



Chlorophyll dynamics and nitrate modulations around San Nicolas and Santa Catalina

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Catalina Marine Society

CalCOFI Conference 2018

La Jolla, Ca

Objective and Data

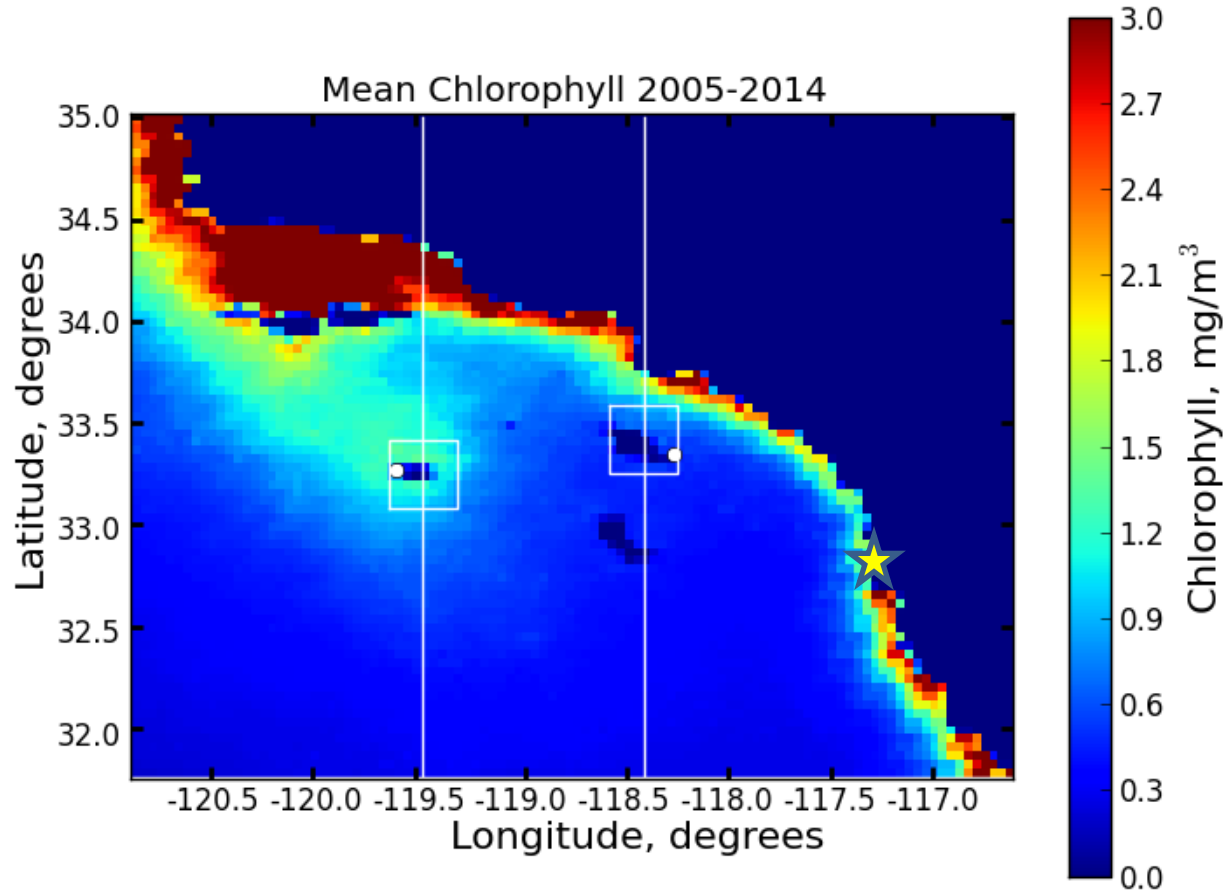


- Understand marine differences among the Channel Islands, use Catalina natural laboratory
- Data 2005-2014
 - CalCOFI
 - Nitrate
 - MODIS (Aqua)
 - Chlorophyll product
 - Models summarizing empirical studies
 - Temperature
 - Light

