# Long Integration ProjectS (LIPS)

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- CCSM3.5 / T31x3 + ocean BGC: fast and good

- Pliocene with Molnar (CU), Fox-Kemper (CU) & Shields

- ENSO – ocean BGC with Yeager, Lindsay, Moore (UCI) & Murtugudde (UMD)

- decadal ENSO with Fox-Kemper & Stevenson (CU)

- glacial inception with Peacock & Lindsay

- climate change and tuna with Lehodey (IRD), Yeager, Murtugudde (UMD) and Lindsay

- AR5 fallback with: TBA

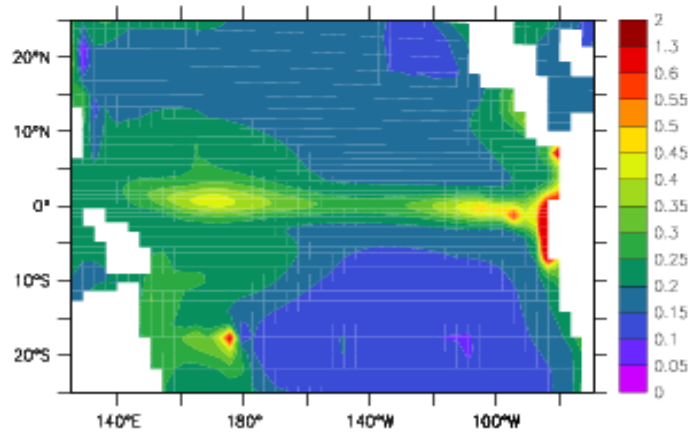# Mixed Layer chlorophyll concentrations, years 251-500

observed
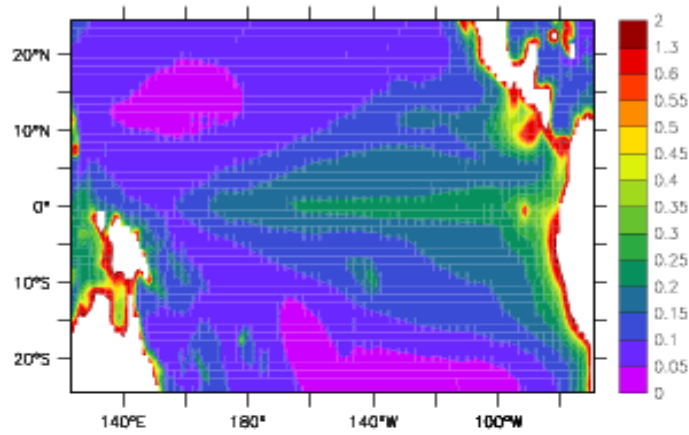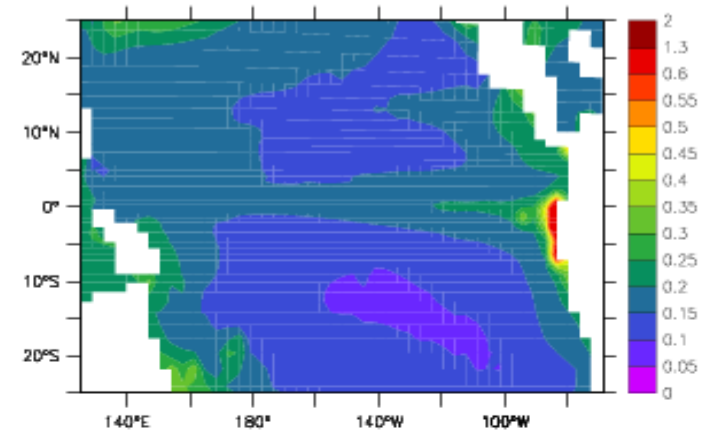
LOWFULL
yrs 251-500
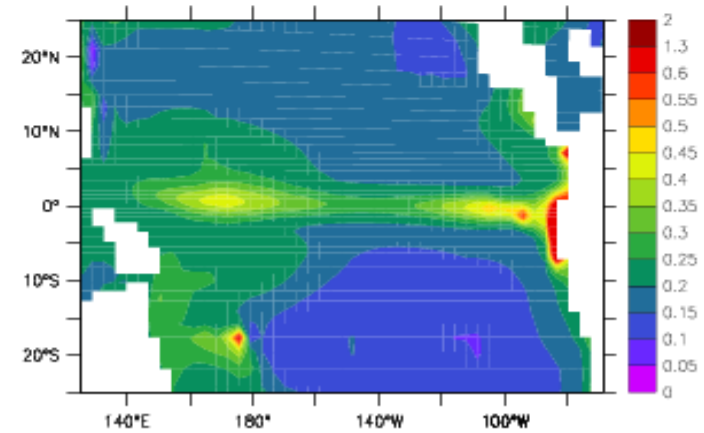
HIGHFULL
yrs 251-500

