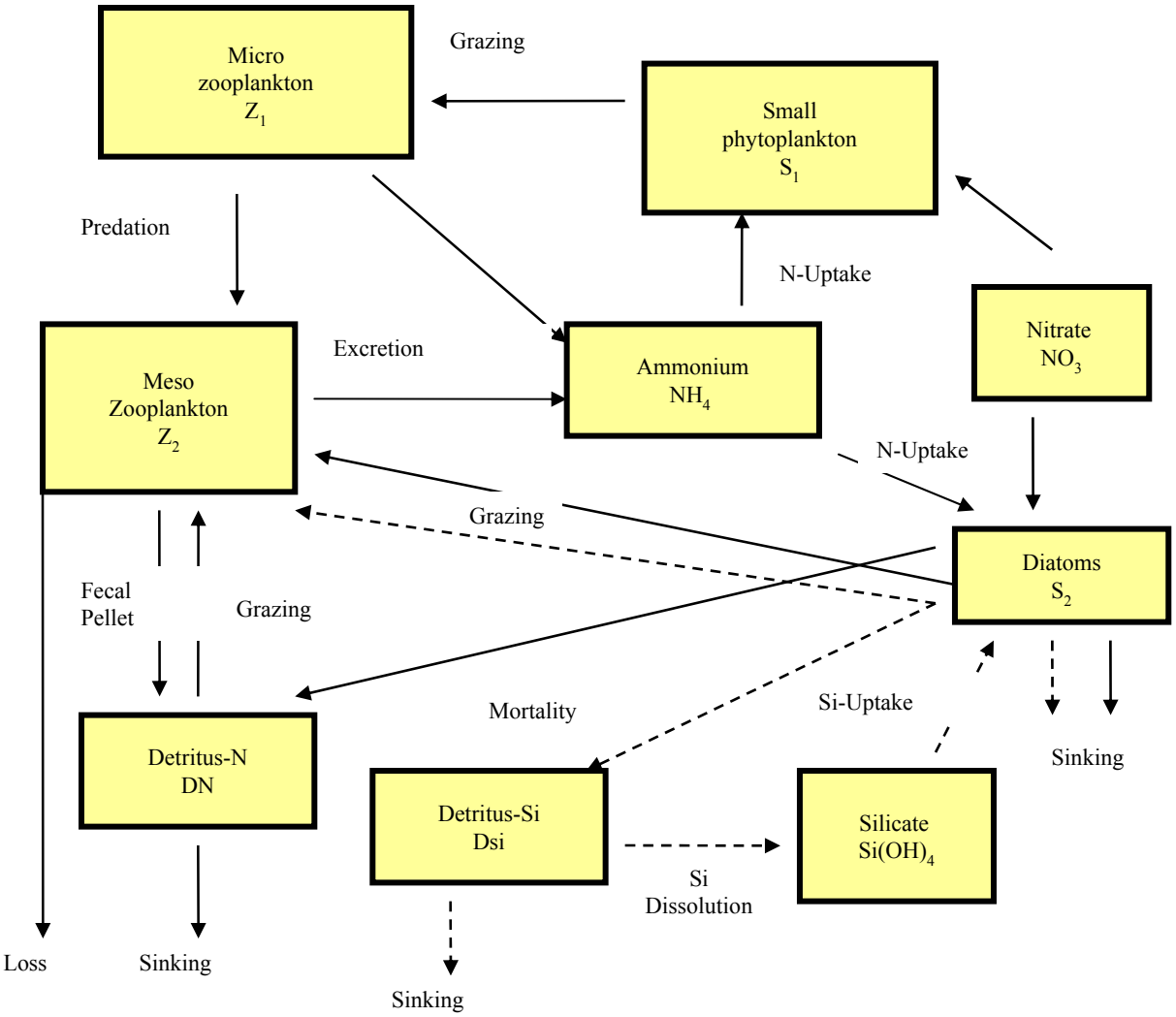
Biophysical modeling of the California Current System

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

HYCOM meeting

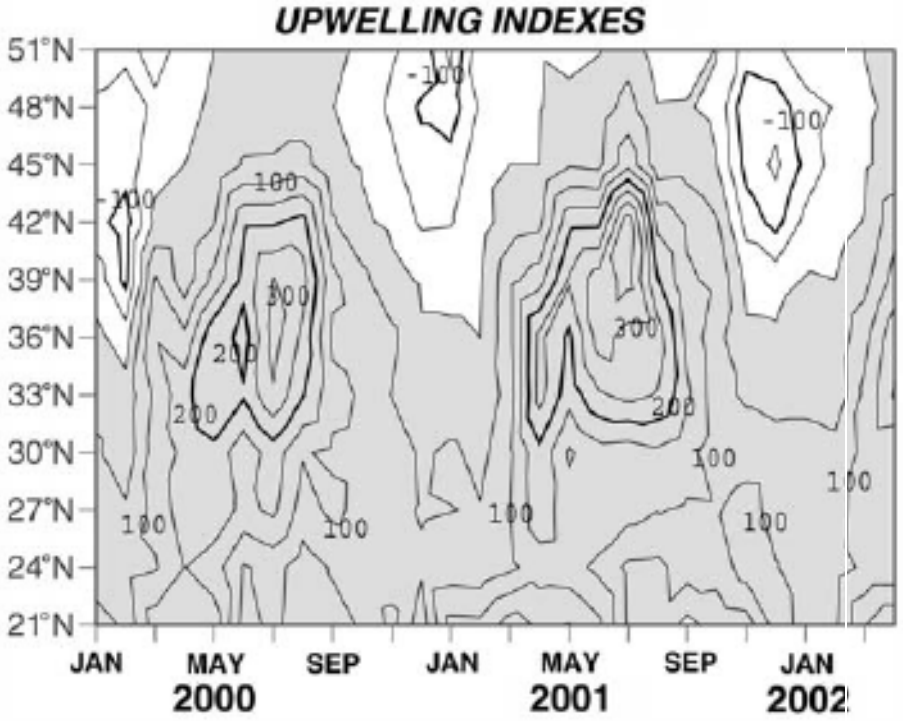
Nov. 2006

Bio model

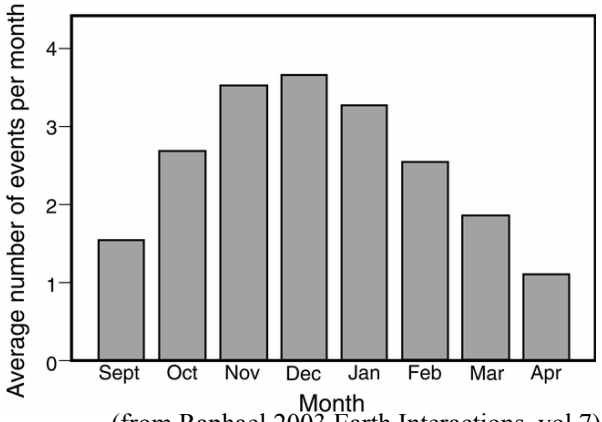

Micro zooplankton Z_1
Grazing
Small phytoplankton S_1
Predation
N-Uptake
Nitrate NO_3
Meso Zooplankton Z_2
Excretion
Ammonium NH_4
N-Uptake
Grazing
Diatoms S_2
Fecal Pellet
Grazing
Mortality
Si-Uptake
Sinking
Detritus-N DN
Detritus-Si Dsi
Silicate $Si(OH)_4$
Si Dissolution
Loss
Sinking
Sinking

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



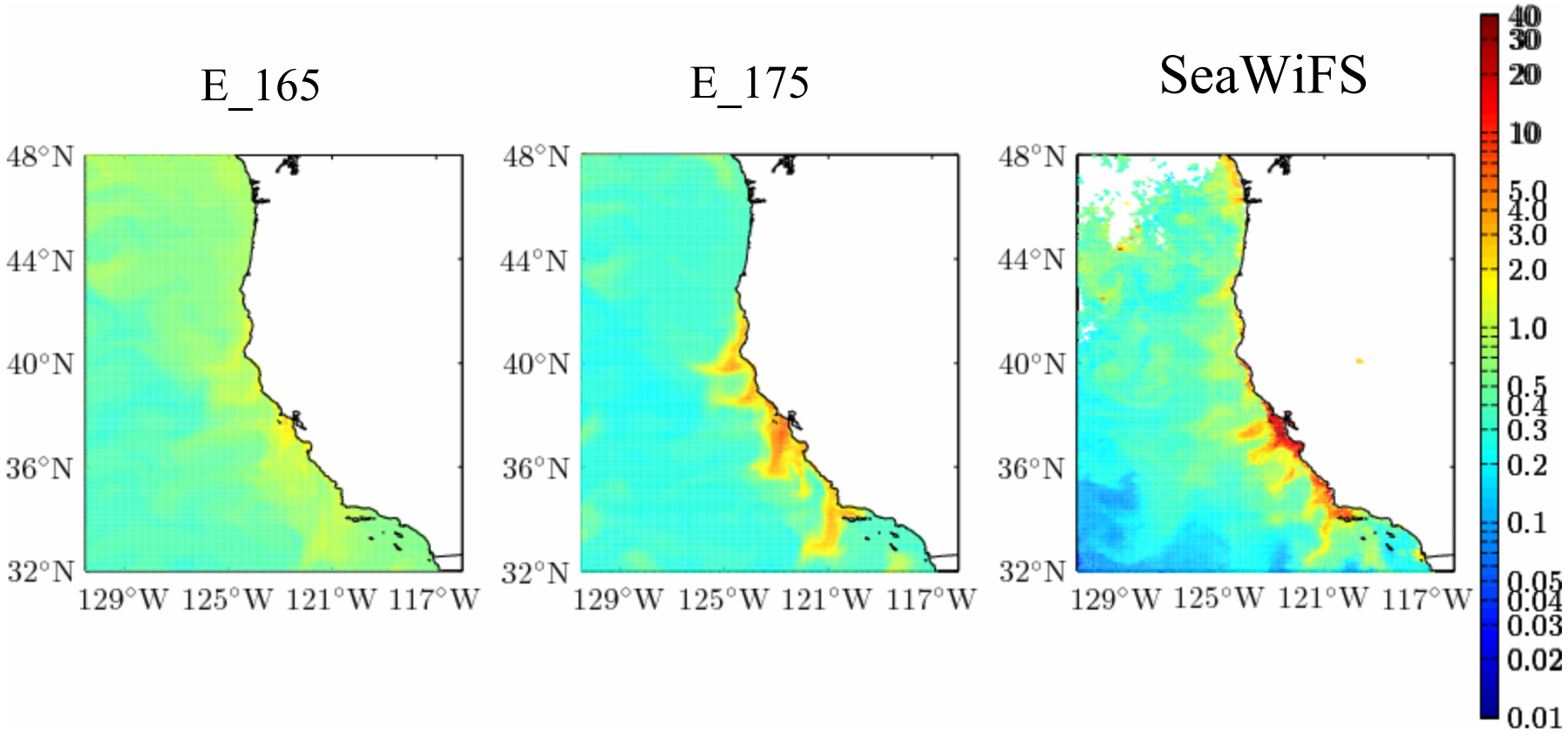
(from Raphael 2003 Earth Interactions, vol 7)