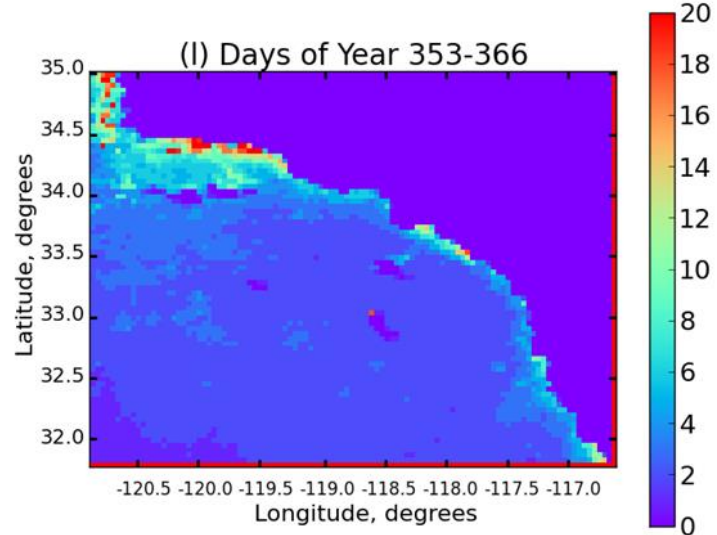
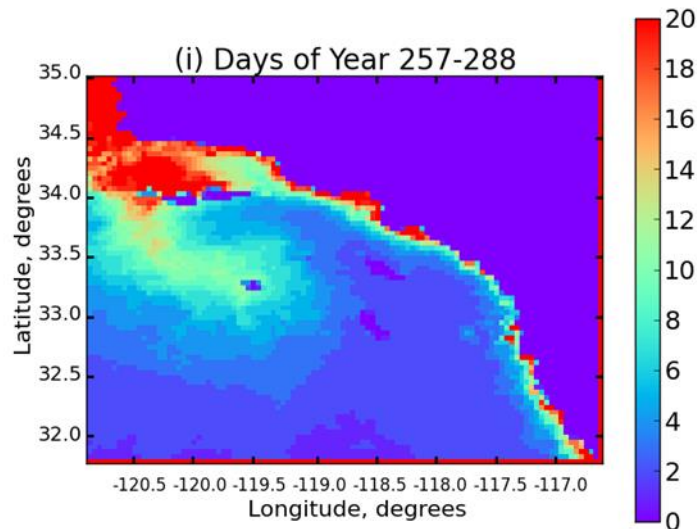
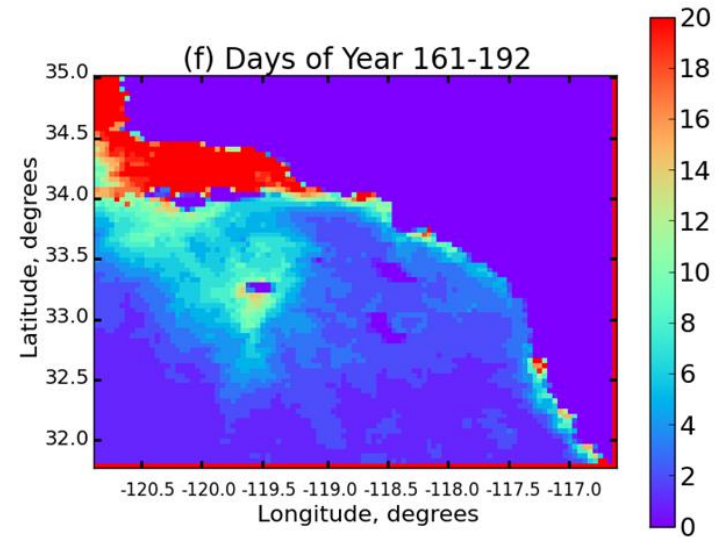
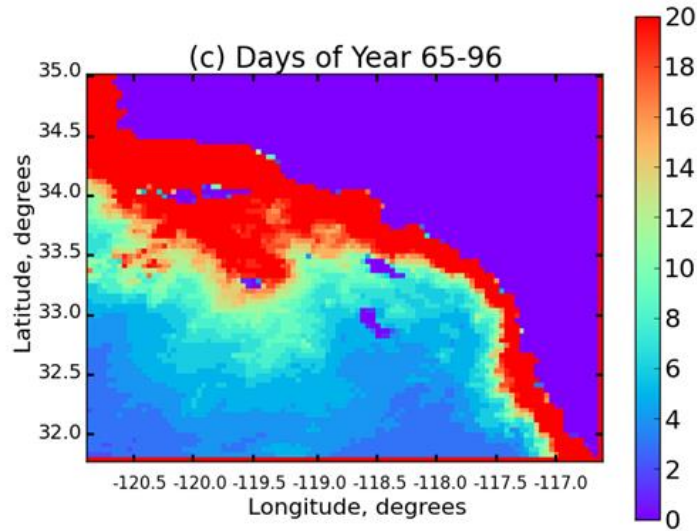
Study Area: SoCal Bight



