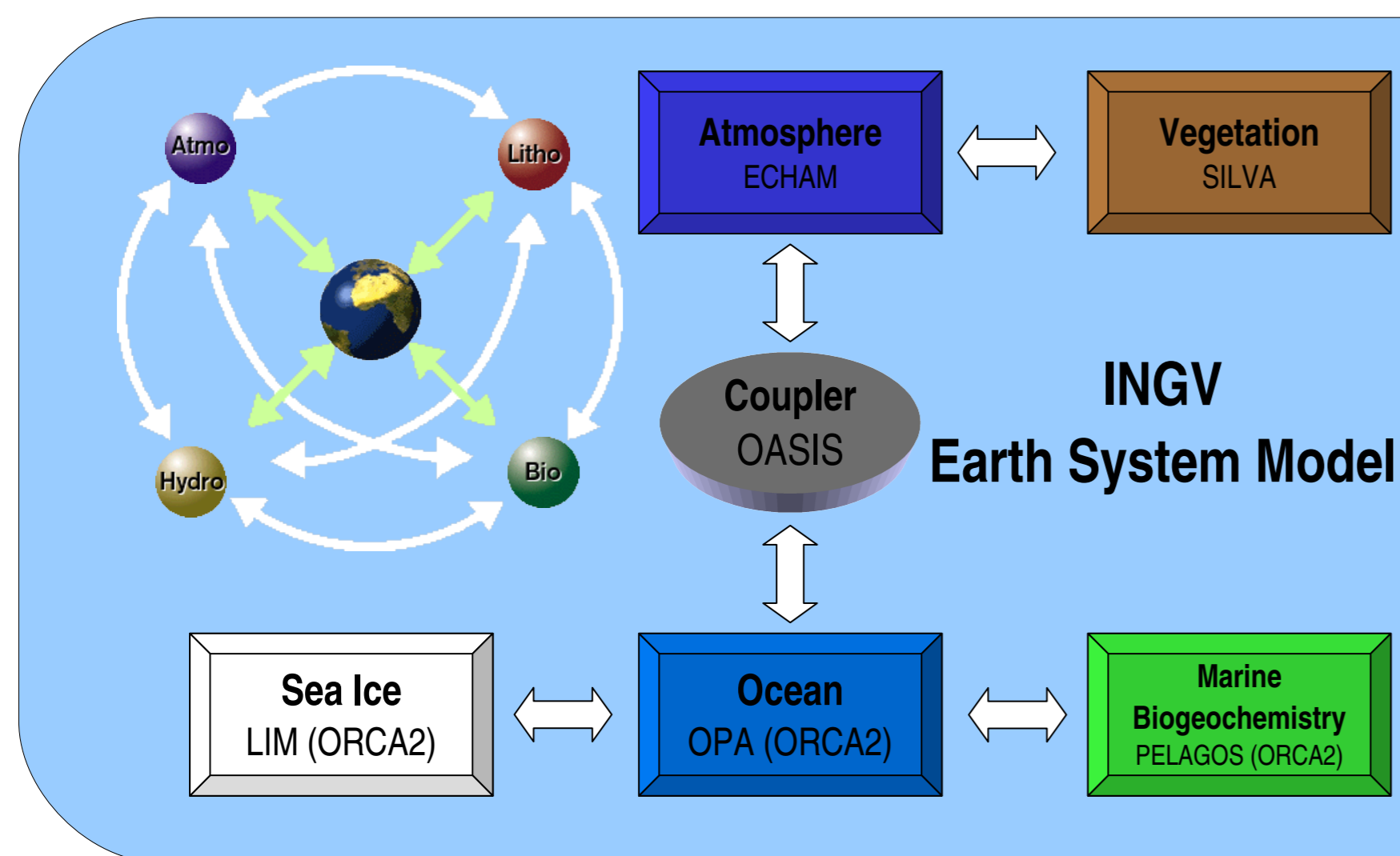


Current Status of the INGV ESM

M. Vichi, P.G. Fogli, E. Manzini, A. Alessandri, S. Gualdi, S. Masina, A. Navarra, L. Patara, E. Scoccimarro



ESM Components