Experiments

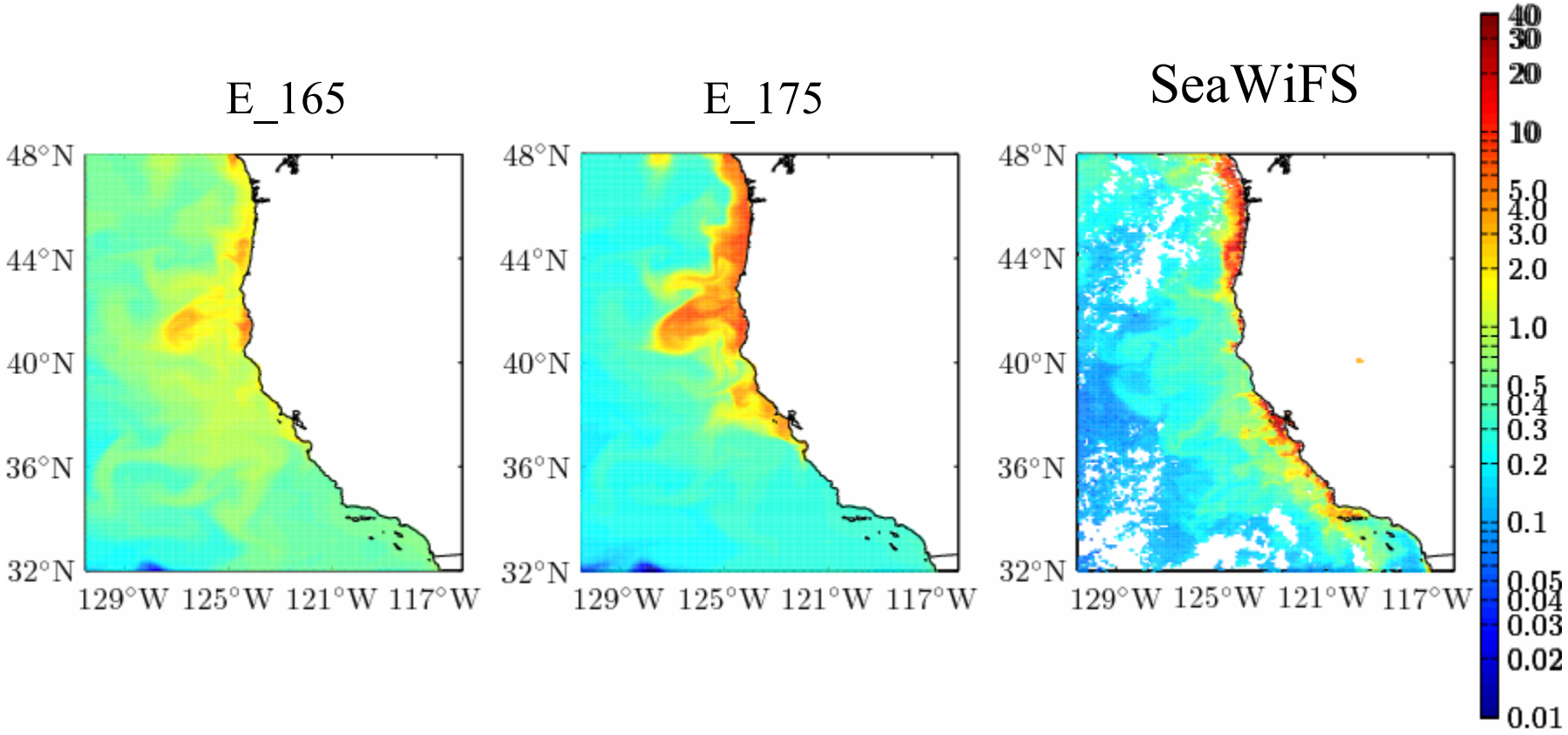
- Experiments oriented to testing model sensitivity to variation in several biological parameters were performed.
- Also, the effects of two different vertical mixing parameterizations (KPP and MY) on the biological response were tested.

		E_165	E_175	
N-Uptake	$Ak_{NO_3S_2}$	1	4	[mmolN/m^3]
Maximum Growth rate	g_{maxS_1}	1.5	1	[1/day]
	g_{maxS_2}	2	2.5	[1/day]
Grazing rate	β_1	0.8	1.35	[1/day]
	β_2	0.8	0.5	[1/day]
Mortality	γ_3	0.02	0.05	[1/day]

Week 16


E_165
E_175
SeaWiFS
48°N
44°N
40°N
36°N
32°N
129°W 125°W 121°W 117°W
40
30
20
10
5.0
4.0
3.0
2.0
1.0
0.5
0.4
0.3
0.2
0.1
0.05
0.04
0.03
0.02
0.01

Week 29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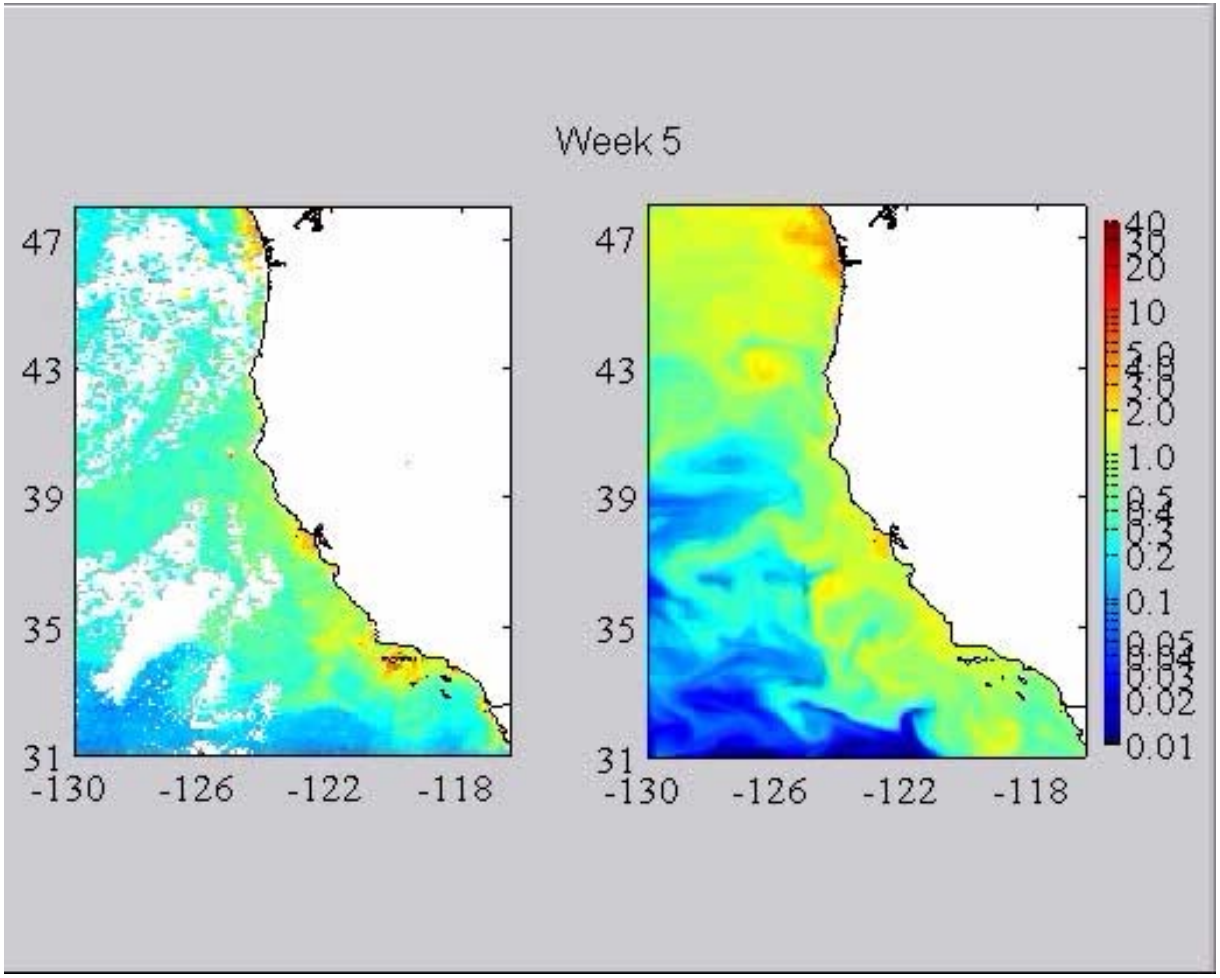
0.3
0.2
0.1
0.05
0.04
0.03
0.02
0.01