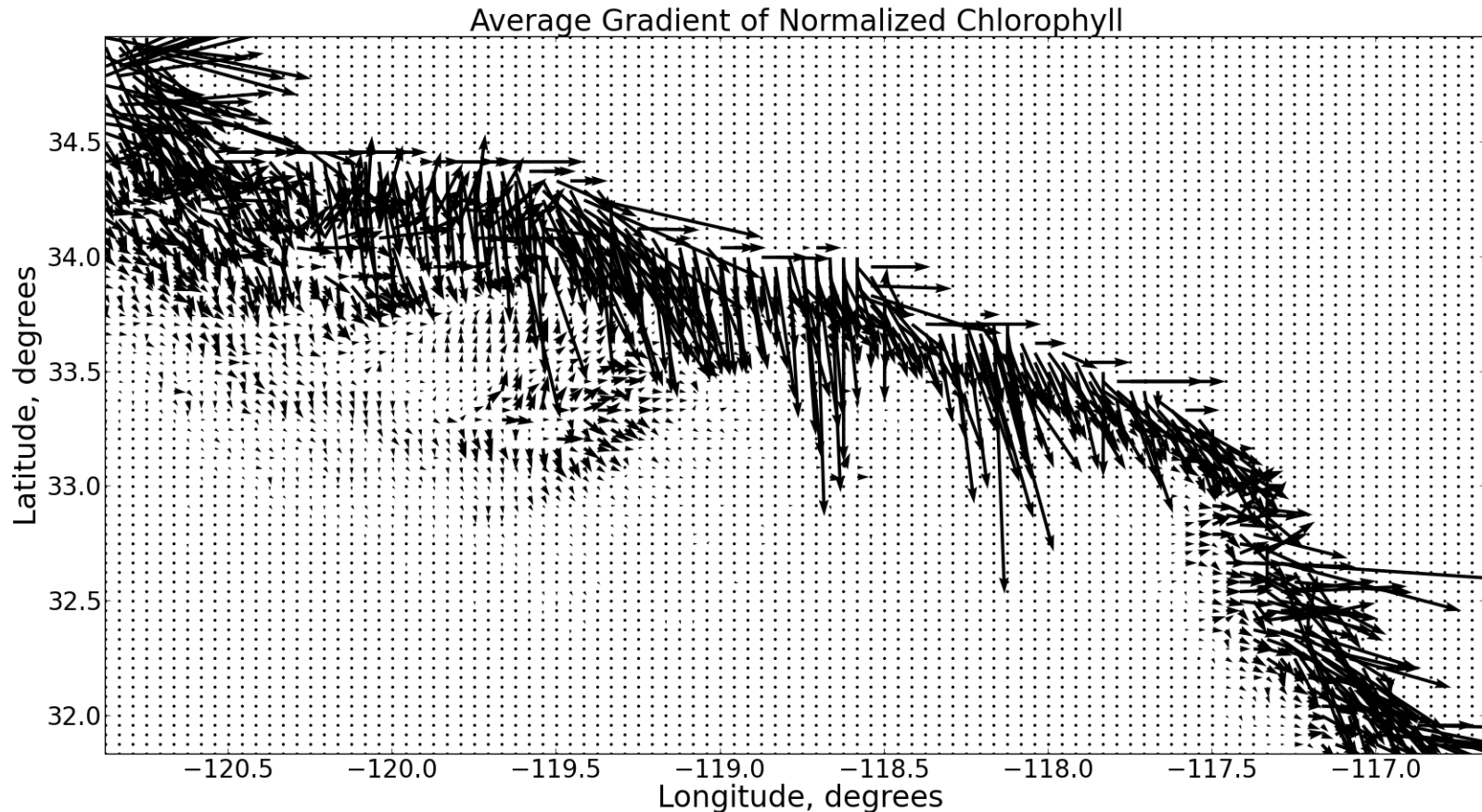
- CalCOFI station
- Averaging box
- Profile location