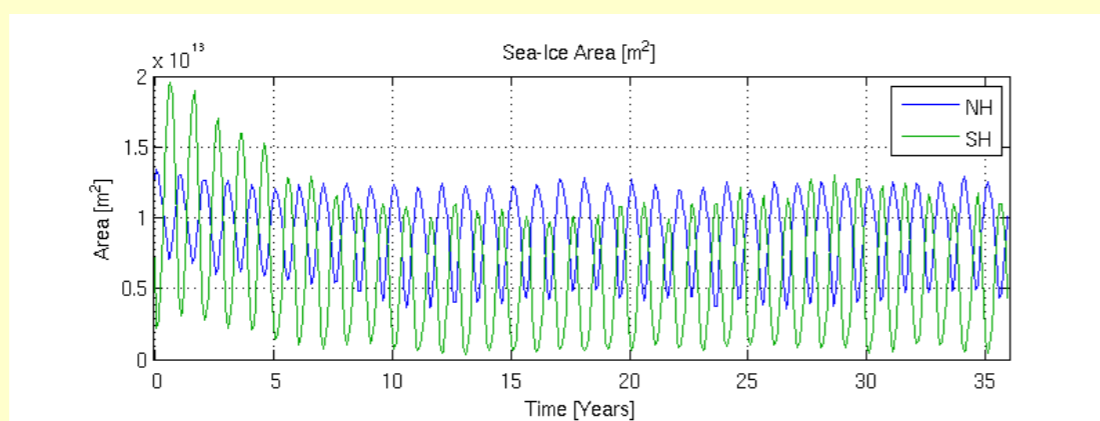
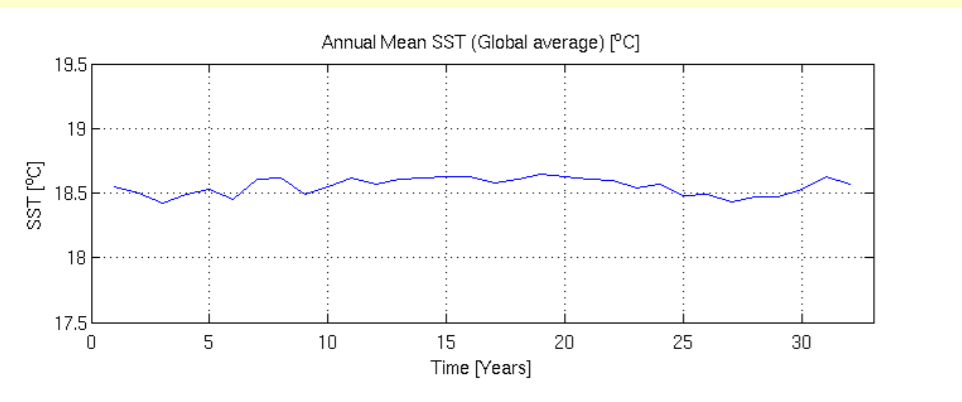
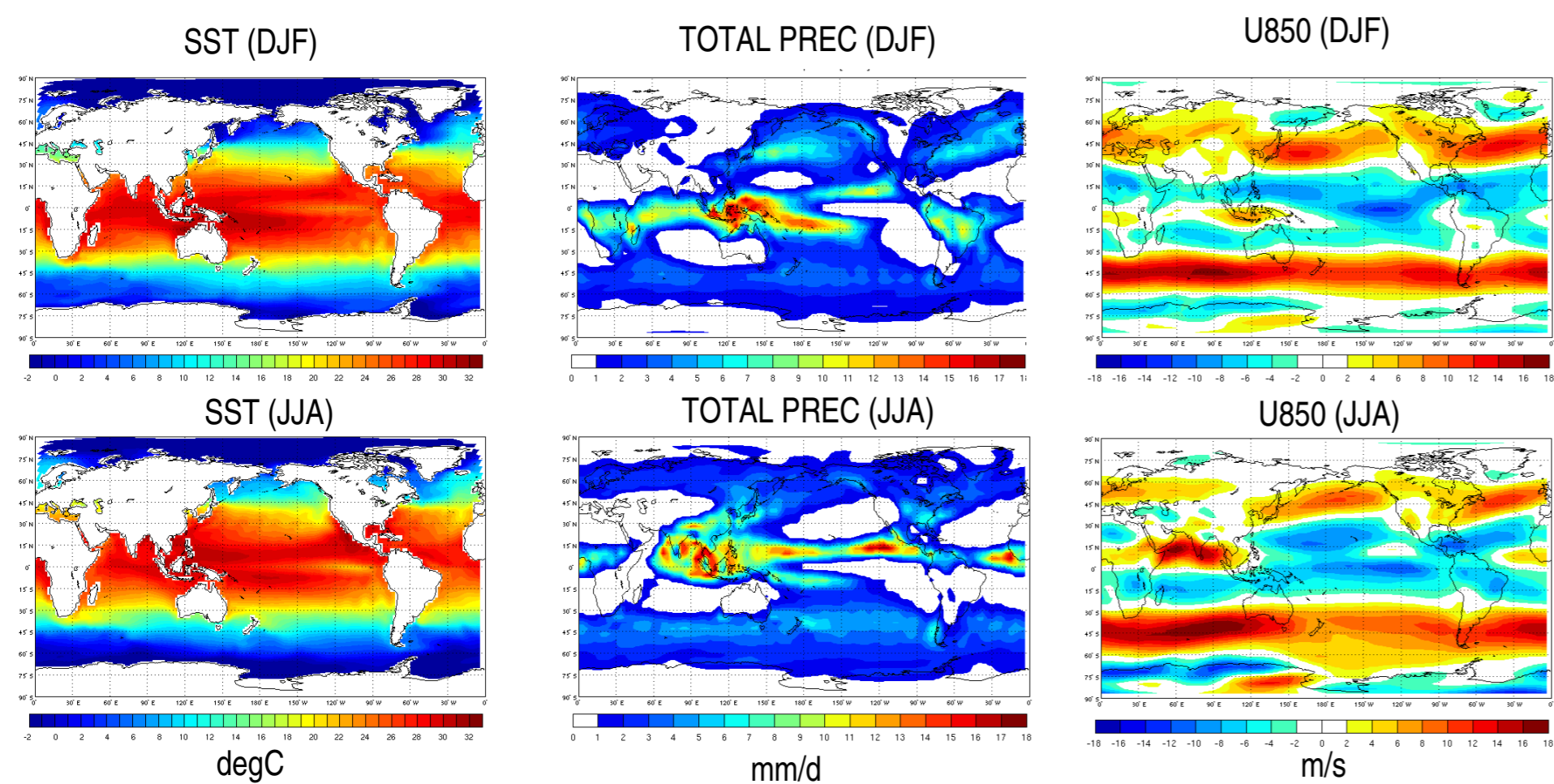
- Atmosphere: ECHAM5 (Roeckner et al 2006)
- Ocean: OPA8.2 (Madec et al 1998)
- Sea-Ice: LIM (Timmermann et al 2005)
- Marine Biogeochemistry: PELAGOS (Vichi et al 2006a,b)
- Land, Vegetation, and Terrestrial Carbon: SILVA (Alessandri, 2006; Zeng et al 2004; Ducoudre et al 1993)
- Coupler: OASIS3 (Valcke et al 2004)