SeaWiFS Model

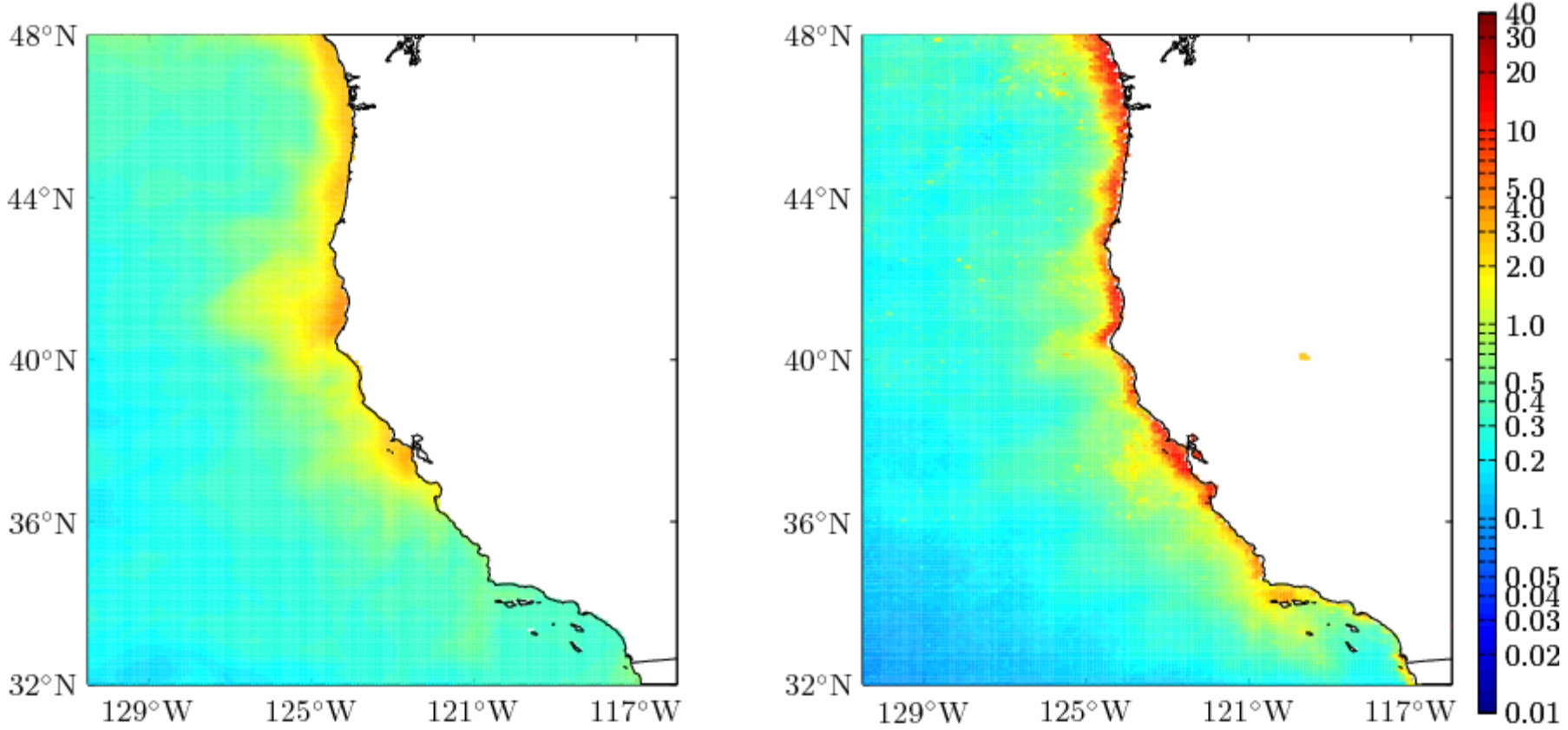


Climatological Mean

A_0

Model

SeaWiFS

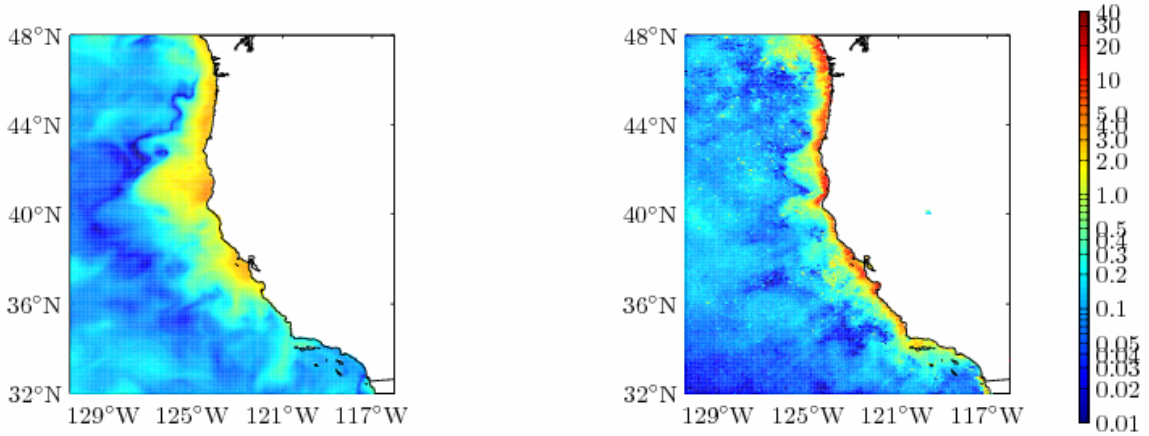


Annual harmonic

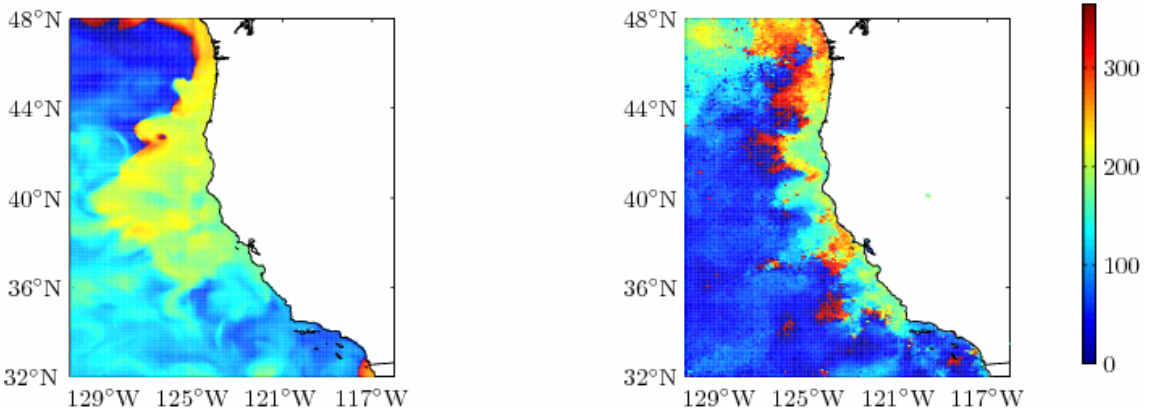
Model

A_1