Chlorophyll Monthly Average



Chlorophyll Gradient

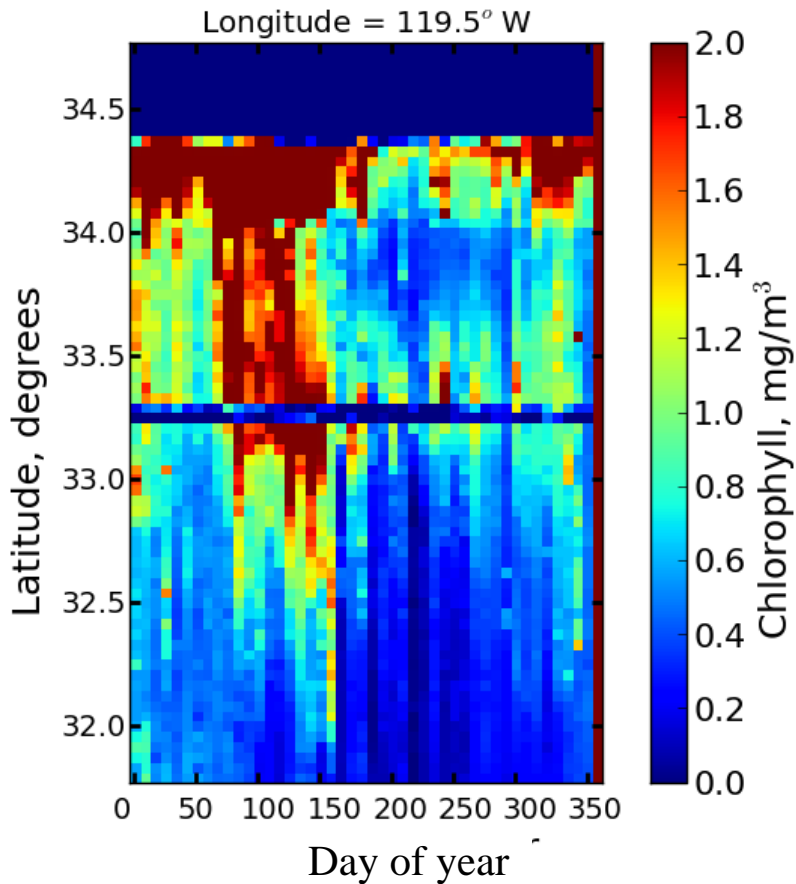


Strong gradient signal at San Nicolas, no signal at Santa Catalina

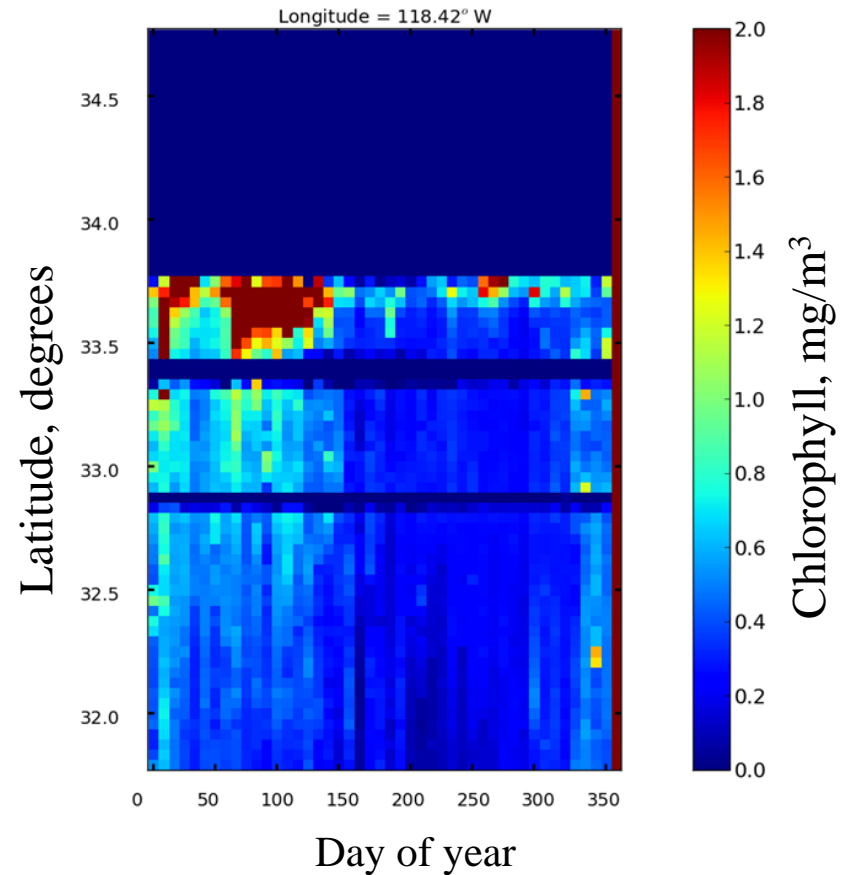