References

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- Vichi M., N. Pinardi and S. Masina (2006a) A generalized model of pelagic biogeochemistry for the global ocean ecosystem. Part I: theory. J. Mar. Sys., in press
- Vichi M., S. Masina and A. Navarra (2006b) A generalized model of pelagic biogeochemistry for the global ocean ecosystem. Part II: numerical simulations. J. Mar. Sys., in press
- Zeng N., A. Mariotti, and P. Wetzel, 2004: Terrestrial mechanism of interannual CO₂ variability. Glob. Biogeochem. Cy., 19, 2539-2558.

Control Simulation (physics-only)

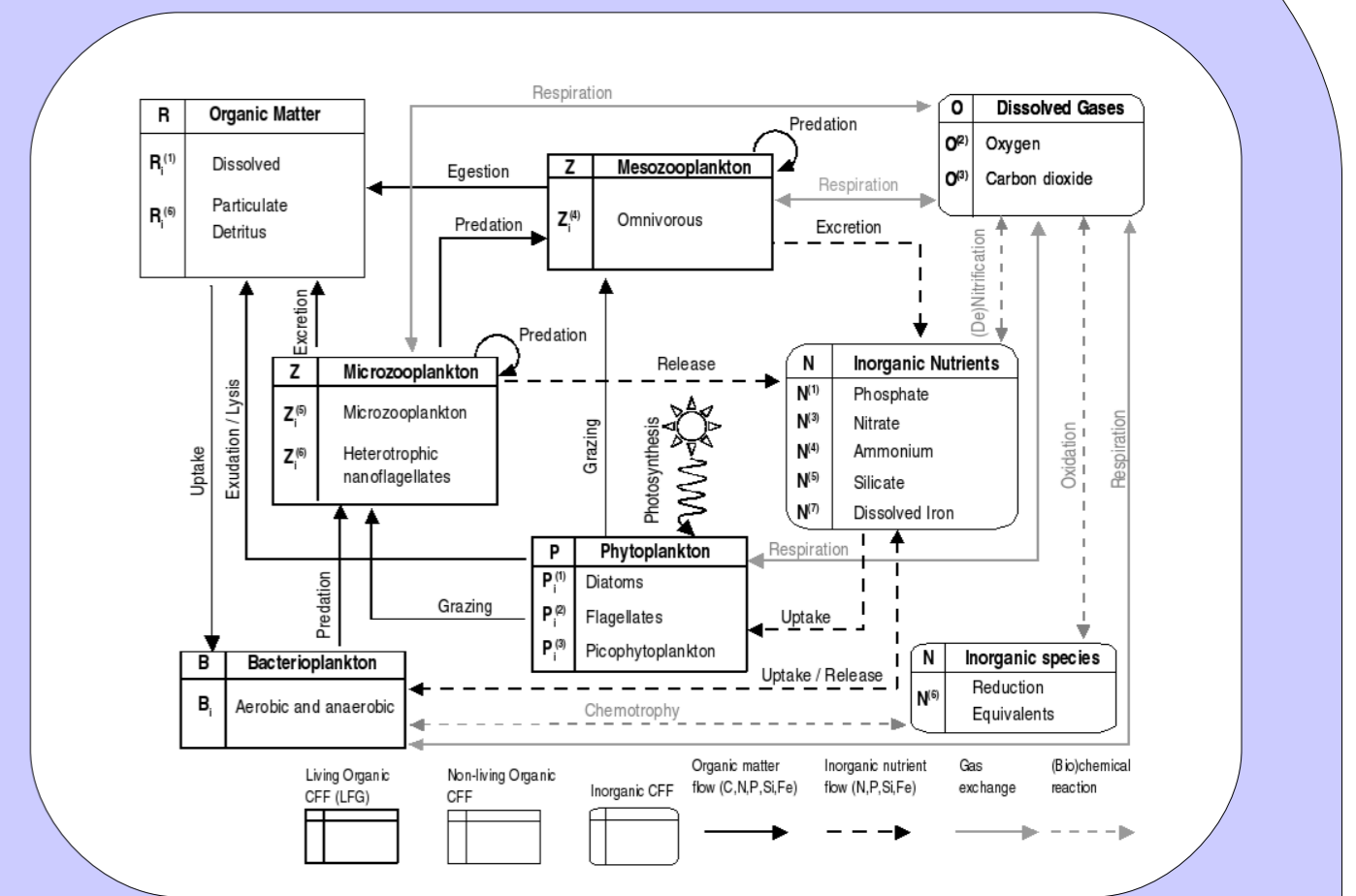
Resolutions: ECHAM5 T31, OPA8.2 ORCA2



Innovation

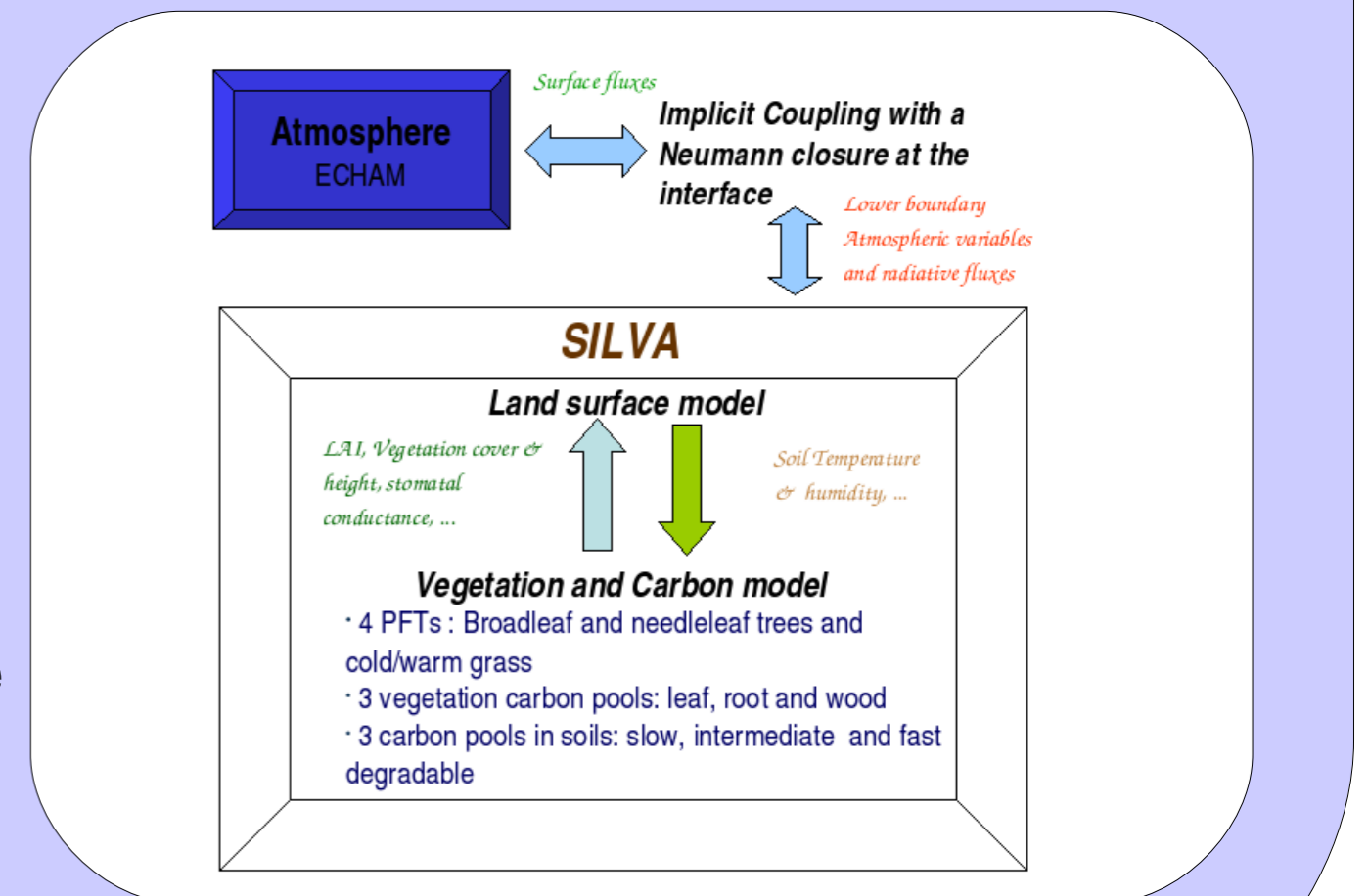
PELAGOS: PELagic biogeochemistry for Global Ocean Simulations