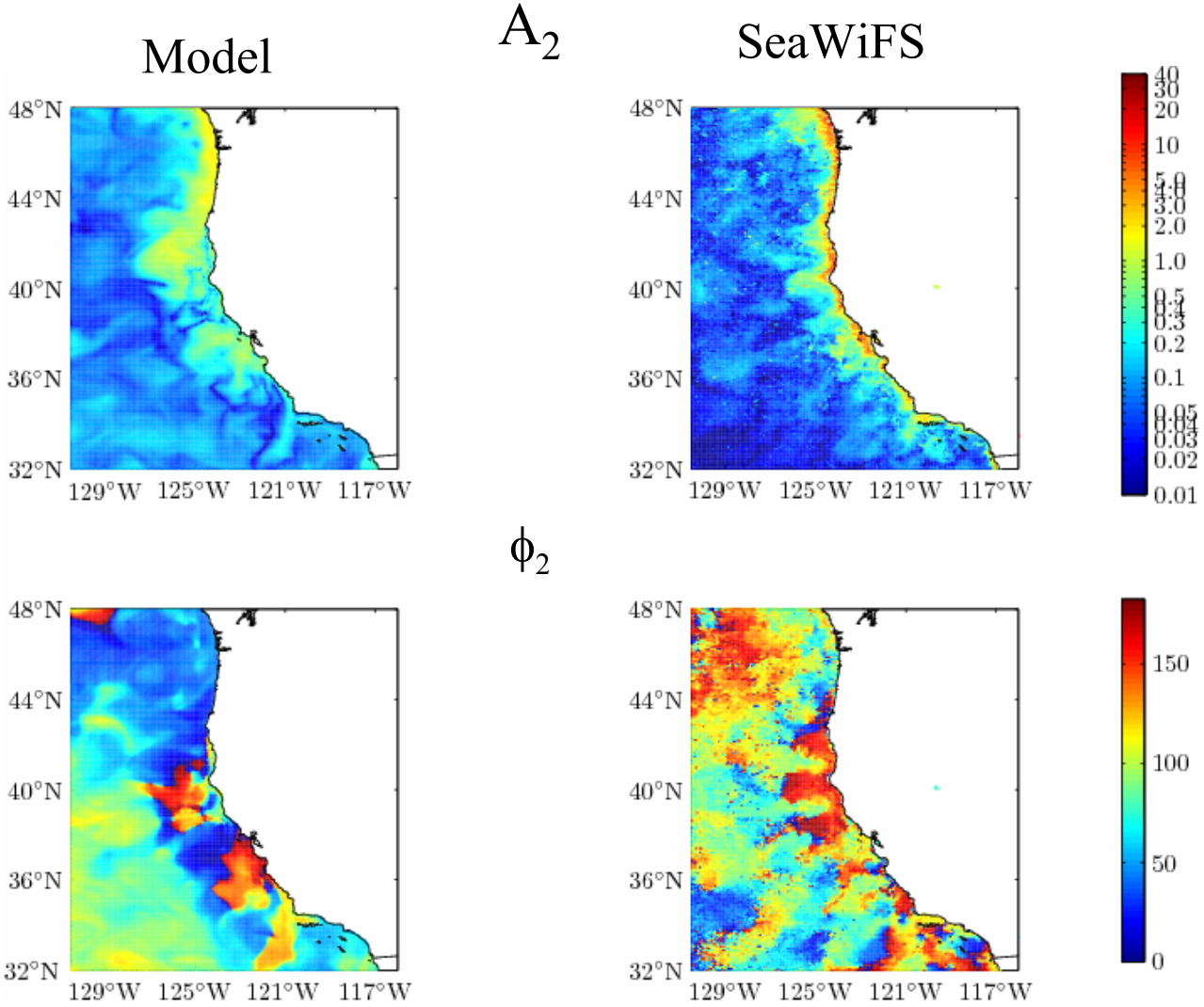
SeaWiFS



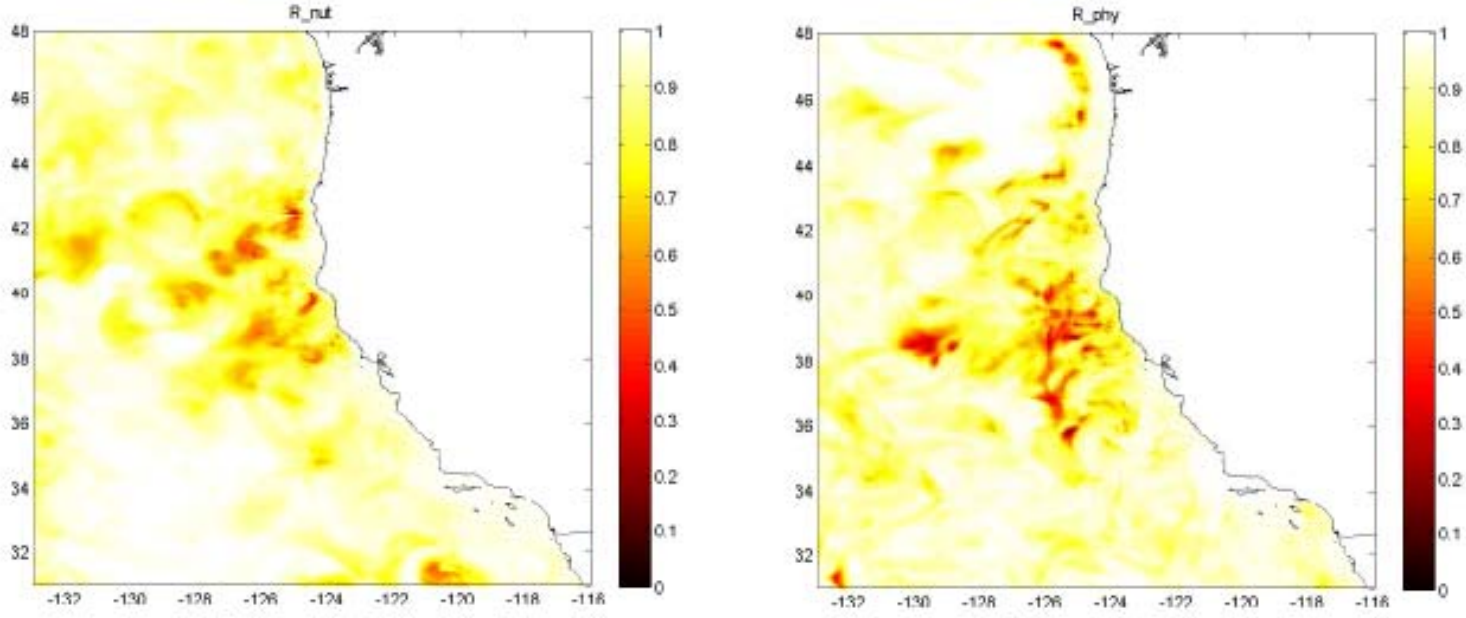
ϕ_1



Semiannual harmonic



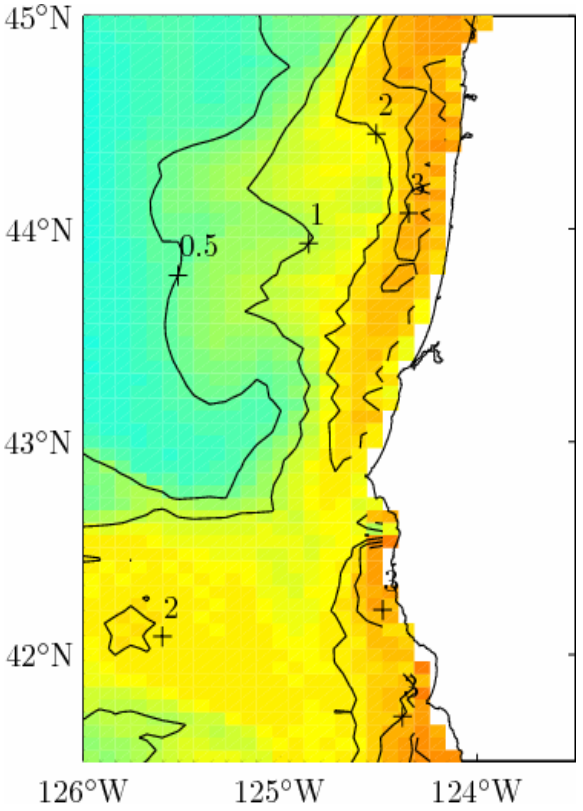
KPP vs MY



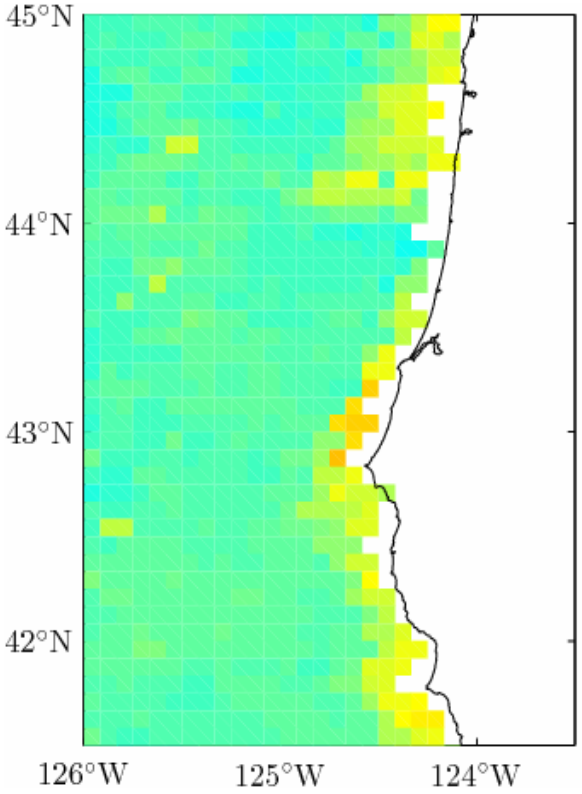
R correlation coef.