Average Day of Year Chlorophyll Profile



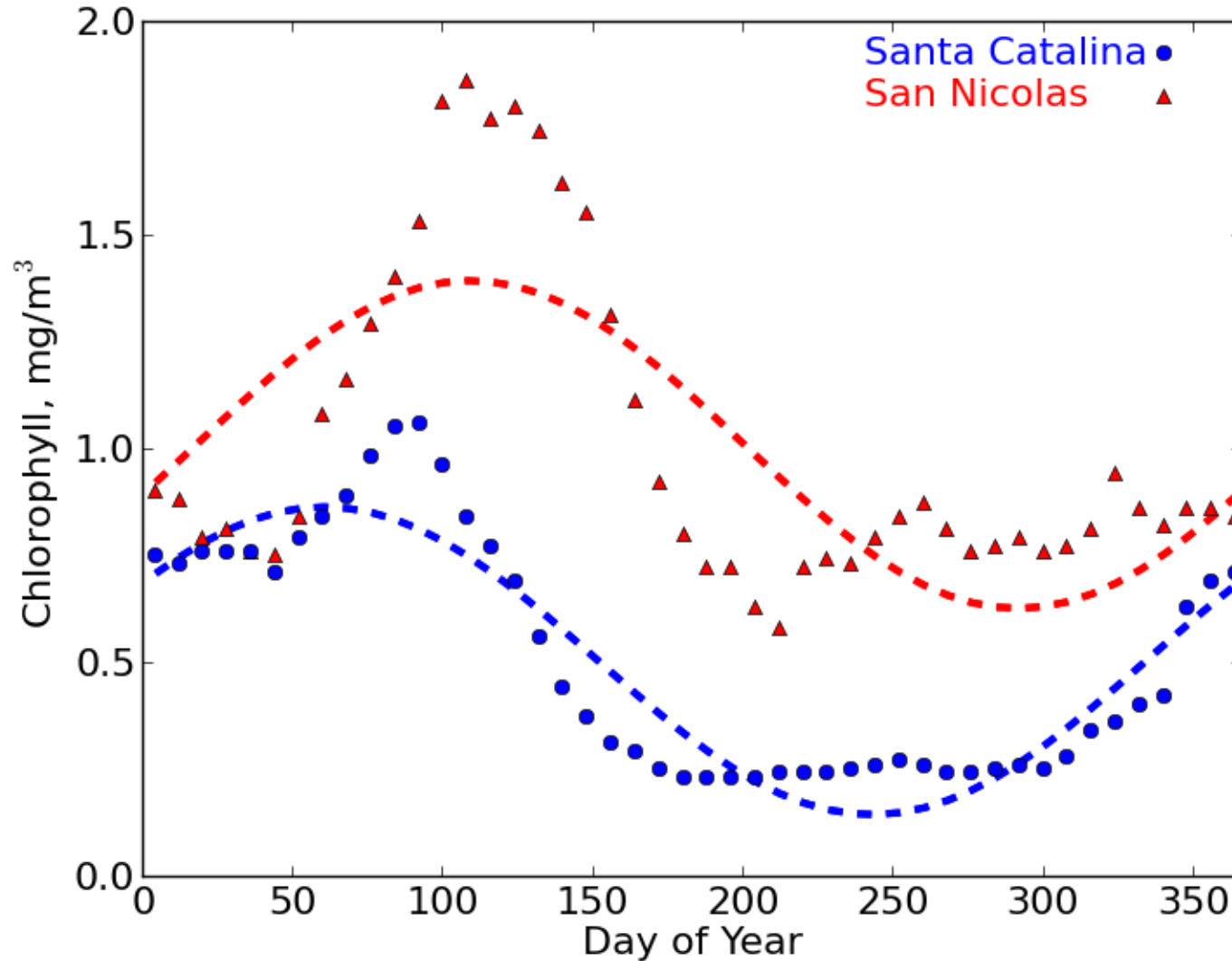
S. Nicolas



S. Cat & S. Cle



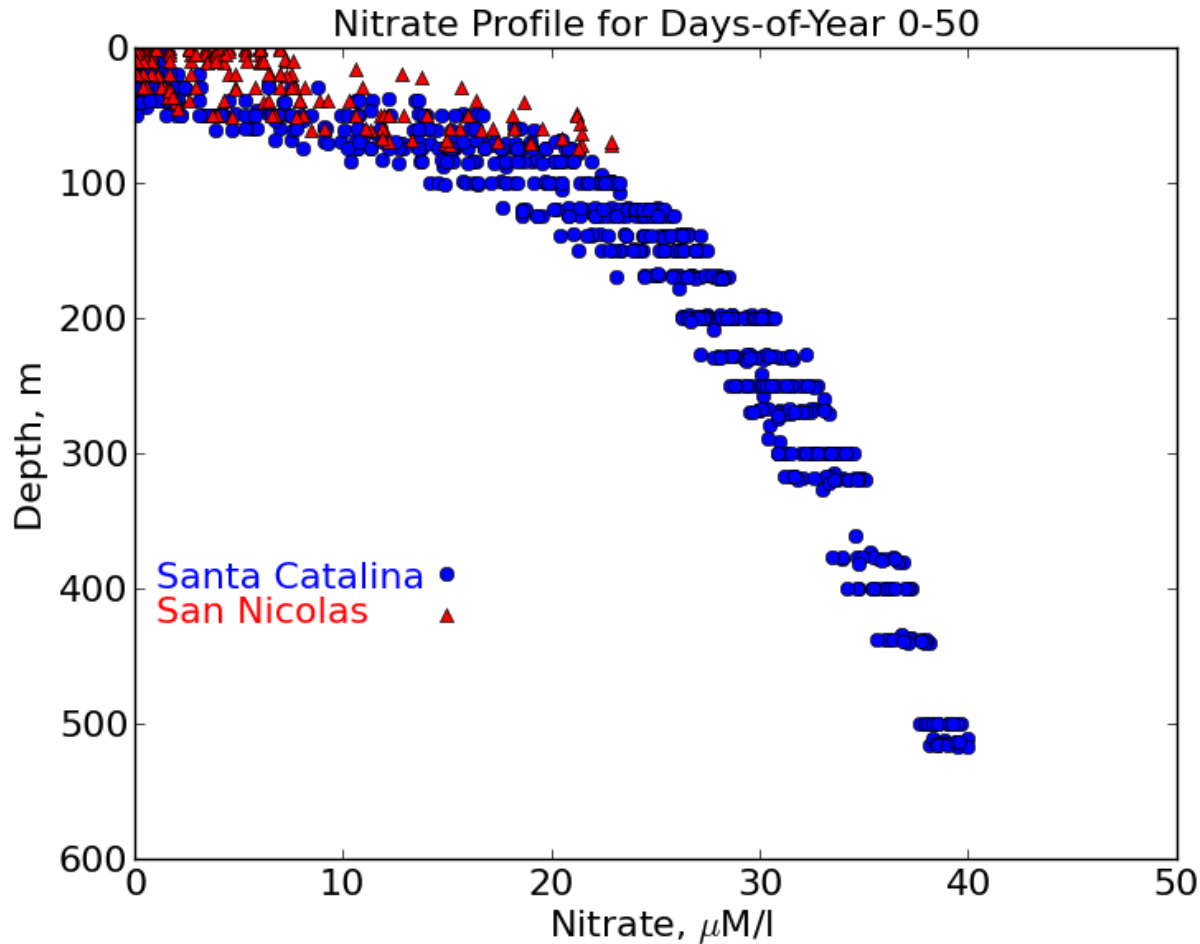
Seasonal Modulation of Chlorophyll



