Phytoplankton composition algorithms for PACE

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Objective:

"Attempt to develop relationships between water leaving radiances and phytoplankton composition using a radiation model, in situ data, and an established global biogeochemical model"

This is achieved by:

1. Use the Ocean-Atmosphere Spectral Irradiance Model (OASIM) to generate water leaving radiances for individual and assemblages of phytoplankton functional groups, as well as other optically active constituents (water, detrital material, CDOM, and particulate inorganic carbon)
2. Use in situ phytoplankton composition data to develop an algorithm(s) and derive bias and uncertainty statistics
3. Use the NOBM to simulate a real environment, validate the algorithm and assess bias and uncertainty quantitatively

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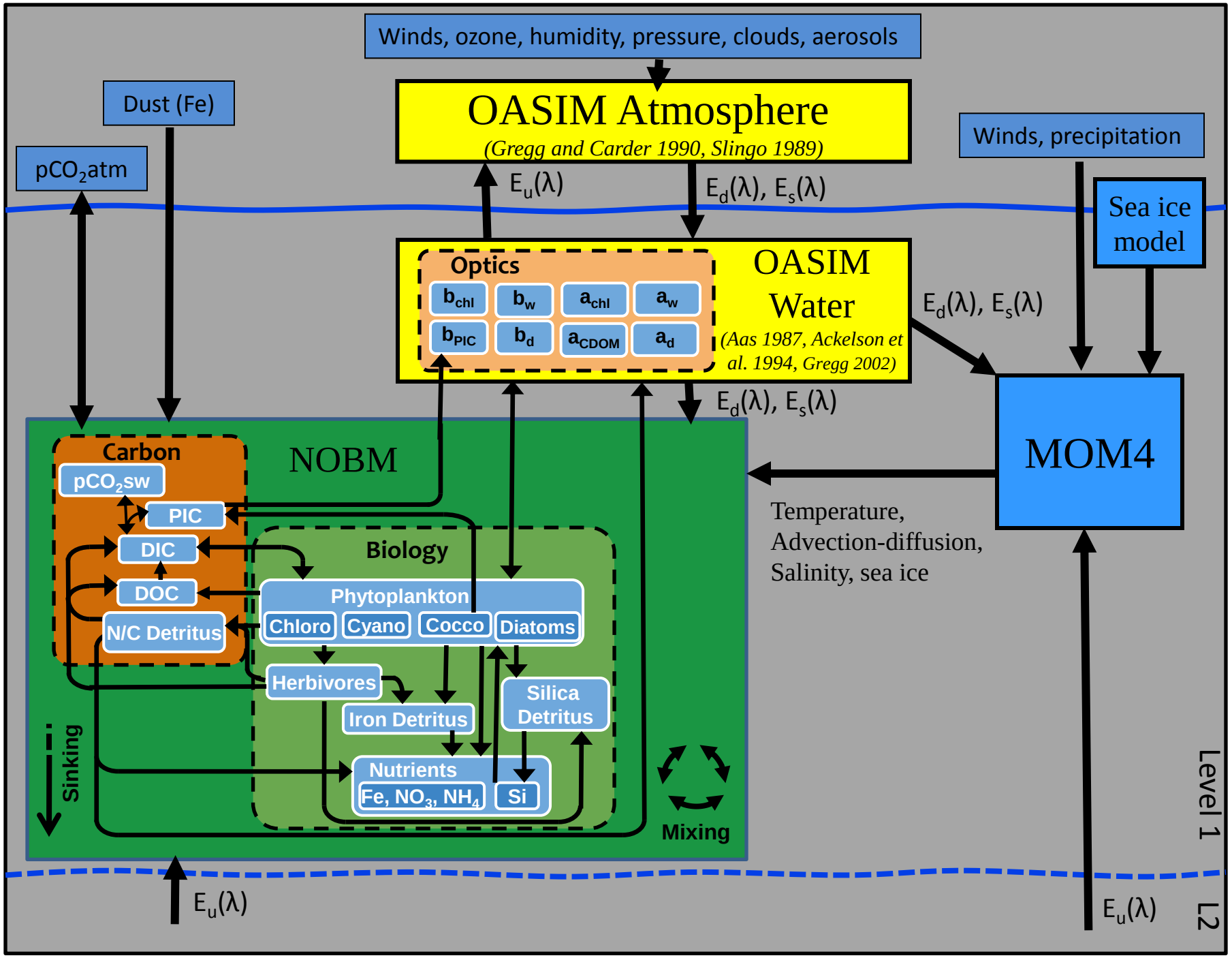
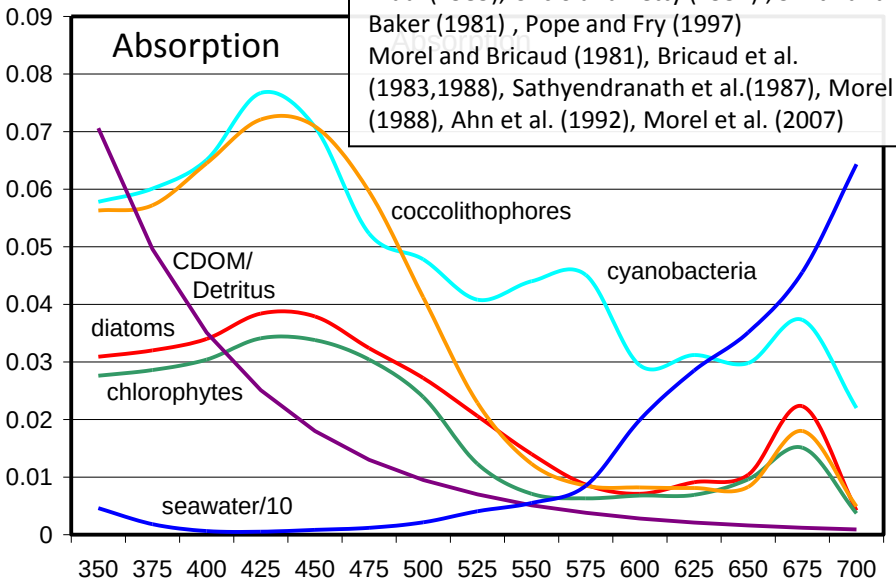
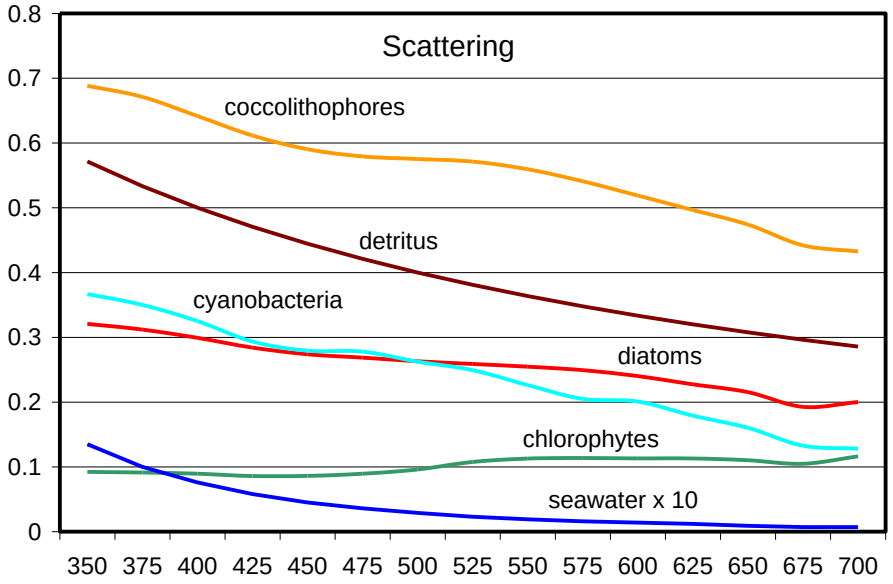
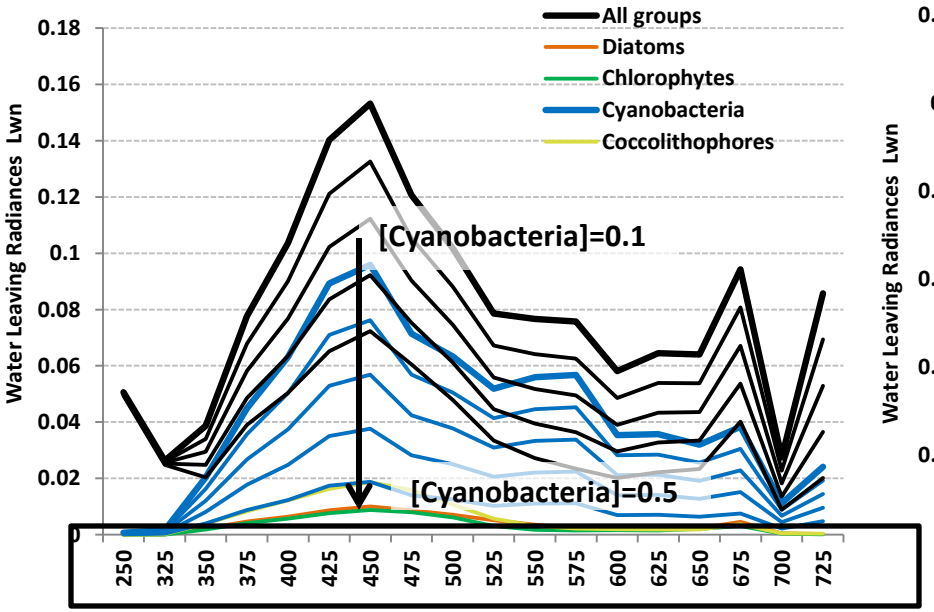
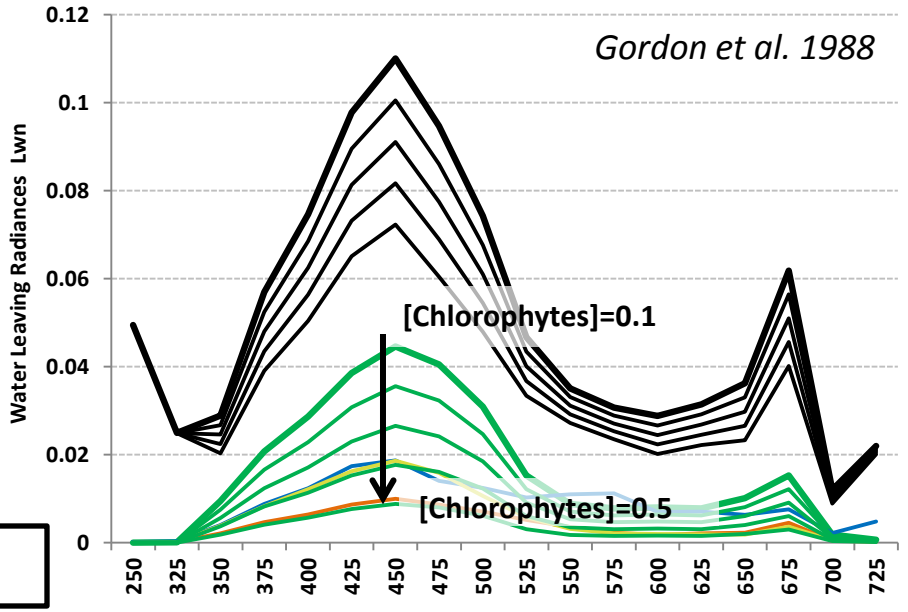