Globec Cruises

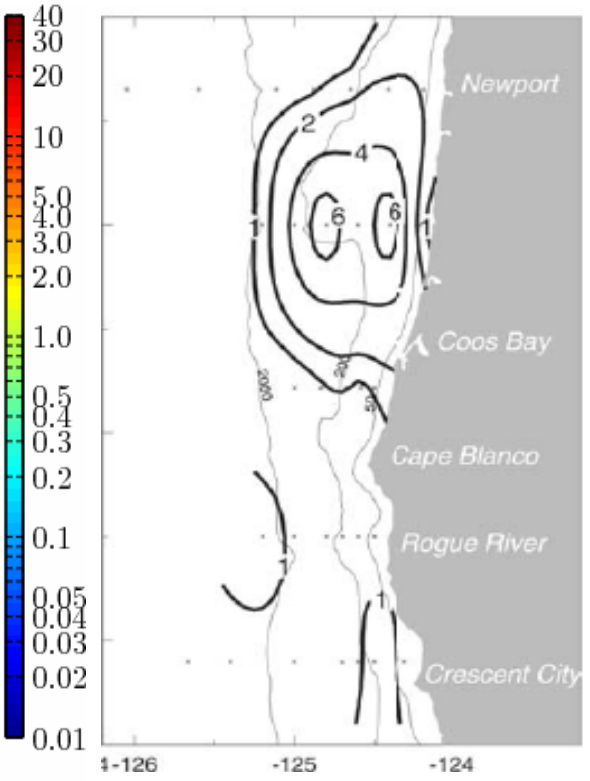
4-10 Sept 2001



Model



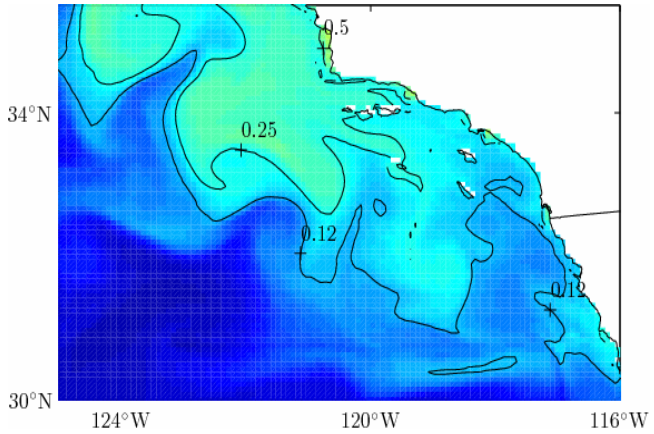
SeaWiFS



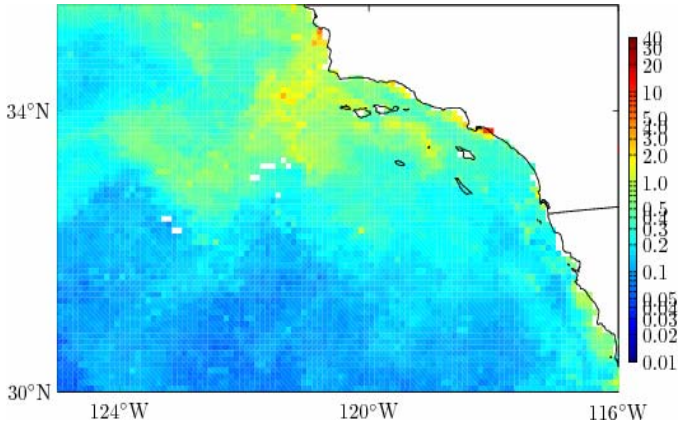
Calcofi Cruises

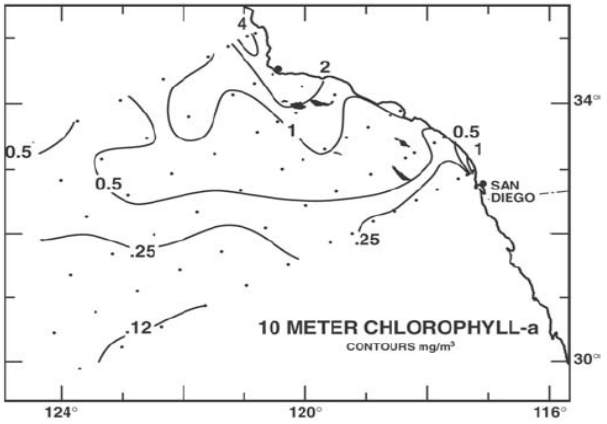
7-26 Jan 2001

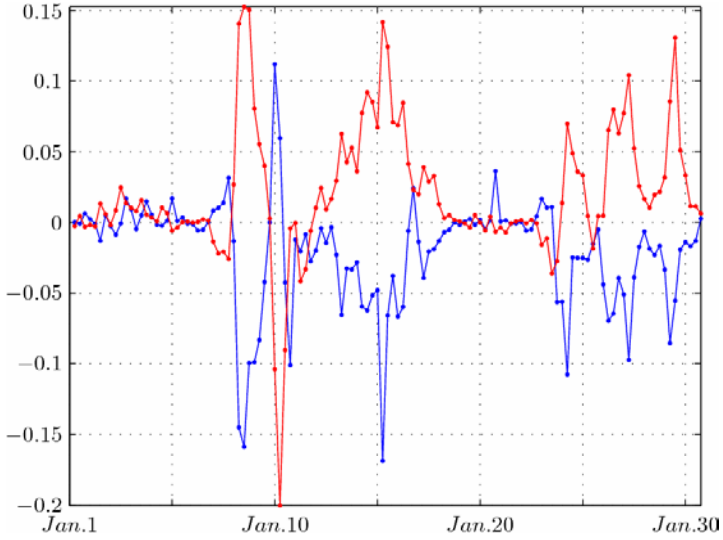
Model



SeaWiFS



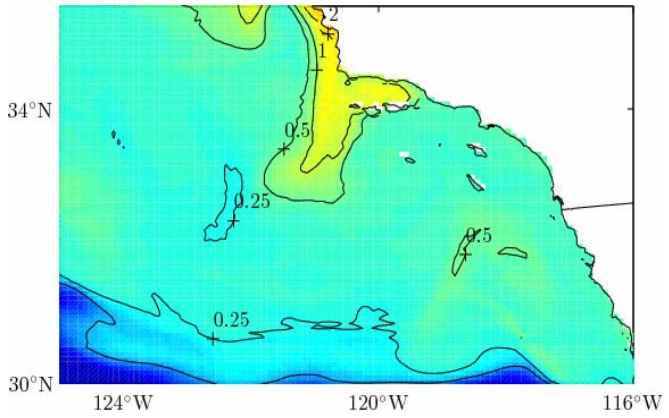




Calcofi Cruises

6 Apr –3 May 2001

Model



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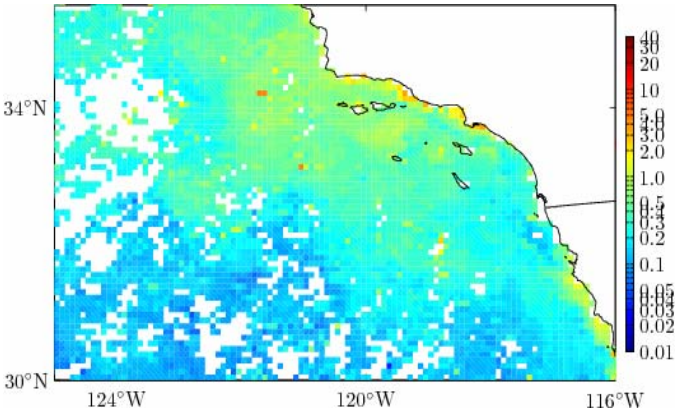
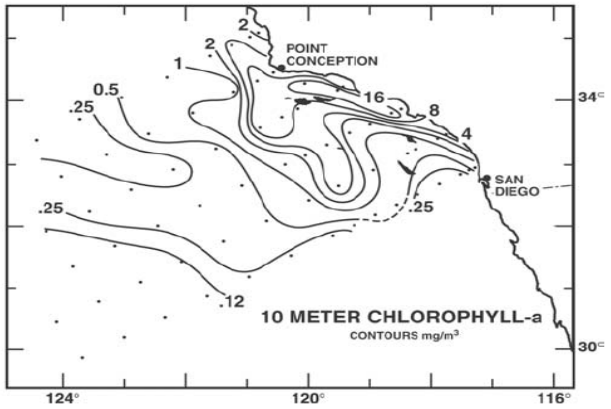
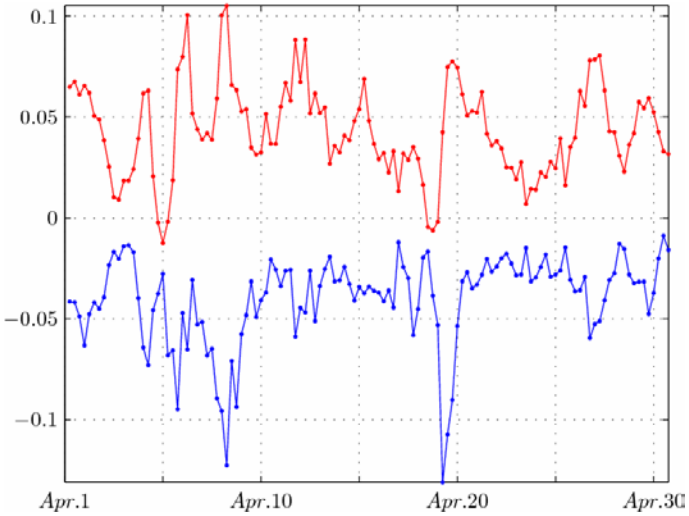
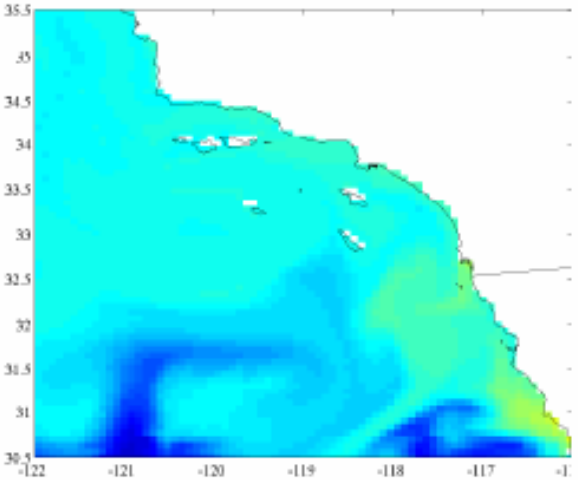