Chl Means differ, Catalina phase earlier



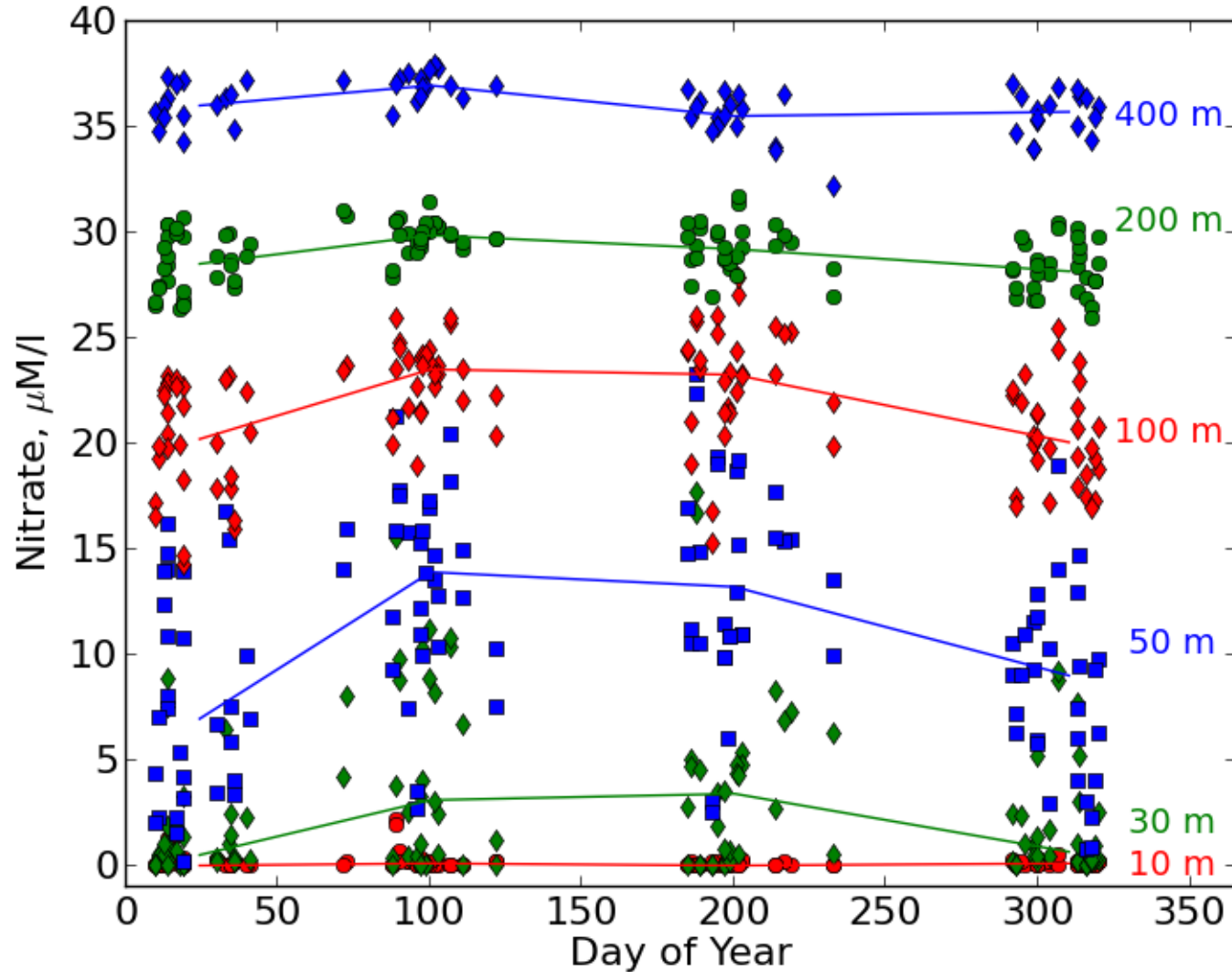
Example Nitrate Profiles



Limiting nutrient at Santa Catalina, non-limiting at San Nicolas