HIGHCLIM
yrs 251-500

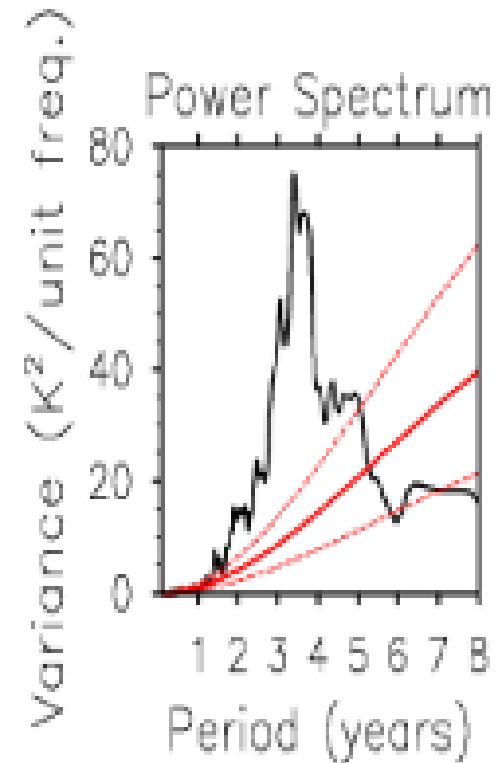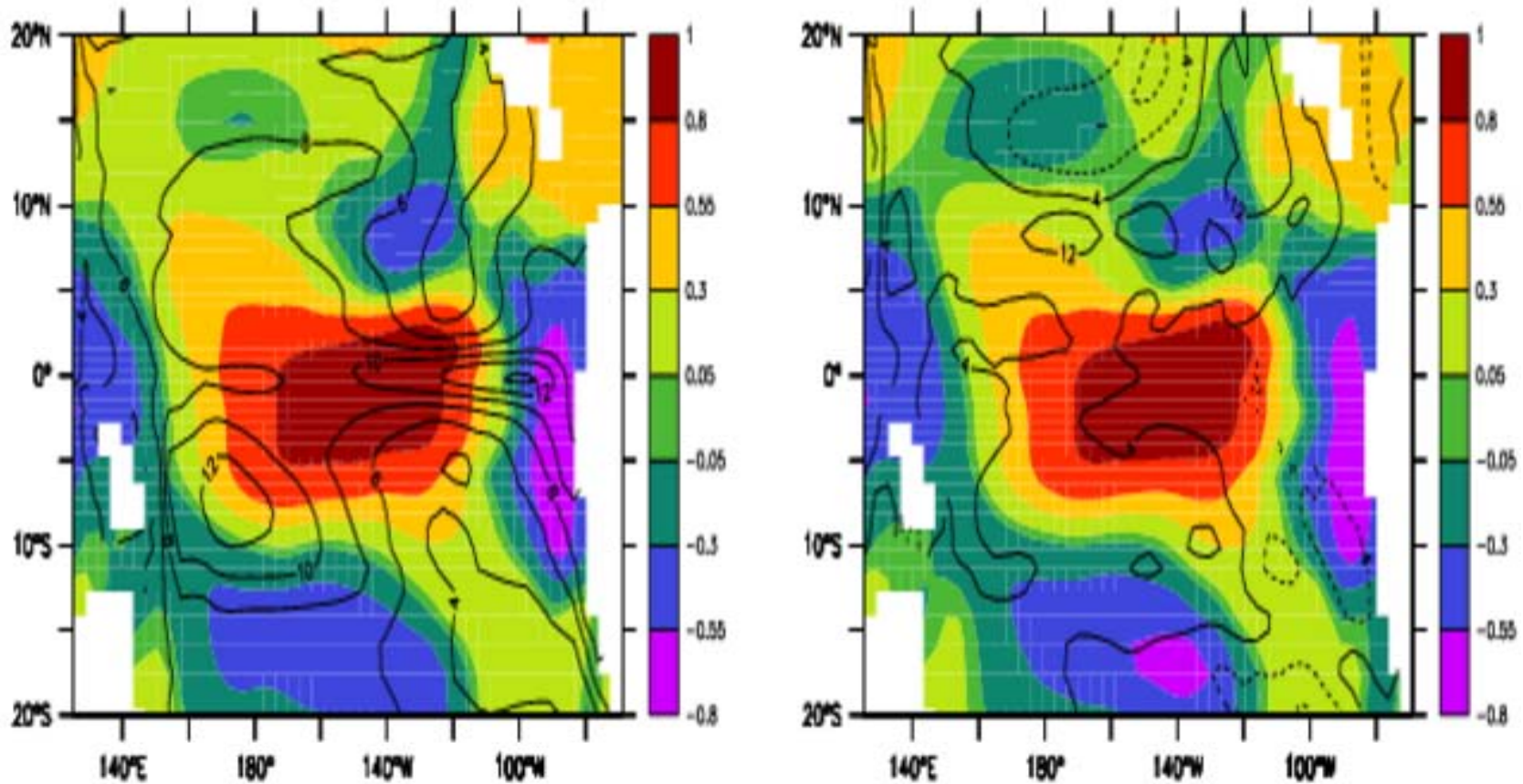# Spectrum of NINO3 SST
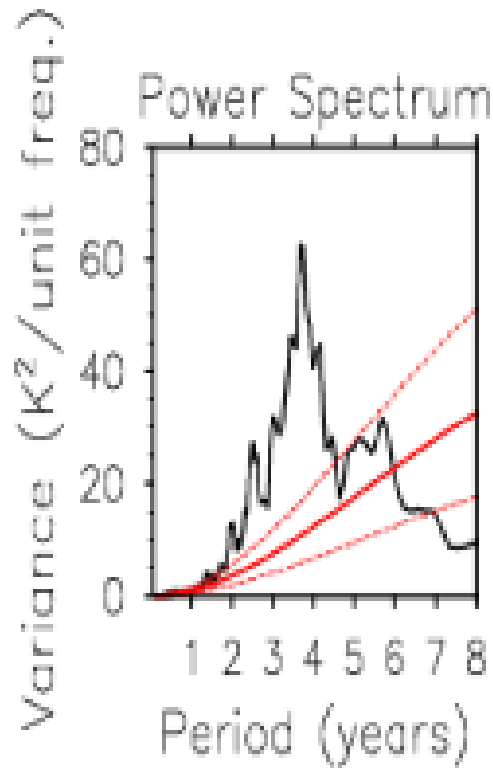
HIGHFULL
std=0.9

HIGHCLIM
std=0.99

values for LOWFULL and LOWCLIM are 0.93 and 1.02, respectively

Dynamical Response

LOWFULL

HIGHFULL

color: correlation between NINO3 SST and Taux; contour lines: standard deviation of thermocline depth in LOWFULL (left) and relative increase in HIGHFULL

Conclusions

- ignoring the ENSO-phytoplankton feedback in GCMs leads to a 10% overestimation of ENSO strength

- off-equatorial feedbacks are potentially important, but have not been well studied yet

- the amplitude of the phytoplankton feedback should also be established for other scenarios of interannual variability or trends (NAO, LGM, 21st century) ...

- ... and maybe a simplified mixed layer chlorophyll model should be added to CCSM