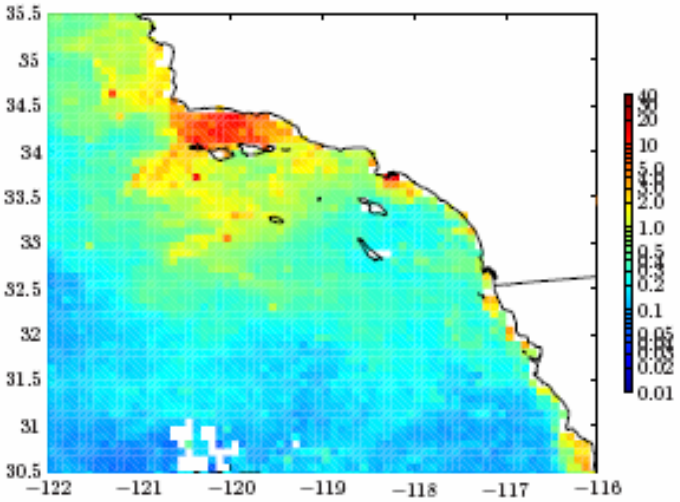


Santa Ana events
week 42

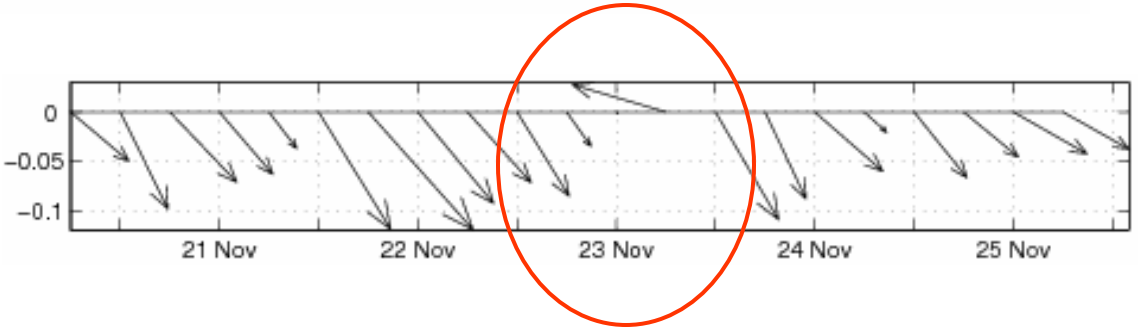
Model

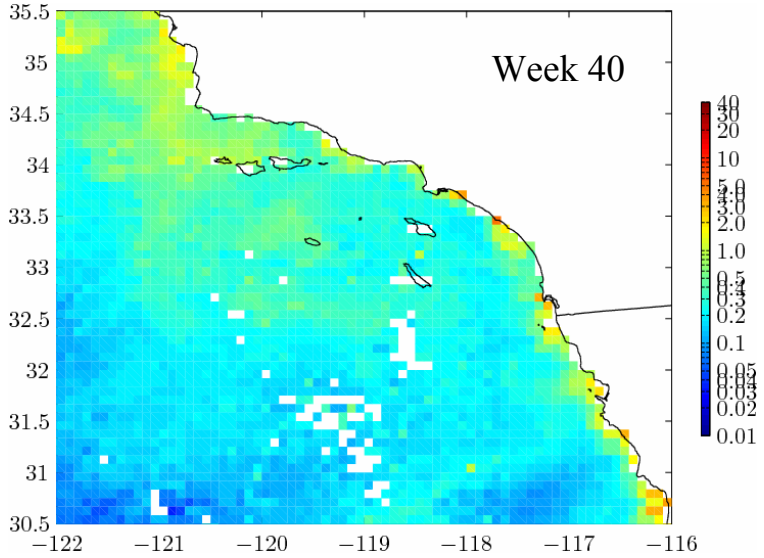


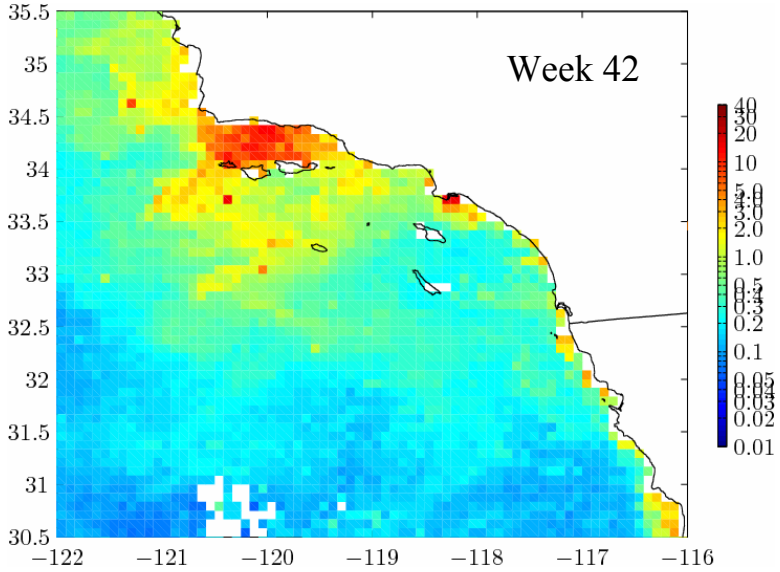
SeaWiFS

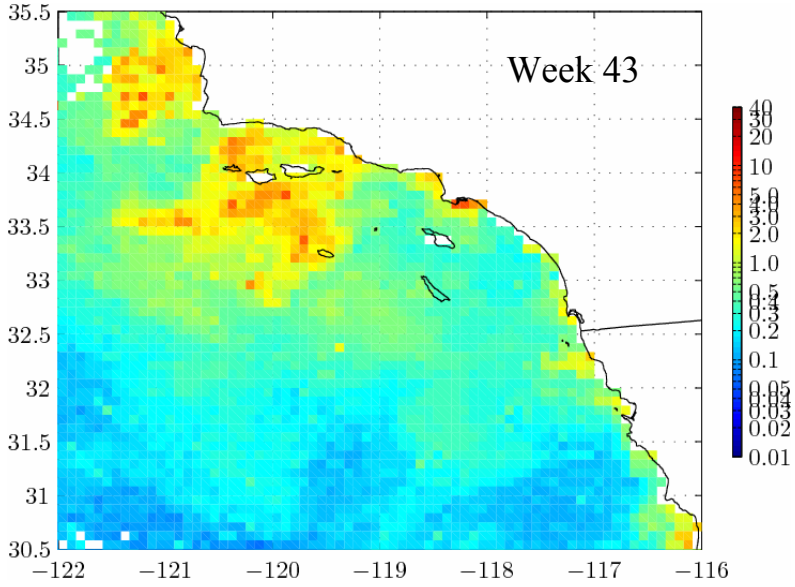


Wind stress

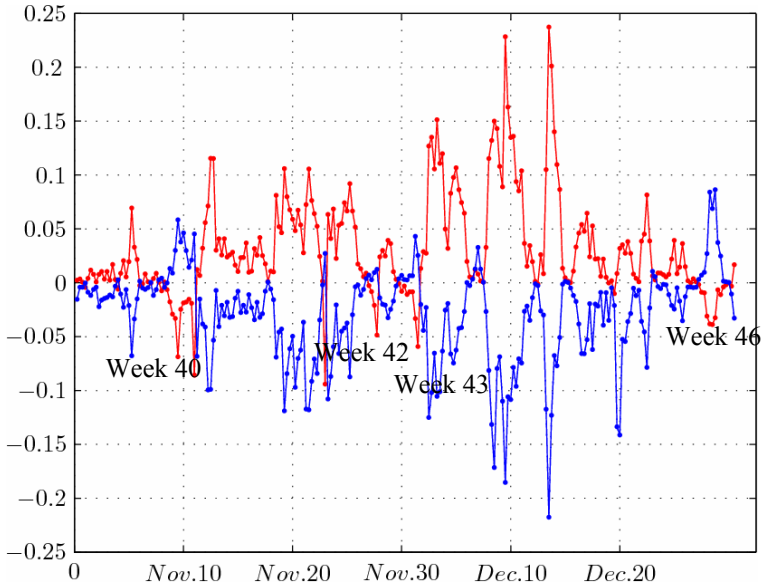