- Biomass-based ocean biogeochemistry model
- Functional group approach (living, non-living and inorganic Chemical Functional Families)
- Several biogeochemical cycles (C, N, P, Si, Fe, O)



SILVA: Surface Interactive Land Vegetation model

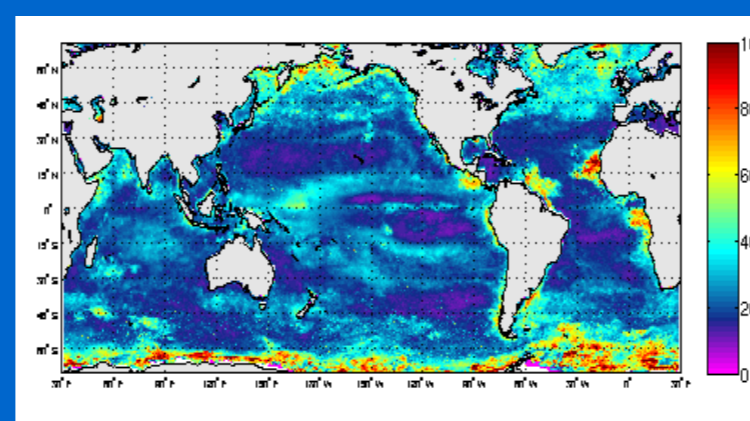
- Hydrology module (2 layers)
- Soil thermodynamics module (7 layers)
- Interactive computation of surface fluxes and parameters
- Dynamical vegetation model:
 - Prognostic carbon pools
 - Competition based on resource allocation strategies, stress tolerances and bioclimatic preferences.



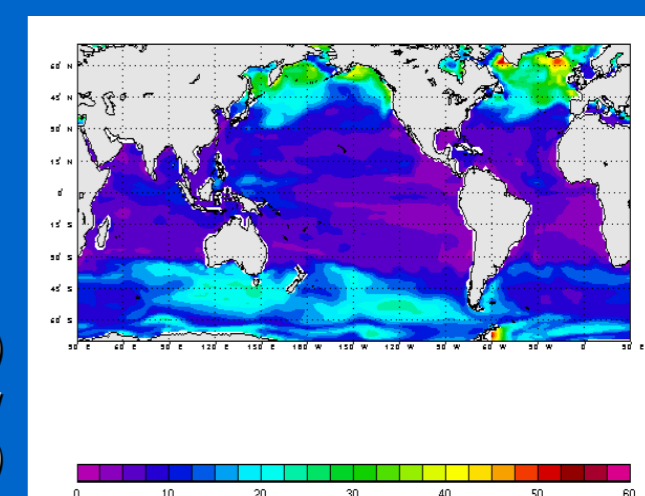
Study case: bio-optical feedbacks in the equatorial Pacific

