Biophysical modeling of the California Current System

M. J. Olascoaga, S. de Rada, J. Kindle and E. Chassignet

HYCOM meeting

Nov. 2006
Bio model

- **Microzooplankton** $Z_1$
  - Grazing
  - Predation

- **Small phytoplankton** $S_1$
  - N-Uptake

- **Meso zooplankton** $Z_2$
  - Excretion
  - Grazing
  - Fecal Pellet
  - Mortality

- **Diatoms** $S_2$
  - Si-Uptake
  - Sinking

- **Detritus-N DN**
  - Loss
  - Sinking

- **Detritus-Si Dsi**
  - Si Dissolution
  - Sinking

- **Ammonium NH$_4$**
- **Nitrate NO$_3$**
- **Silicate Si(OH)$_4$**
- **Dissolution**
HYCOM CCS

- Domain 30-48 N, 116-132 W
- 1/12, 20 layers
- COAMPS forcing
- Rivers included
- IC and BC from Pacific HYCOM.
- IC and BC for biology from Levitus.
Santa Ana winds

(from Raphael 2003 Earth Interactions, vol 7)
Experiments

• Experiments oriented to testing model sensitivity to variation in several biological parameters were performed.
• Also, the effects of two different vertical mixing parameterizations (KPP and MY) on the biological response were tested.
<table>
<thead>
<tr>
<th></th>
<th>$E_{165}$</th>
<th>$E_{175}$</th>
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</thead>
<tbody>
<tr>
<td><strong>N-Uptake</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Ak_{NO_3S_2}$</td>
<td>1</td>
<td>4</td>
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<tr>
<td><strong>Maximum Growth rate</strong></td>
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<tr>
<td>$g_{maxS_1}$</td>
<td>1.5</td>
<td>1</td>
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<tr>
<td>$g_{maxS_2}$</td>
<td>2</td>
<td>2.5</td>
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<td><strong>Grazing rate</strong></td>
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<tr>
<td>$\beta_1$</td>
<td>0.8</td>
<td>1.35</td>
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<tr>
<td>$\beta_2$</td>
<td>0.8</td>
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<td><strong>Mortality</strong></td>
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<td>$\gamma_3$</td>
<td>0.02</td>
<td>0.05</td>
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Week 16

E_165

E_175

SeaWiFS
Week 29

E_165

E_175

SeaWiFS
SeaWiFS        Model

Week 5
Climatological Mean
Annual harmonic

Model

$A_1$

SeaWiFS

$\phi_1$
Semiannual harmonic

Model $A_2$

SeaWiFS $\phi_2$
KPP vs MY

R correlation coef.
Globec Cruises
4-10 Sept 2001

Model

SeaWiFS
Calcofi Cruises
7-26 Jan 2001

Model

SeaWiFS
Calcofi Cruises
6 Apr – 3 May 2001
Santa Ana events
week 42
Santa Ana events
Summary

- The indistinct consideration of the two vertical mixing schemes leads to a good representation of the coarse features of the blooms. Small differences in the biological responses are noted offshore and along the core of the CC.
- In certain isolated coastal areas important differences are found with respect to observations, specially in the SCB. The lack of agreement in those localized regions may be attributed to nutrient sources not considered in the simulations such as those due to river runoff and Santa Ana wind events.
FIN
Week 21
Phytoplankton
Explained Variance
Calcofi Cruises
10-27 Jul 2001
Calcofi Cruises