Winds, ozone, humidity, pressure, clouds, aerosols
OASIM Atmosphere
(Gregg and Carder 1990, Slingo 1989)
Dust (Fe)
pCO2atm
Winds, precipitation
Sea ice model
Eu(λ)
Ed(λ), Es(λ)
Optics
bchl
bw
achl
aw
bPIC
bd
aCDOM
ad
OASIM Water
(Aas 1987, Ackelson et al. 1994, Gregg 2002)
Ed(λ), Es(λ)
Ed(λ), Es(λ)
MOM4
NOBM
Carbon
pCO2sw
PIC
DIC
DOC
N/C Detritus
Biology
Phytoplankton
Chloro
Cyano
Cocco
Diatoms
Herbivores
Iron Detritus
Silica Detritus
Nutrients
Fe, NO3, NH4
Si
Sinking
Mixing
Temperature,
Advection-diffusion,
Salinity, sea ice
Eu(λ)
Eu(λ)
Level 1
L2

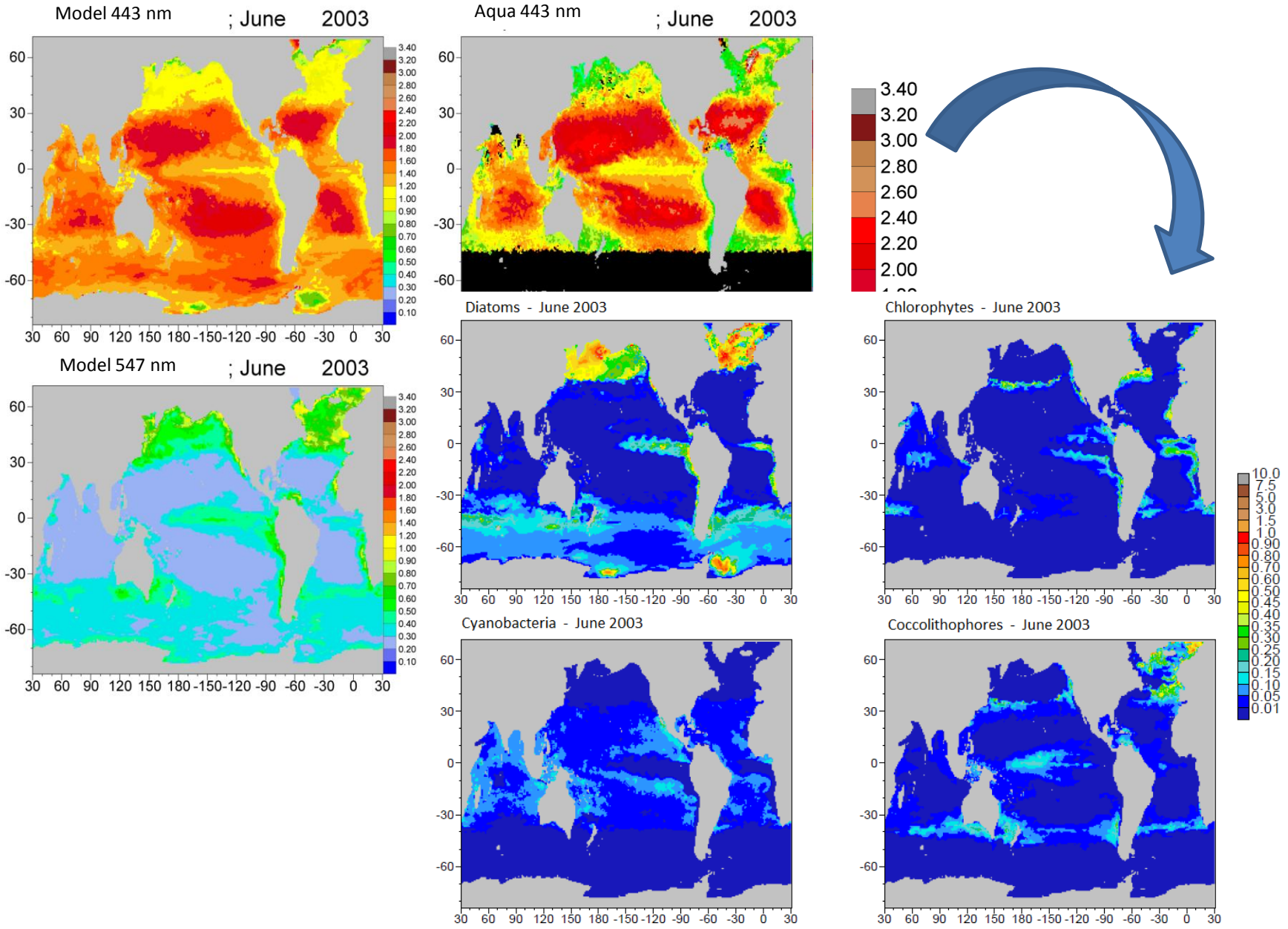
Data for a's and b_b's:
Maul (1985), Circio and Petty (1951) , Smith and Baker (1981) , Pope and Fry (1997)
Morel and Bricaud (1981), Bricaud et al. (1983,1988), Sathyendranath et al.(1987), Morel (1988), Ahn et al. (1992), Morel et al. (2007)










Model 443 nm ; June 2003
Aqua 443 nm ; June 2003
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
Model 547 nm ; June 2003
Diatoms - June 2003
Chlorophytes - June 2003
Cyanobacteria - June 2003
Coccolithophores - June 2003
10.0
7.5
5.0
3.0
1.5
1.0
0.90
0.80
0.70
0.60
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.01

Connection to the rest of the team:

- Data on optical properties of phytoplankton, CDOM, detritus, PIC to further improve OASIM
- Validate Rrs with Rrs from the field
- Test algorithm using NOBM which will provide hyperspectral water leaving radiance similar to what PACE will observe
- Use the NOBM/OASIM models to test different band aggregation strategies