Blue Ocean

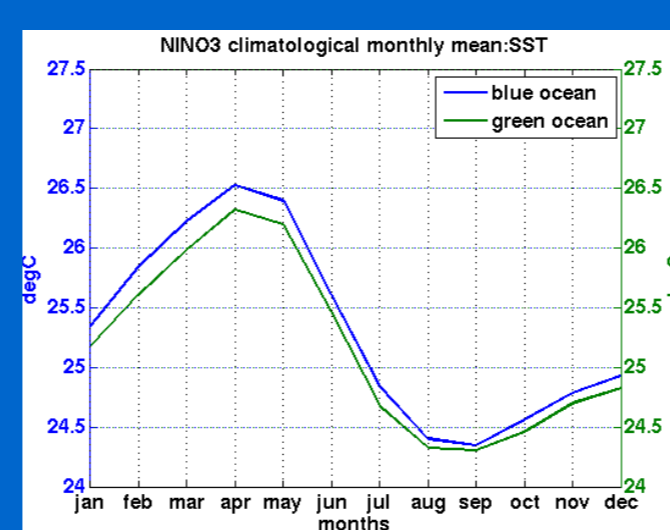
Green Ocean



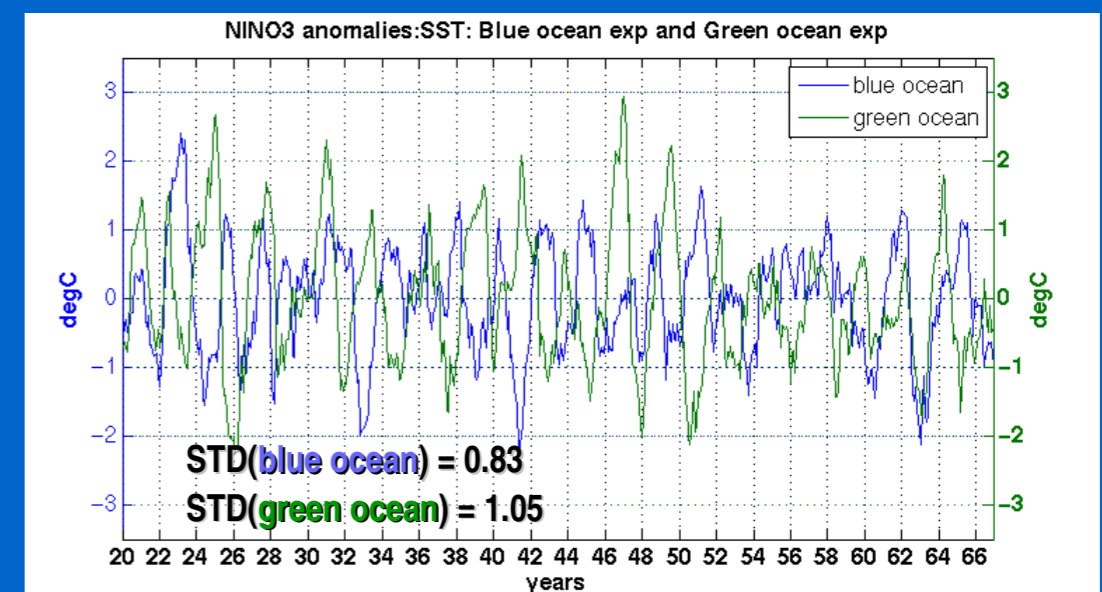
Model (40 years) Chl variability (normalized stdev of anomalies)



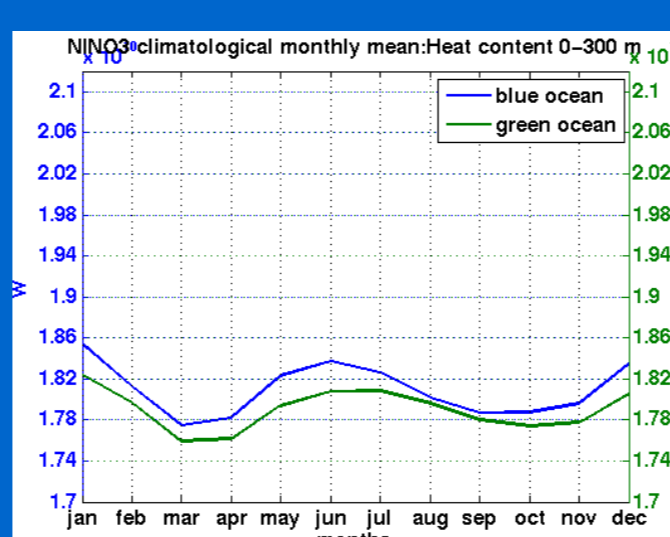
NINO3 region: Green Ocean (green) Blue Ocean (blue)



