Ocean Ecosystem-Biogeochemistry

Recent Advances:

-model-data evaluation protocols (beginning to build ocean version of C-LAMP) (Doney et al., JMS, in press; Doney et al., DSR II, in press)

-new continental shelf iron source (Moore & Braucher, Biogeosciences, 2008)

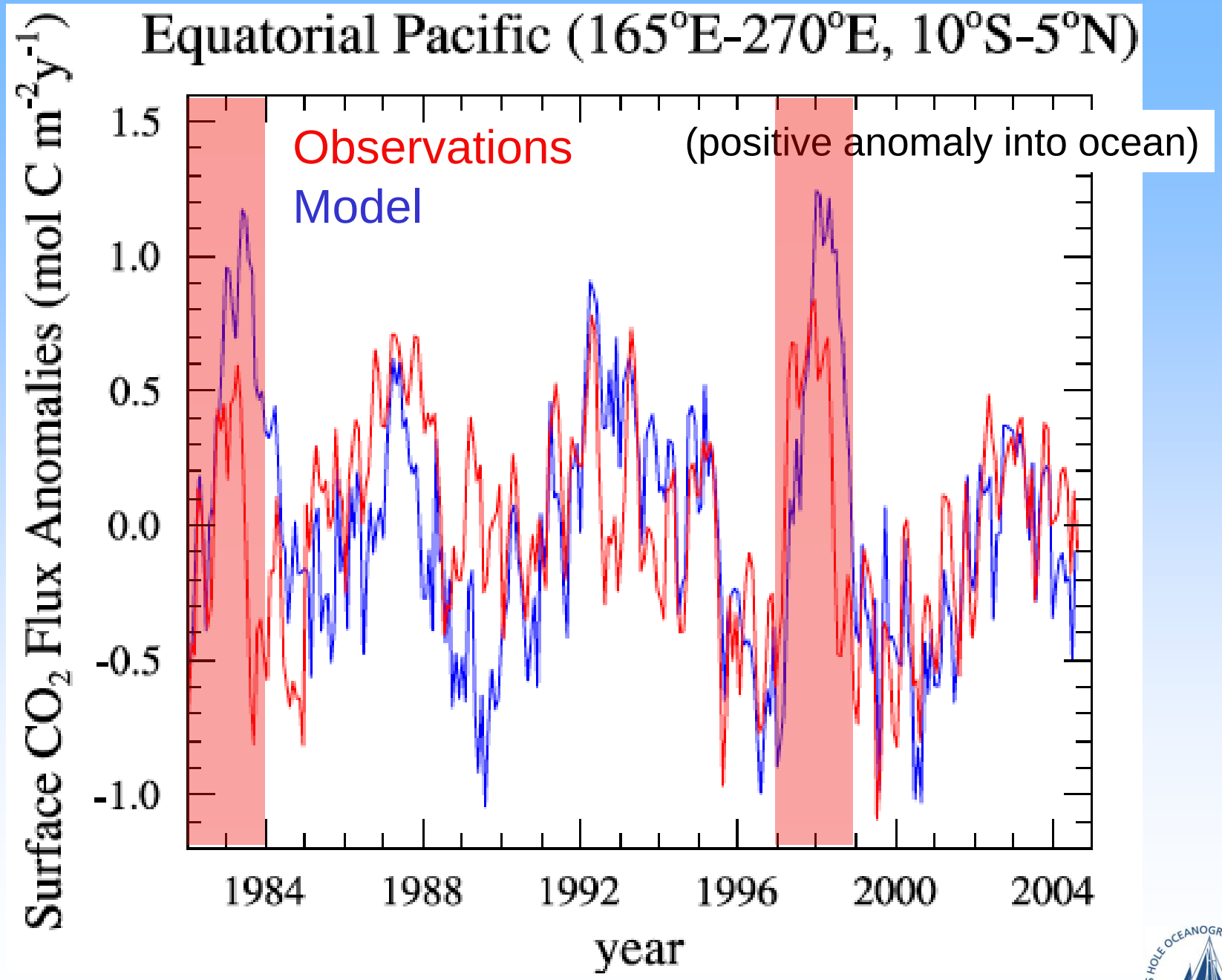
Current Status:

-known biases in ecosystem-biogeochemistry module (e.g., low NH summer biomass & productivity)

-mixed layer depth biases

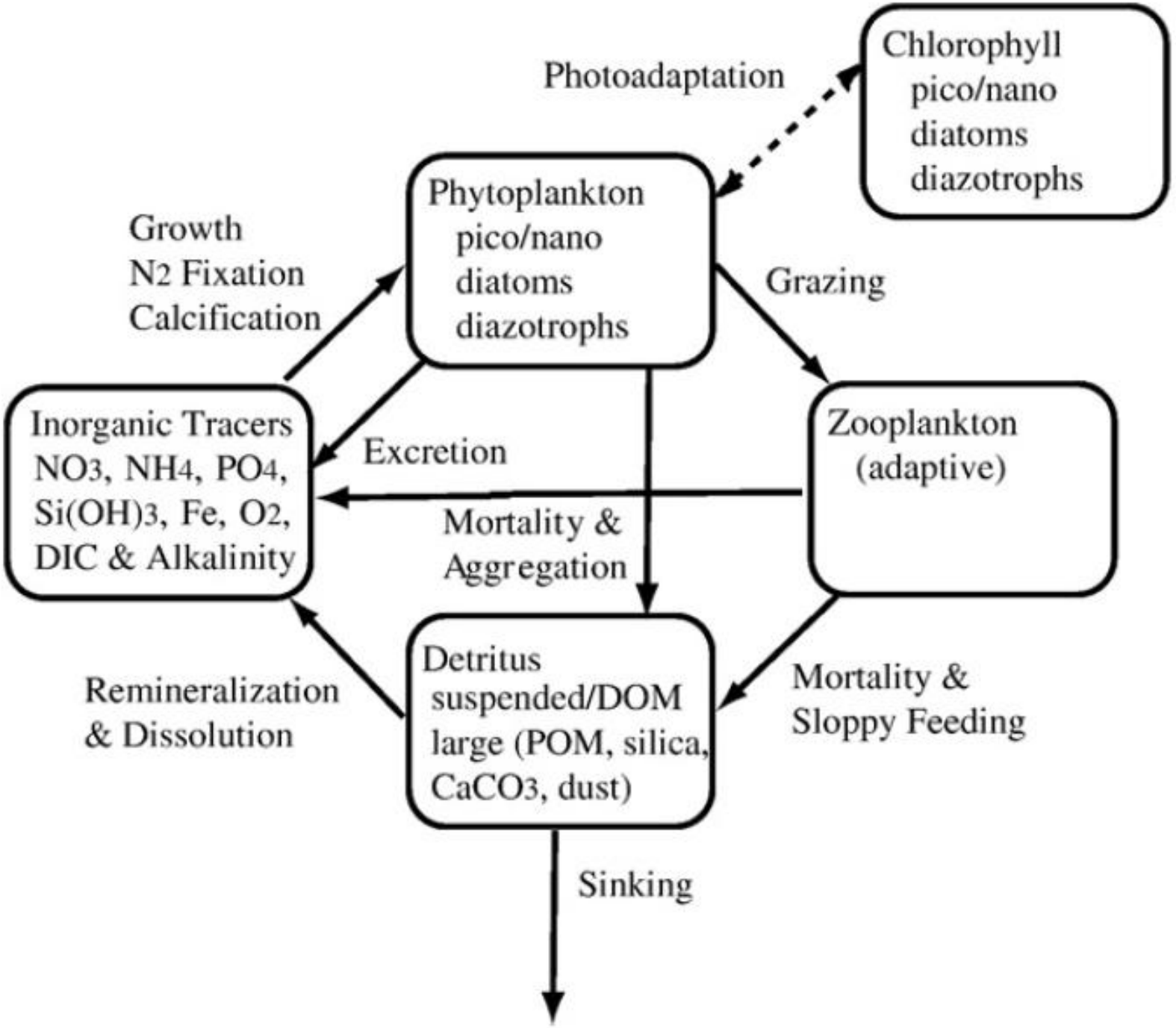
-coupled ocean-atm. model has weak SH ventilation and low anthropogenic CO_2 uptake