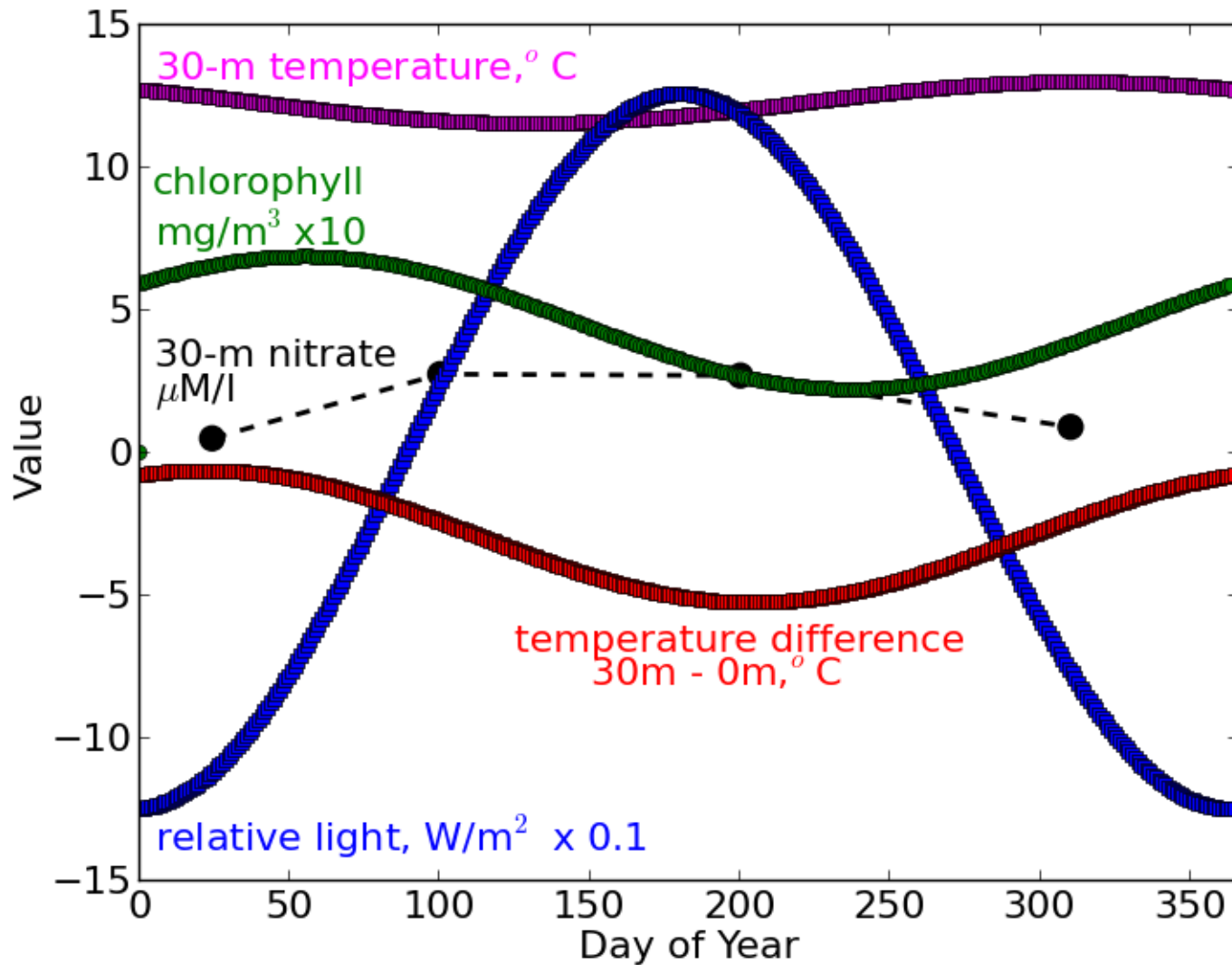


Seasonal Nitrate at S. Catalina



Seasonal nitrate modulation greatest at 50 m depth

Summary Data Plot



Chlorophyll is driven by stratification.

