than phytoplankton.
- “The mixed layer variations act as a natural ‘dilution experiment’ allowing temporal mismatches between autotrophic production and grazing” (Marra and Barber, 2005).