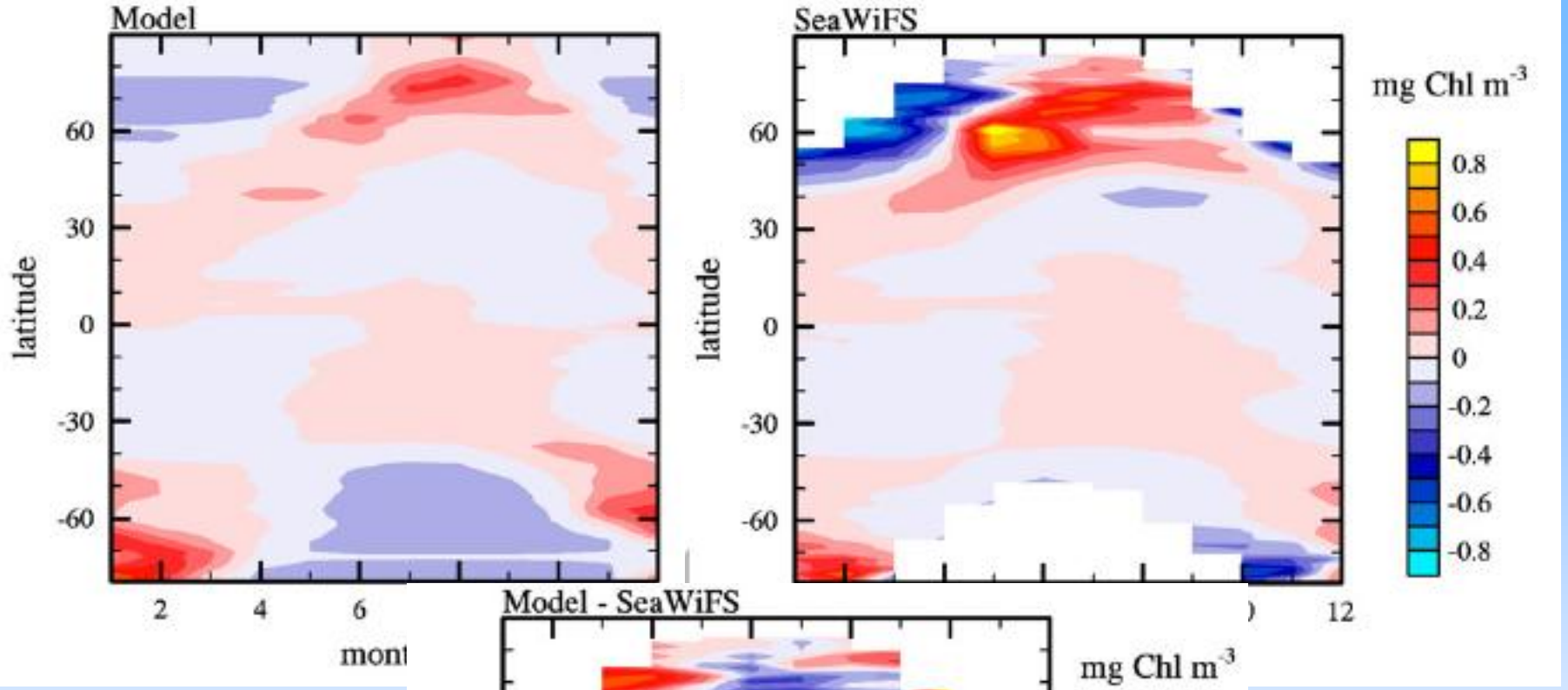
-major issue for coupled spin-up is the slow equilibration time-scale for ocean CO_2 system