Santa Ana events

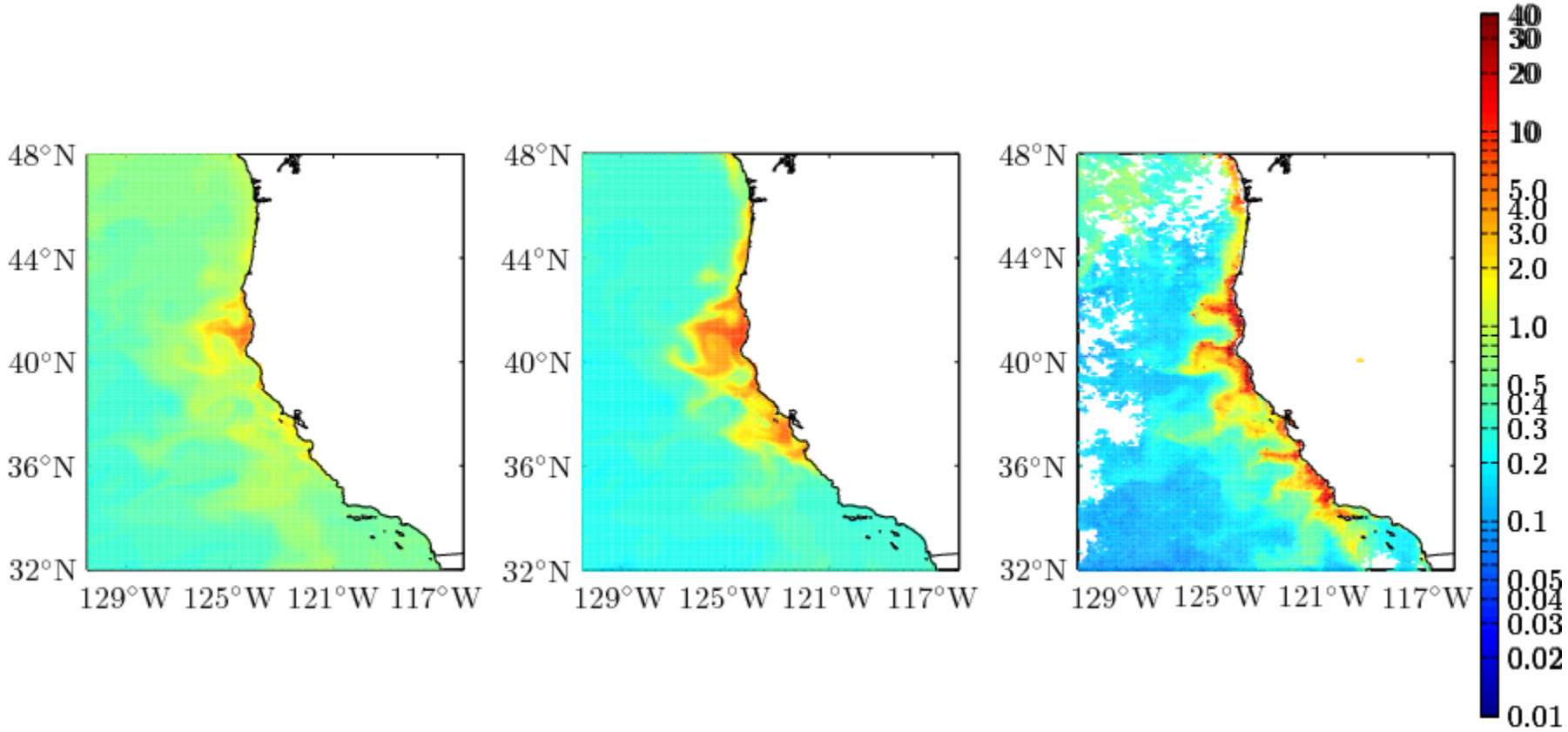


Summary

- 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


48°N
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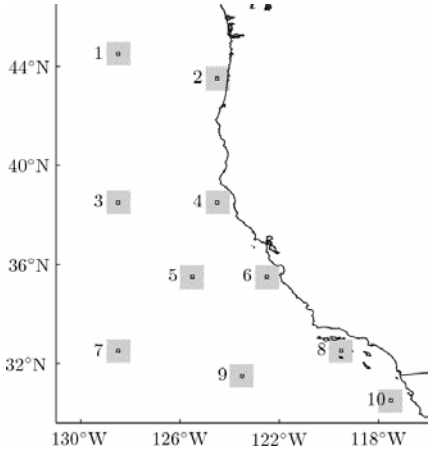
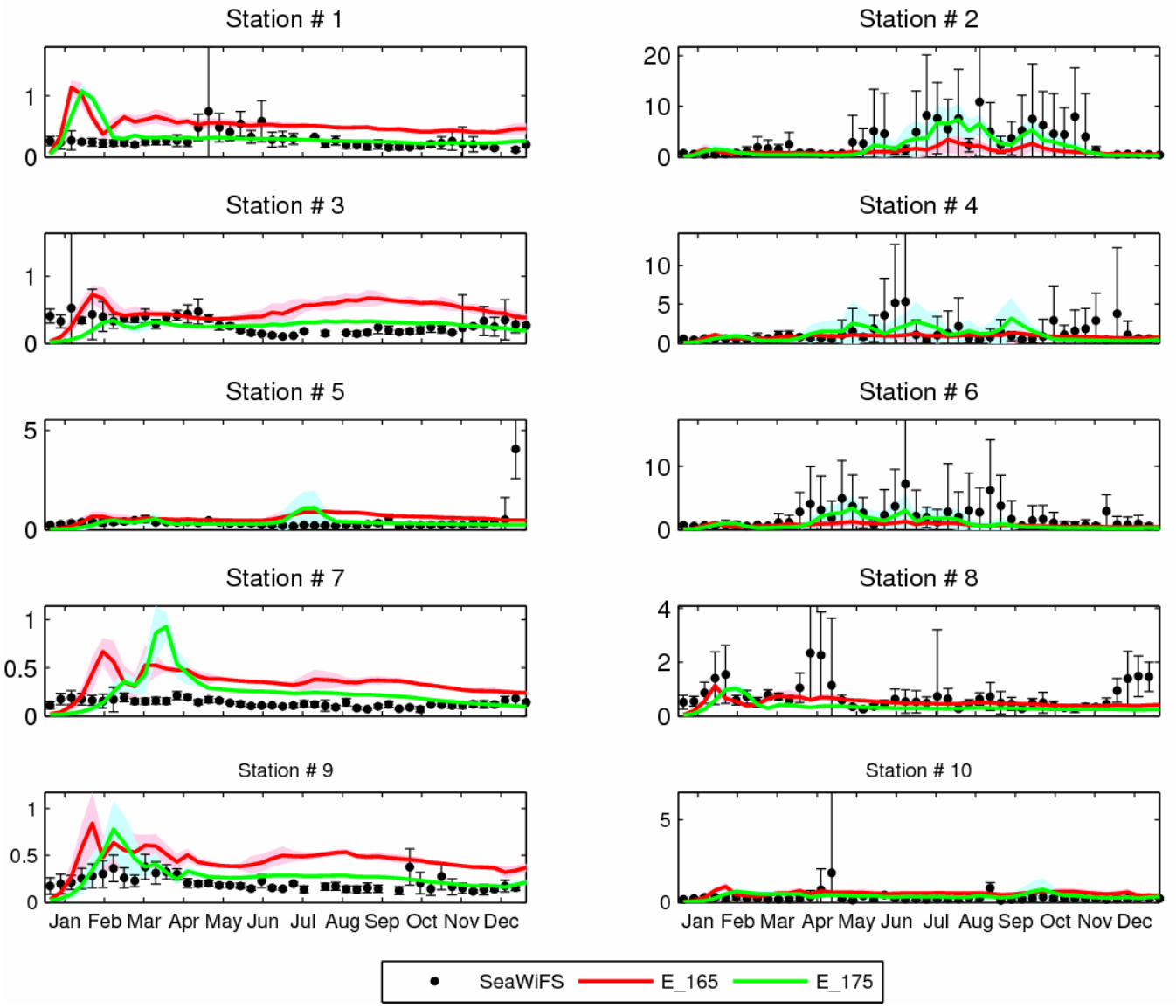
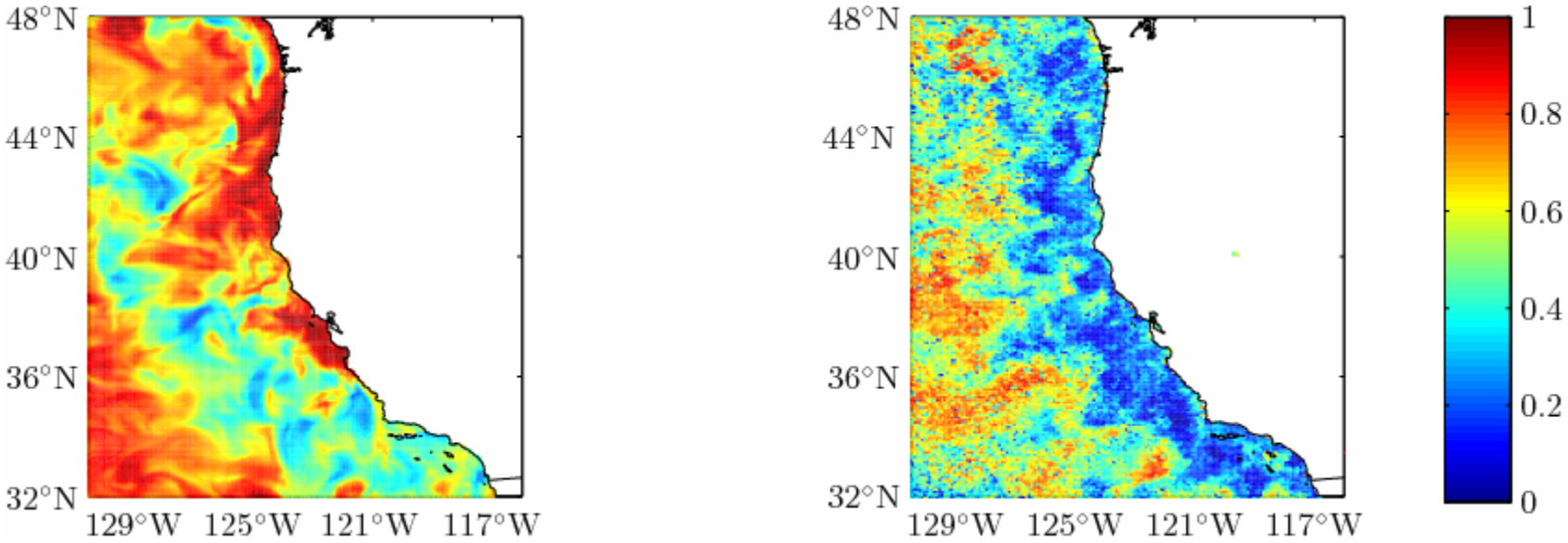
Phytoplankton