Model for Chlorophyll and Nitrate



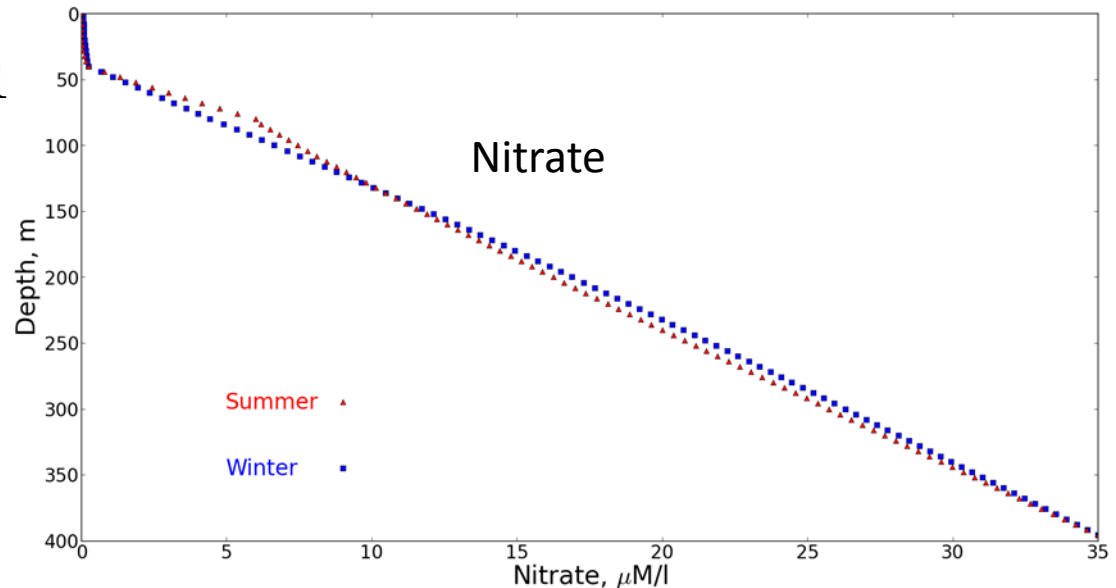
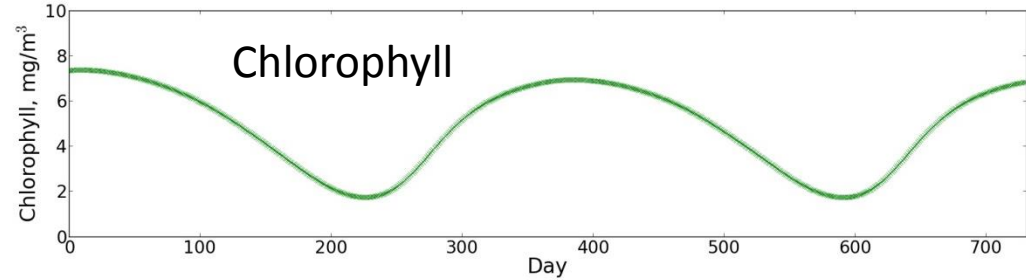
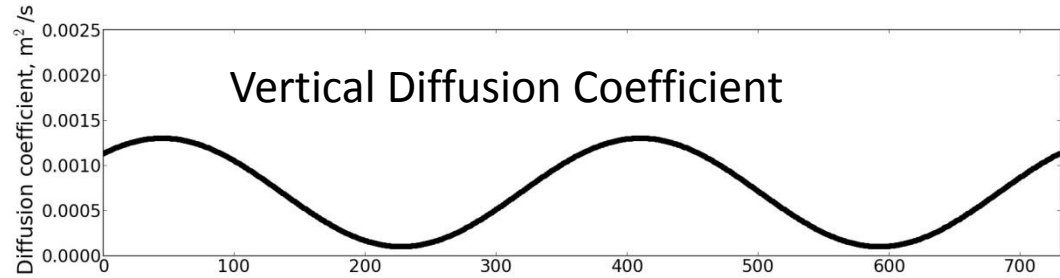
$$\frac{\partial T}{\partial t} - \kappa \frac{\partial^2 T}{\partial z^2} = Q(t, z)$$



$$\frac{\partial N}{\partial t} - \kappa \frac{\partial^2 N}{\partial z^2} = S(t, z)$$

$$\frac{\partial N}{\partial t} - \kappa \frac{\partial^2 N}{\partial z^2} = -\alpha \frac{\partial P}{\partial t}; \frac{\partial P}{\partial t} > 1$$

$$\frac{\partial P}{\partial t} = (\mu H(N) - \beta)P$$





Conclusions

- Classic Catalina
 - Exhibits canonical behavior of temperate seas
 - Phytoplankton bloom and temperature modulations consistent with same vertical eddy diffusion coefficient
 - No island mass effect
- San Nicolas has large island mass effect
- Thank you.