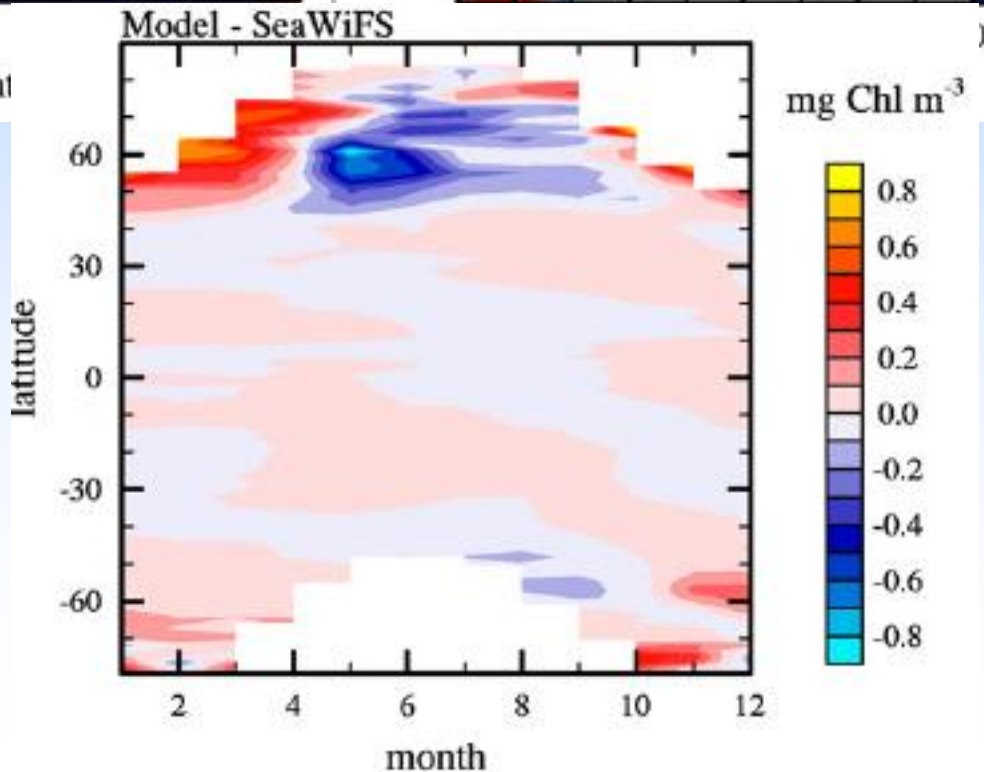


Doney et al. DSR II, in press

WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930


Photoadaptation
Chlorophyll
pico/nano
diatoms
diazotrophs
Phytoplankton
pico/nano
diatoms
diazotrophs
Growth
N2 Fixation
Calcification
Grazing
Inorganic Tracers
NO3, NH4, PO4,
Si(OH)3, Fe, O2,
DIC & Alkalinity
Excretion
Zooplankton
(adaptive)
Mortality &
Aggregation
Detritus
suspended/DOM