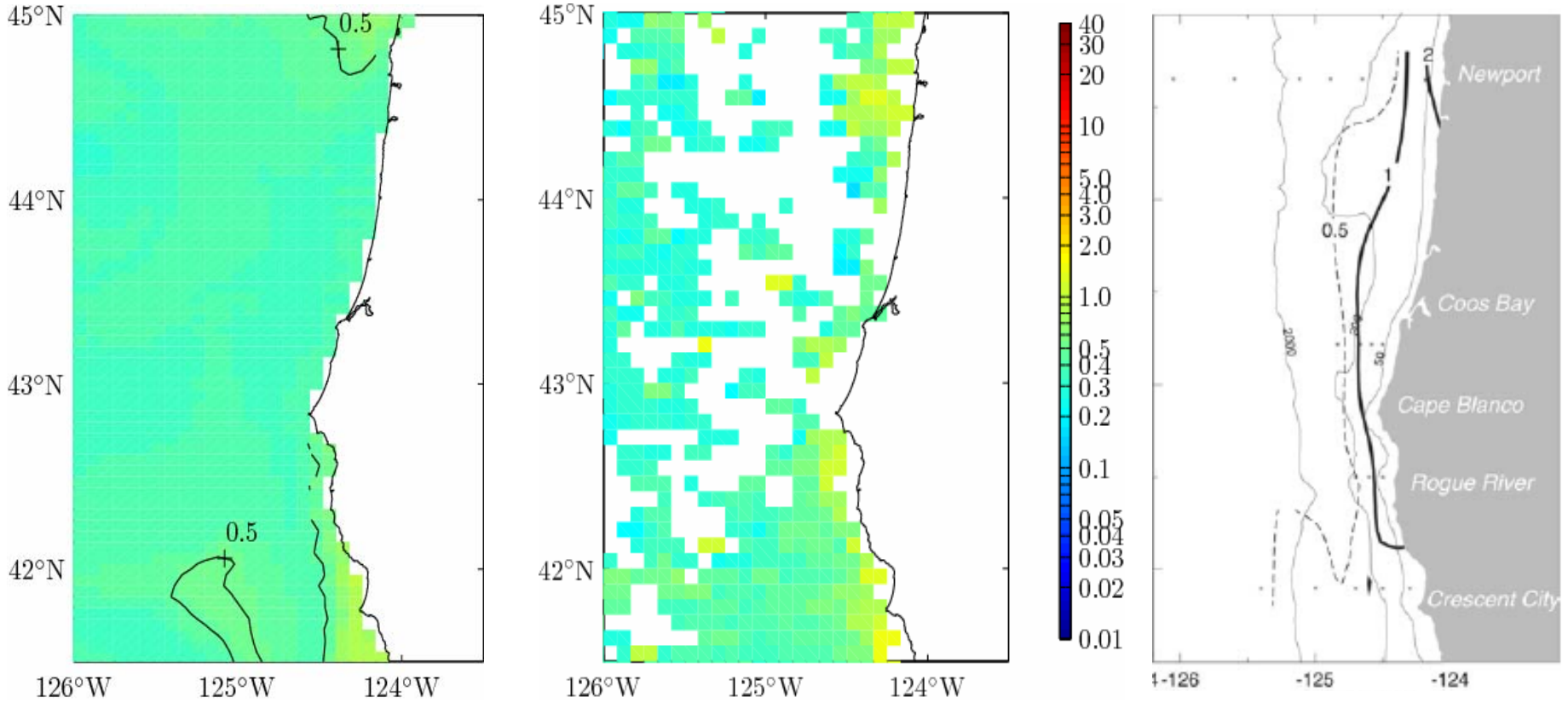


Explained Variance



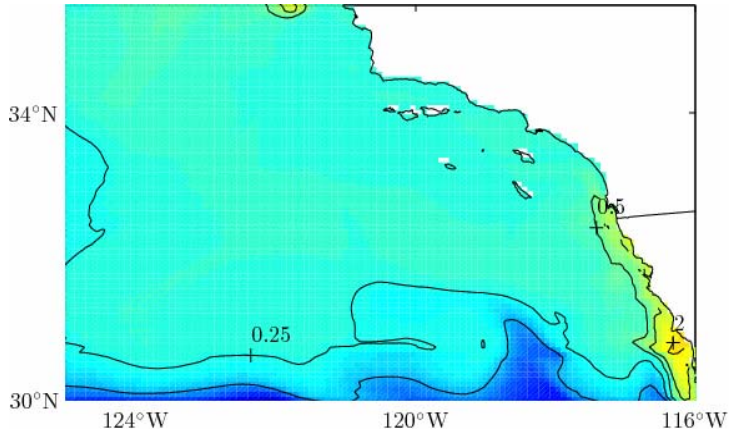
Globec Cruises

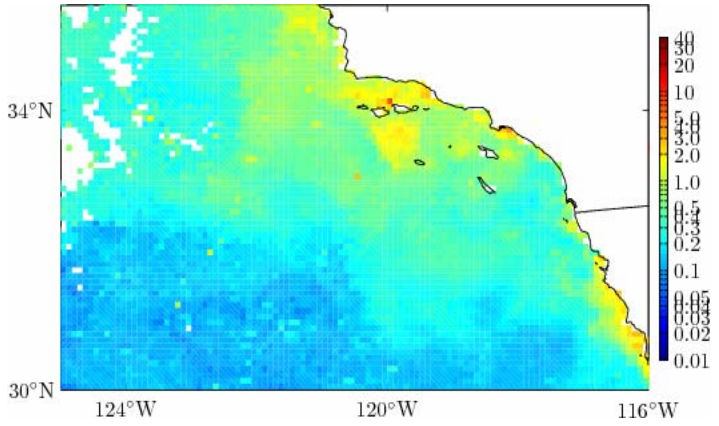
15-24 Mar 2001

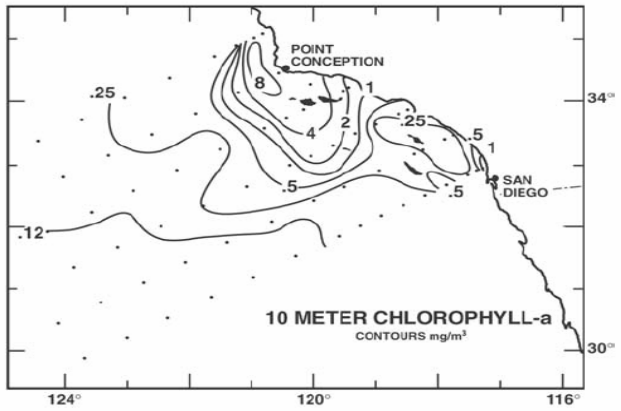


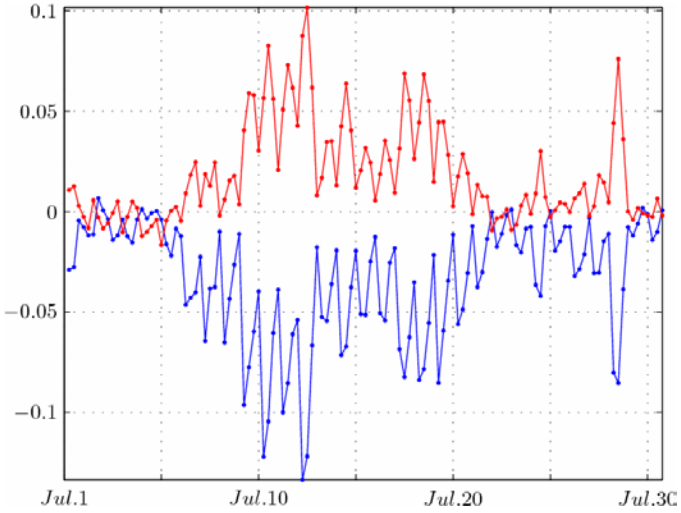
Calcofi Cruises

10-27 Jul 2001









Calcofi Cruises

25 Oct –9 Nov 2001