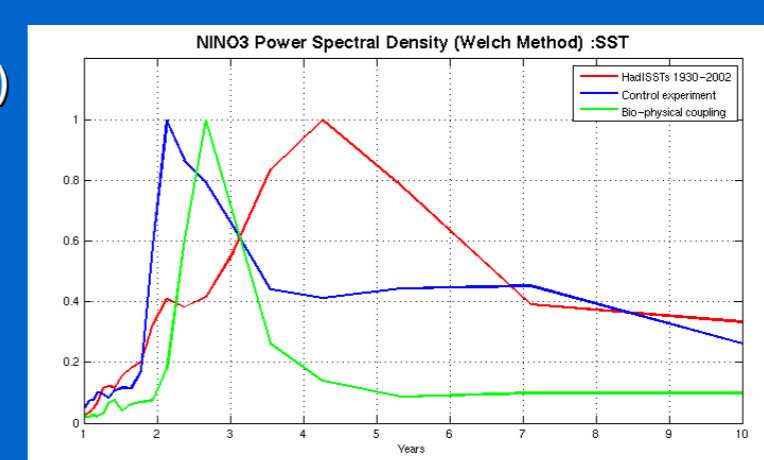
SST monthly climatology (degC)



SST anomalies (degC)

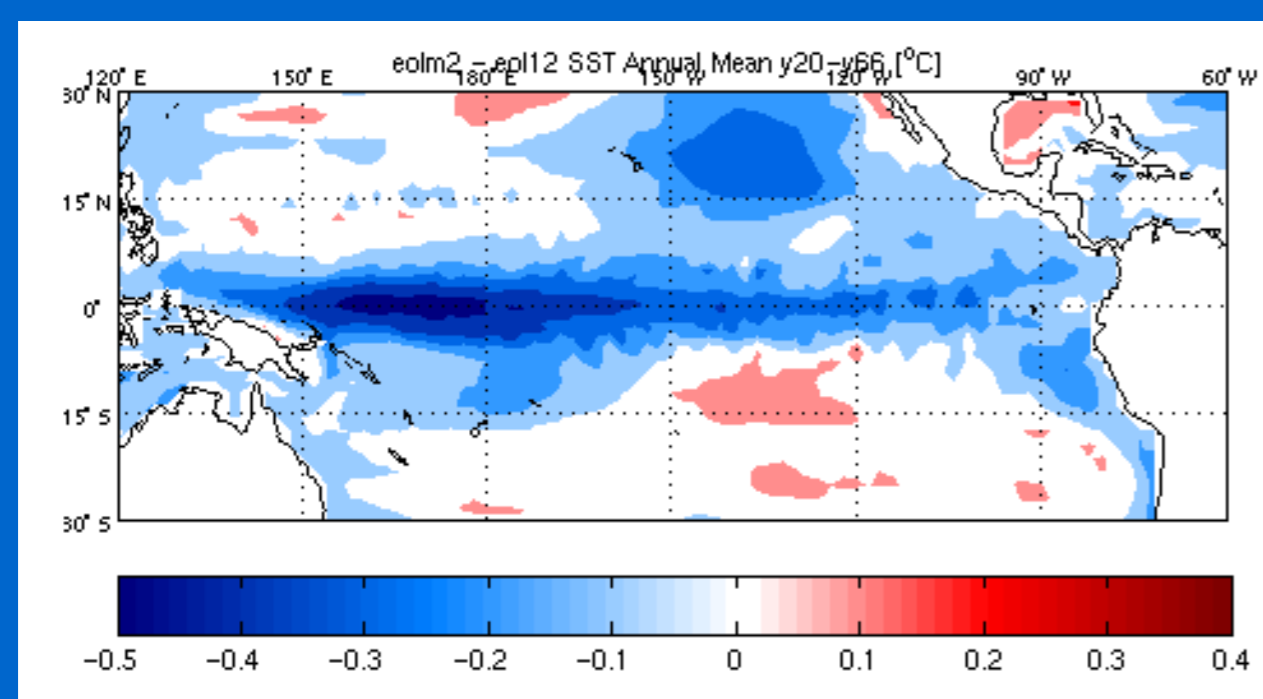


Heat Content monthly climatology (W)



HadISST (red)
Green Ocean (green)
Blue Ocean (blue)

ATMOSPHERE OCEAN/SEA-ICE MARINE BIOGEOCHEMISTRY



SST Annual Mean: Green ocean - Blue ocean