large (POM, silica,
CaCO3, dust)
Remineralization
& Dissolution
Mortality &
Sloppy Feeding
Sinking





Zonal Average Anomalies Surface Chlorophyll

Doney et al. JMS, in press

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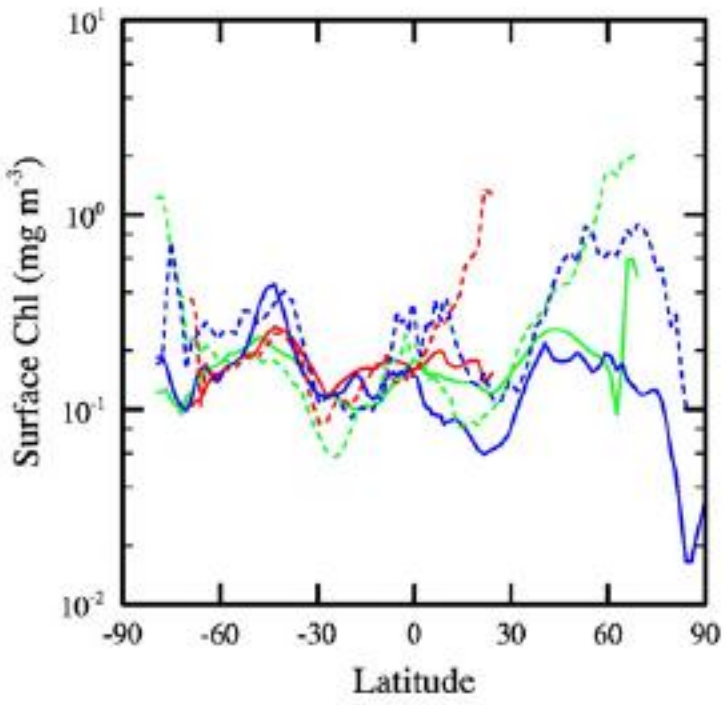
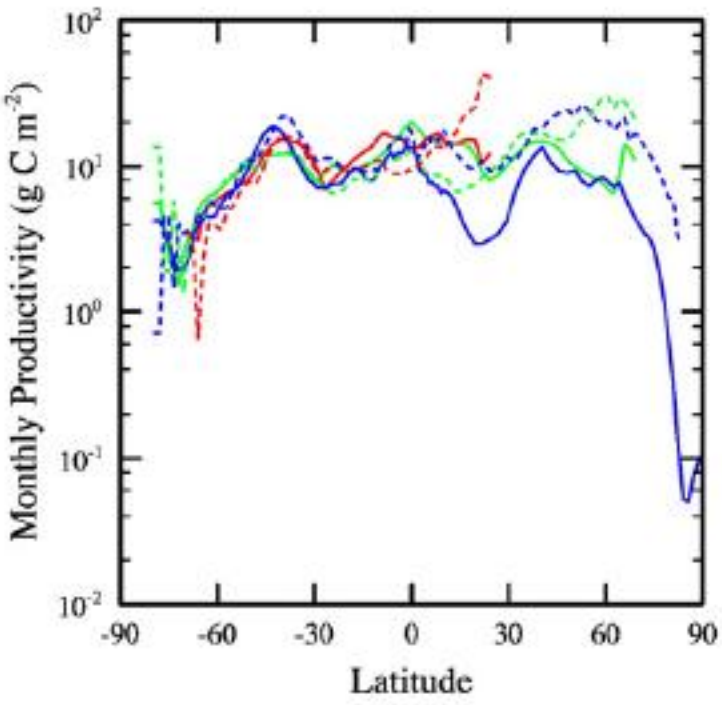
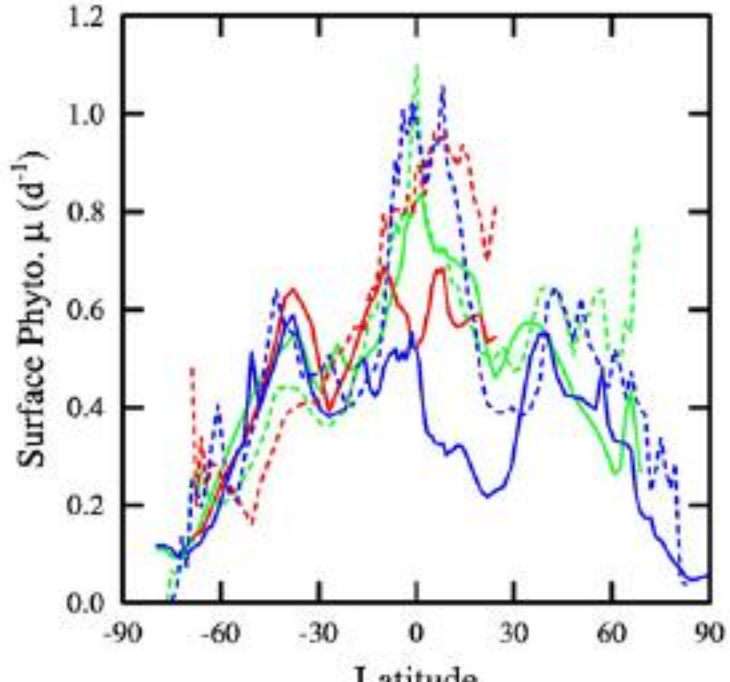
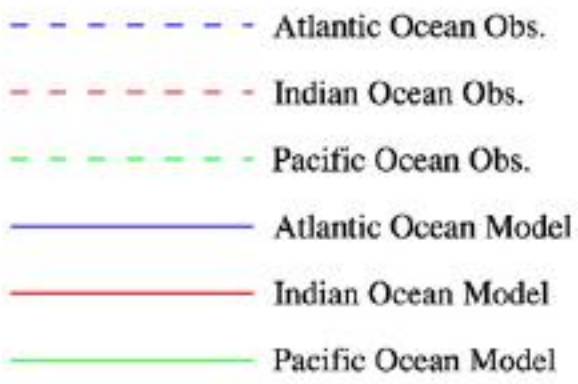
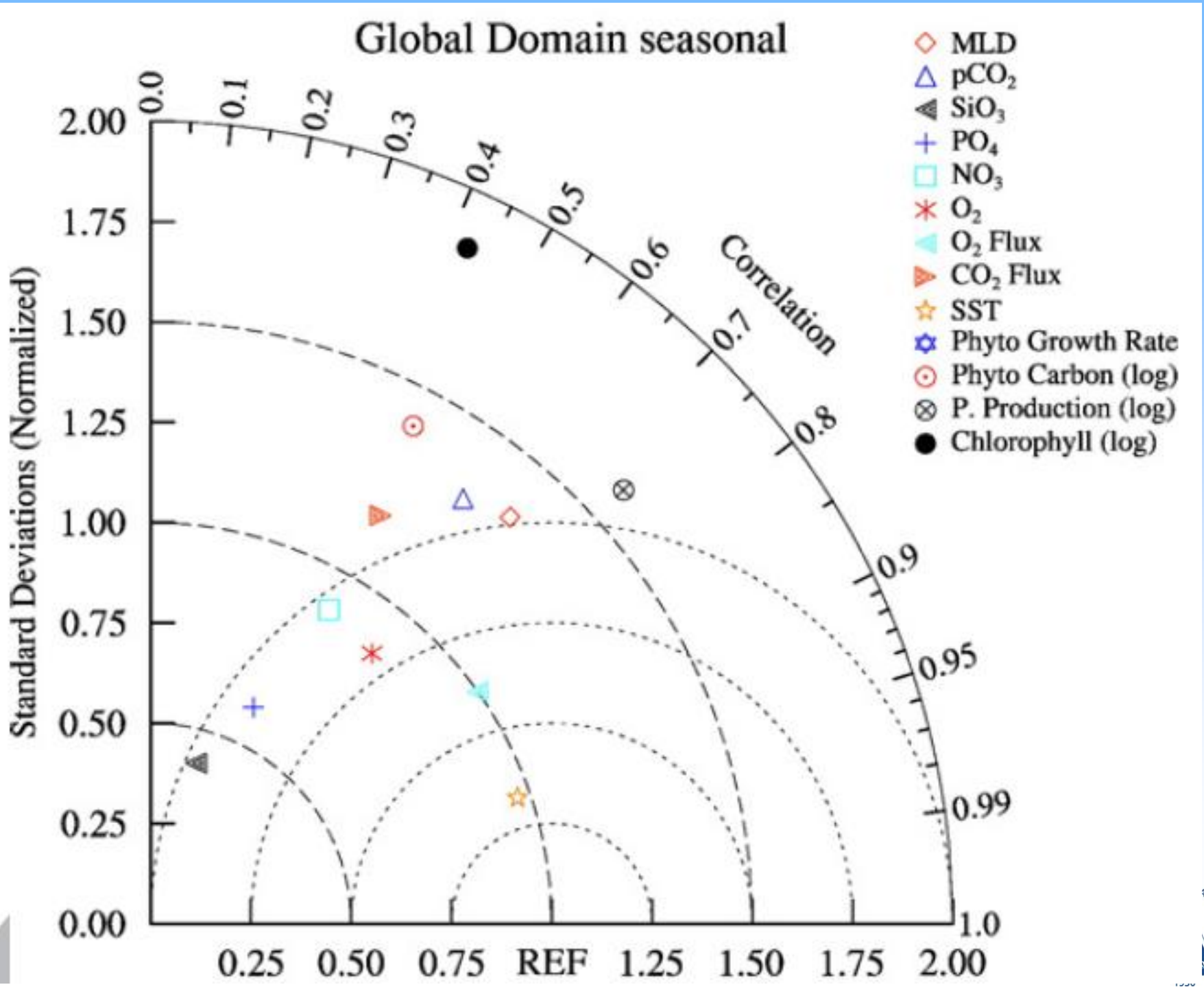


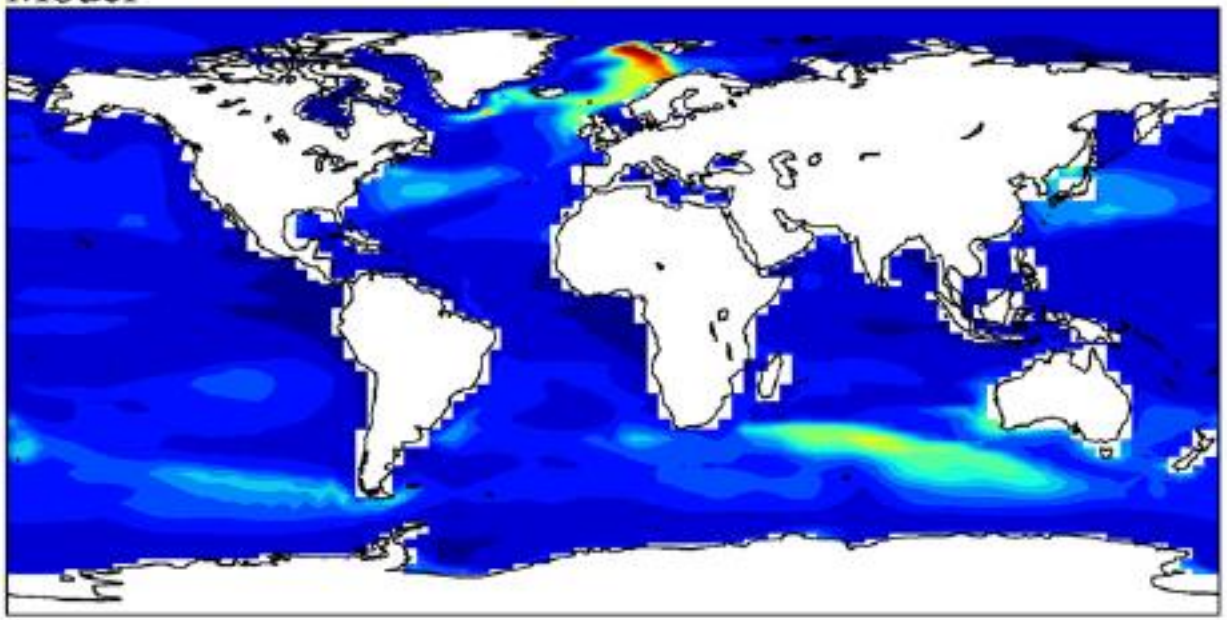


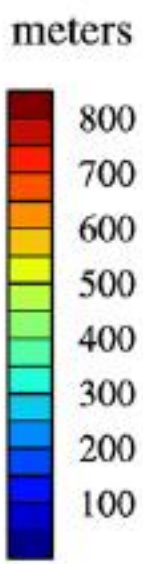




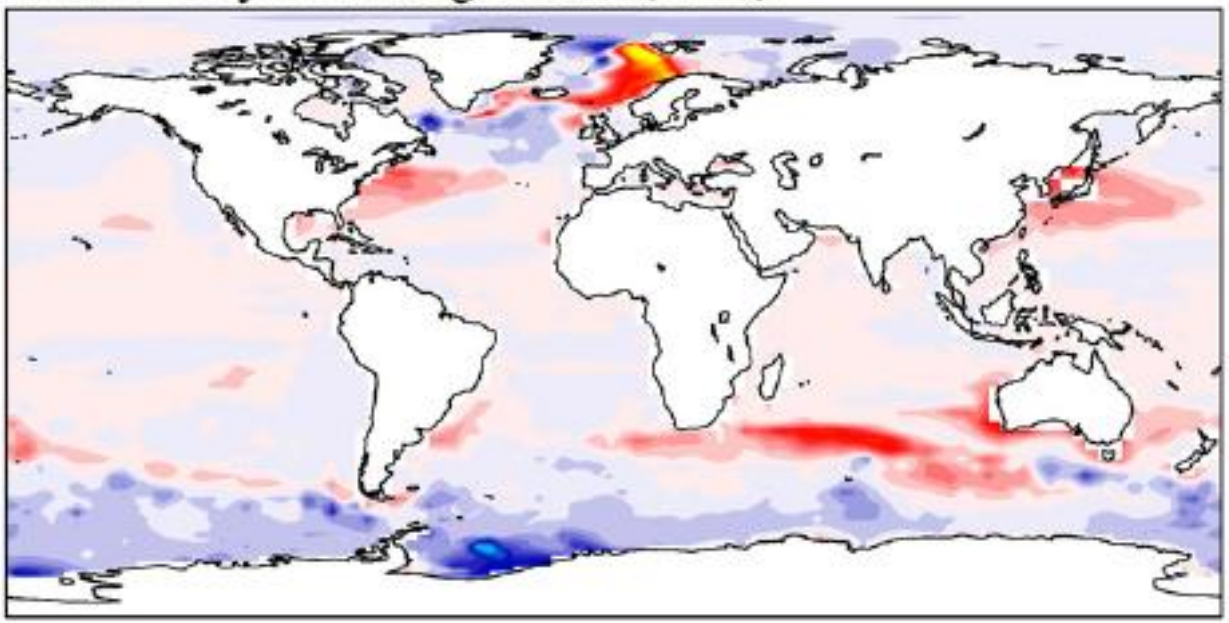

Global Domain seasonal
Standard Deviations (Normalized)
Correlation
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95
0.99
1.0
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
REF
1.25
1.50
1.75
2.00
MLD
pCO2
SiO3
PO4
NO3
O2
O2 Flux
CO2 Flux
SST
Phyto Growth Rate
Phyto Carbon (log)
P. Production (log)
Chlorophyll (log)

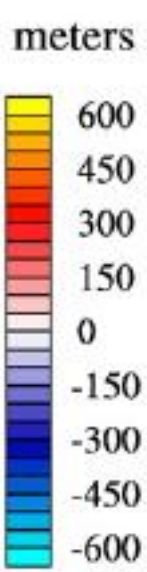
Model

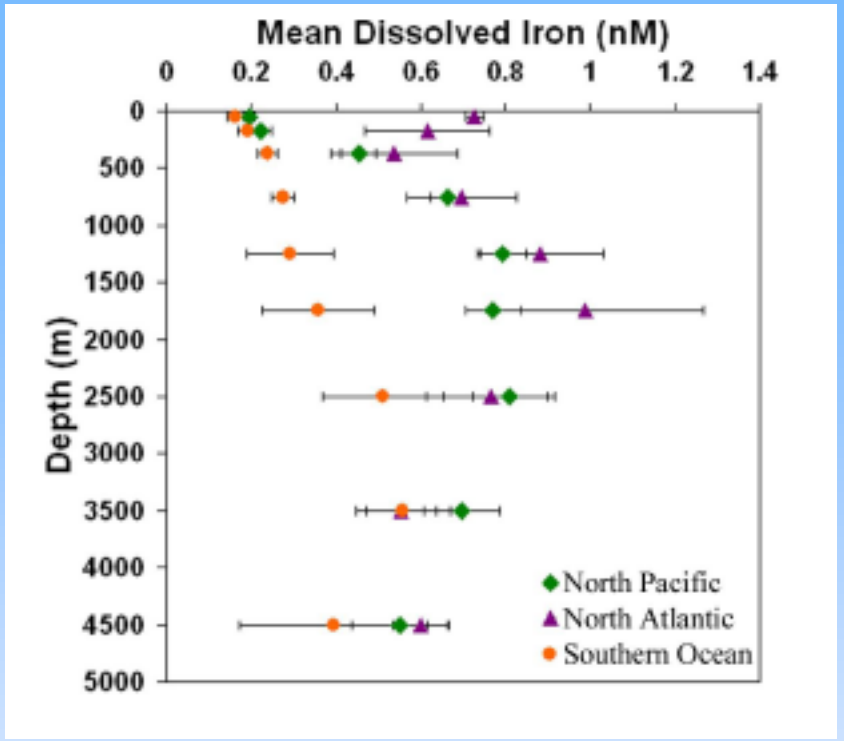


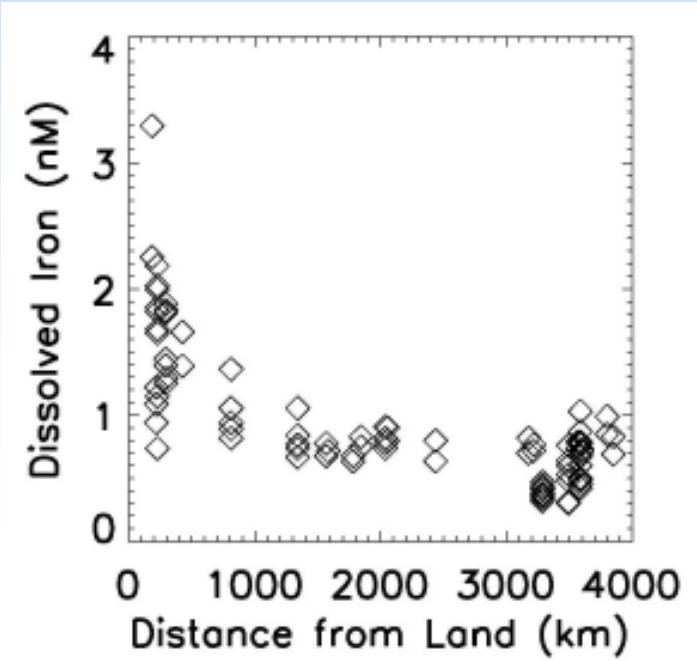


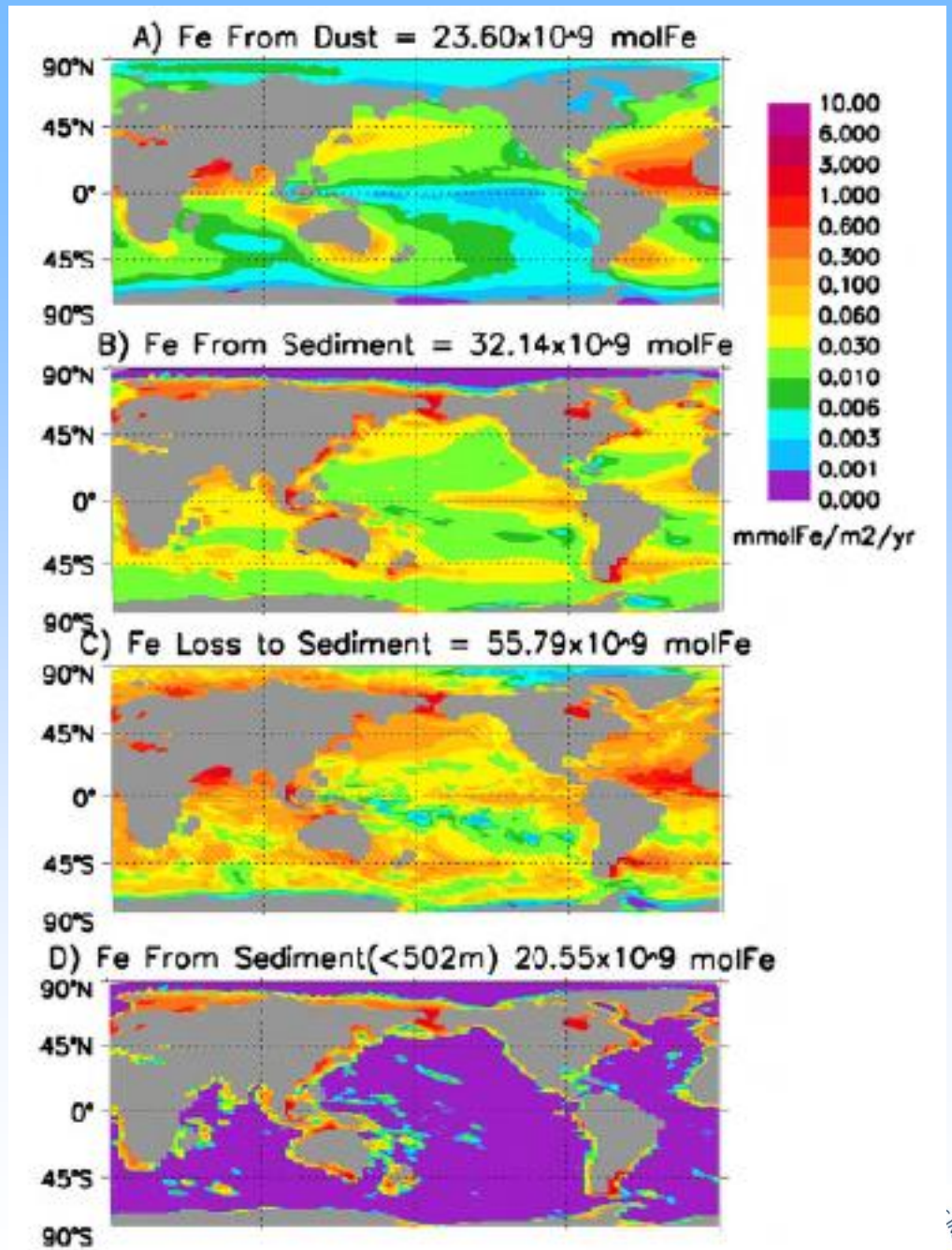
Model - Boyer-Montegut et al. (2004)



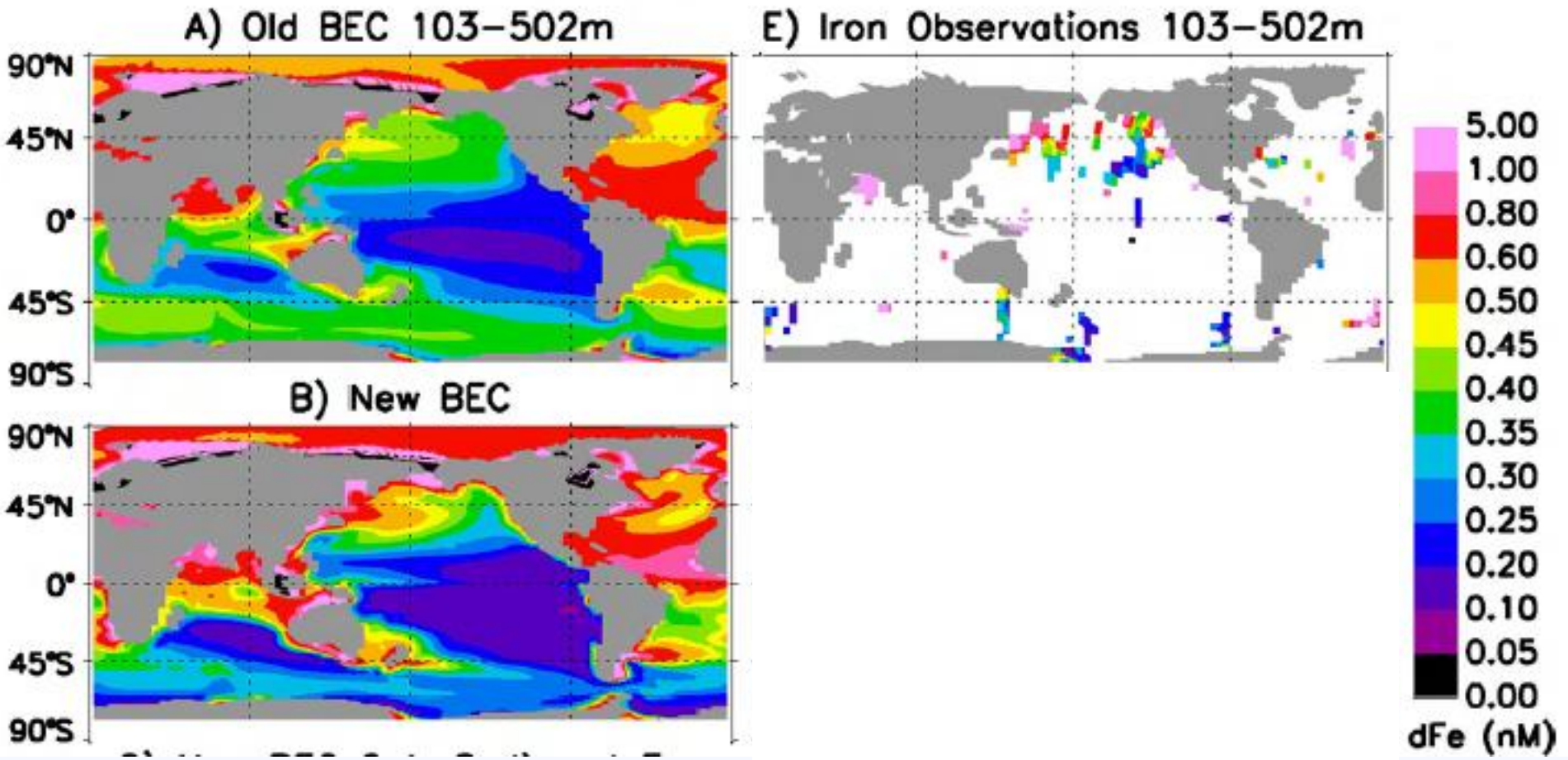


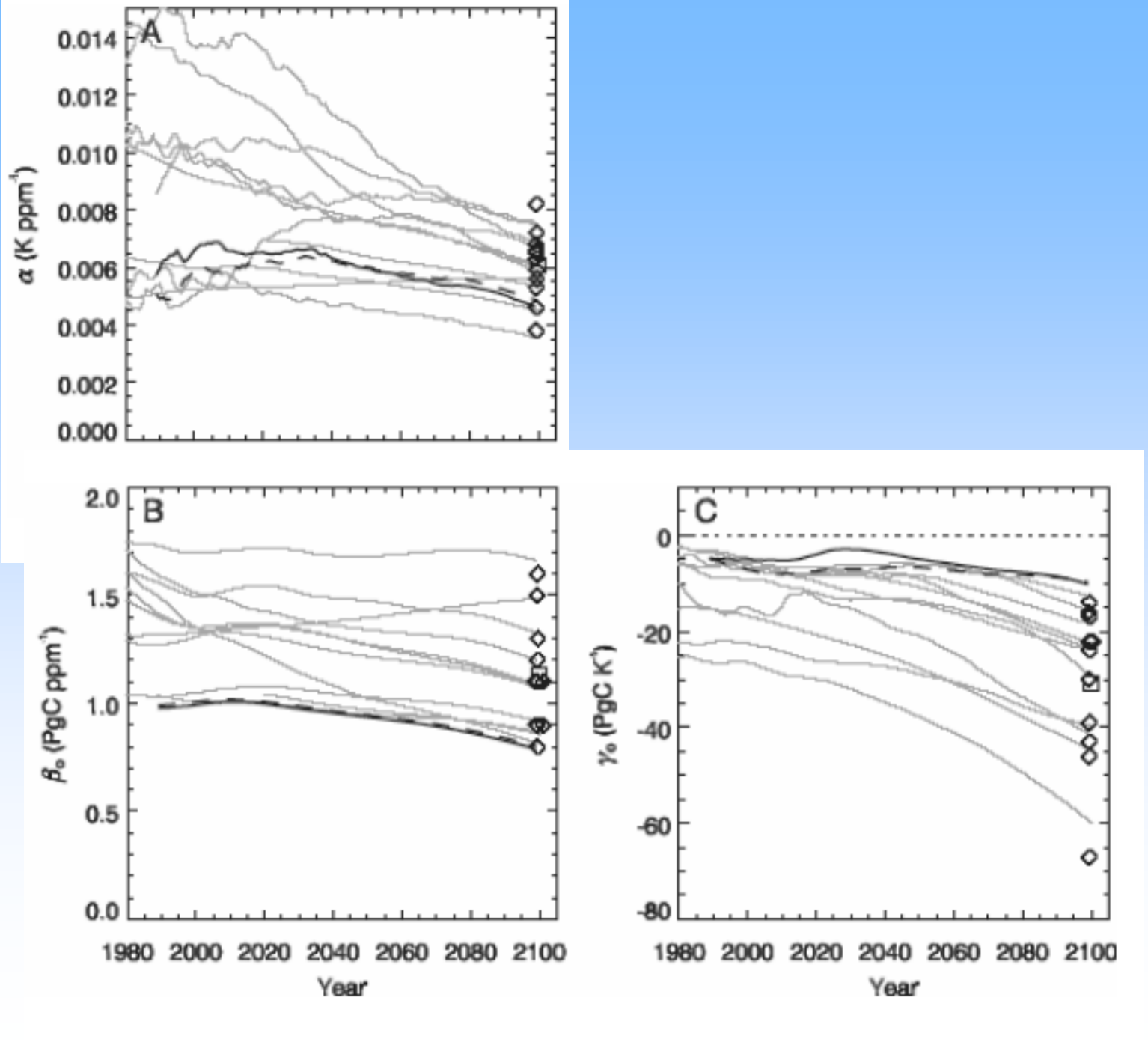


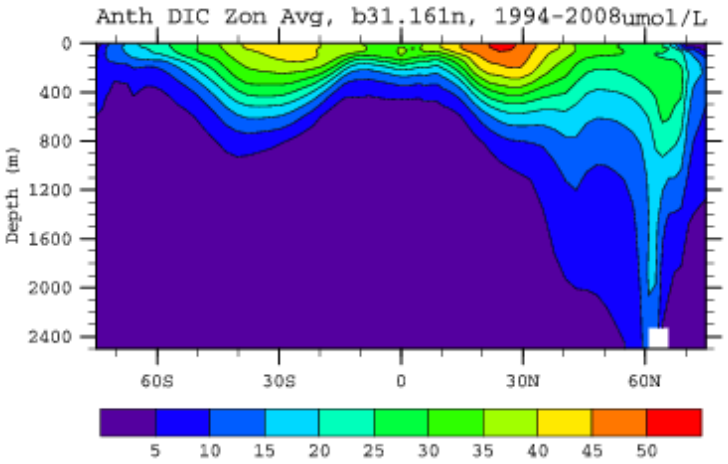


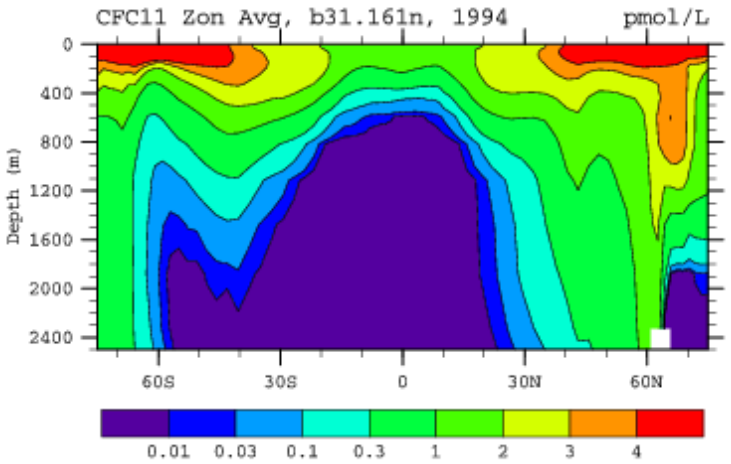


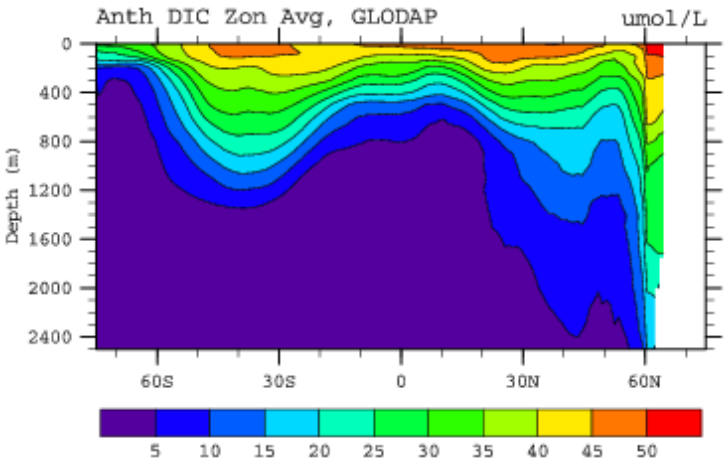
Moore & Braucher, Biogeosci. 2008

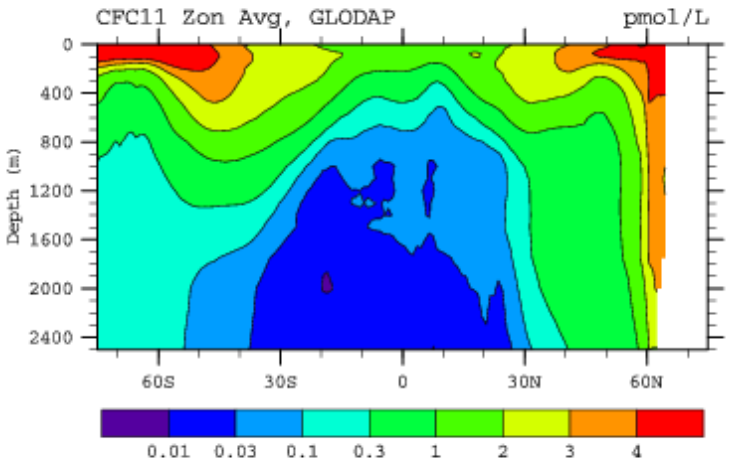


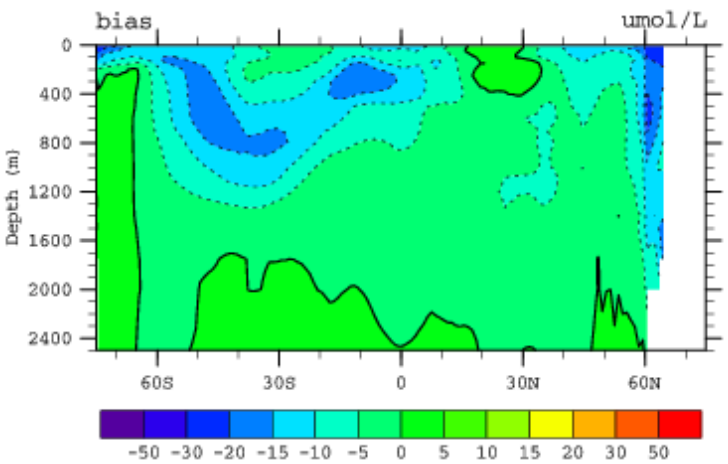


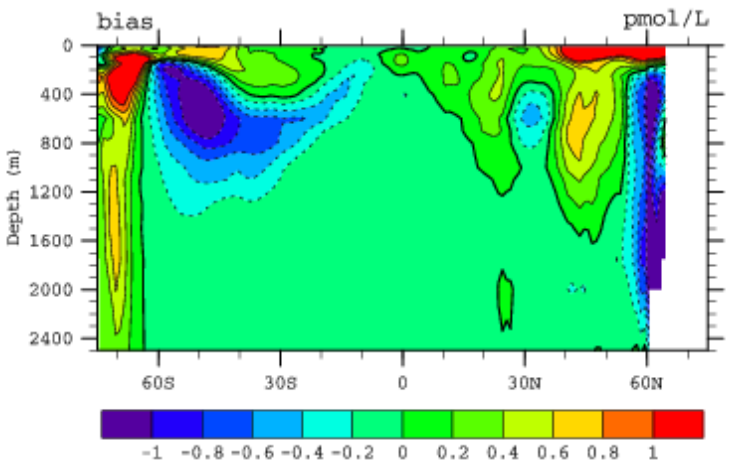












Ocean Ecosystem-Biogeochemistry

Work in Progress:

-adapting literature equilibration methods

- initial experiments with Newton-Krylov method
- pre-conditioning to improve convergence
- split fast processes (ecology) from slow processes (geochemistry)

-improving iron biogeochemistry

- atmospheric iron (e.g. dust, atmospheric processing, combustion iron sources)
- add revise sediment sources and scavenging rates

-preliminary analysis of 21st century coupled runs

- shifts in plankton community structure

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