

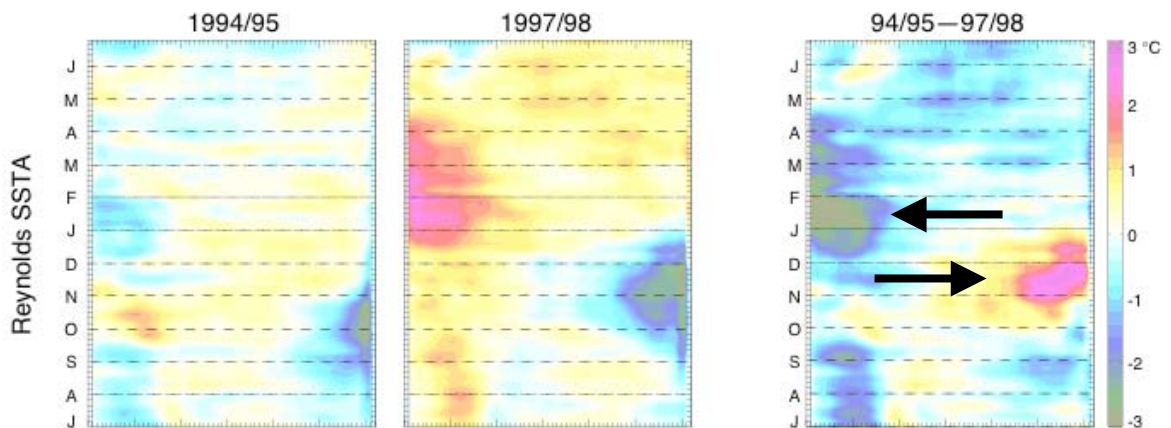


Climate Scale Interactions in the Indo-Pacific Tropical Basins

Jean-Philippe Boulanger, Albert Fischer, Julie Leloup, Matthieu Lengaigne
and many co-auteurs...

- Role of an MJO event in the termination of the 1994-1995 Indian Dipole Event
- Role of the March 1997 WWE in El Niño onset
- WWE activity and ENSO dynamics
- Conclusions

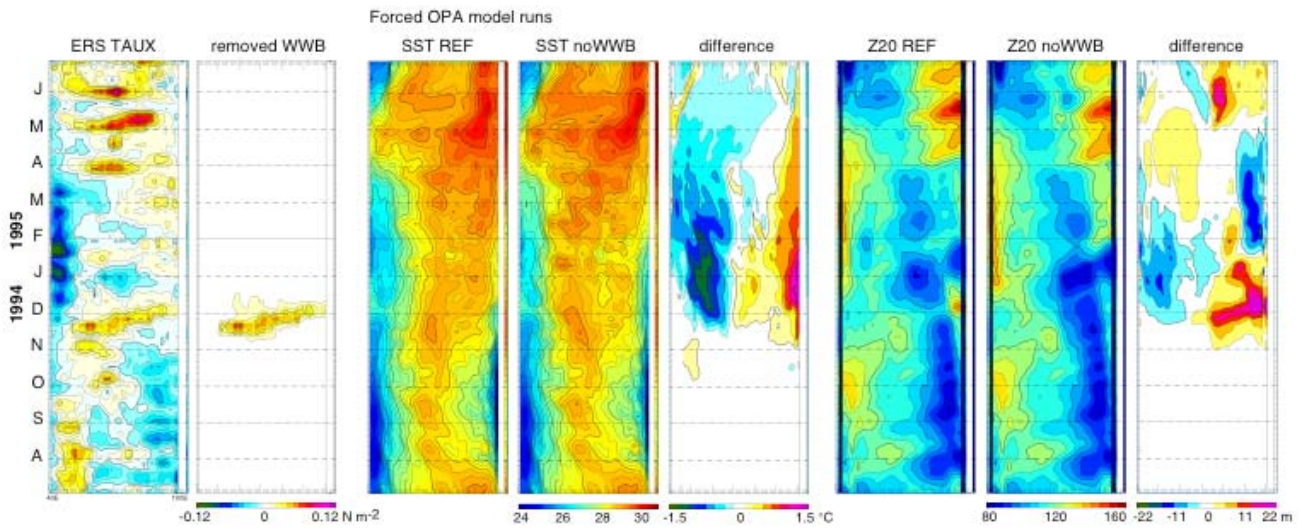
Interannual anomalies of SST and Taux during the 1994-1995 and 1997-1998 Dipole events



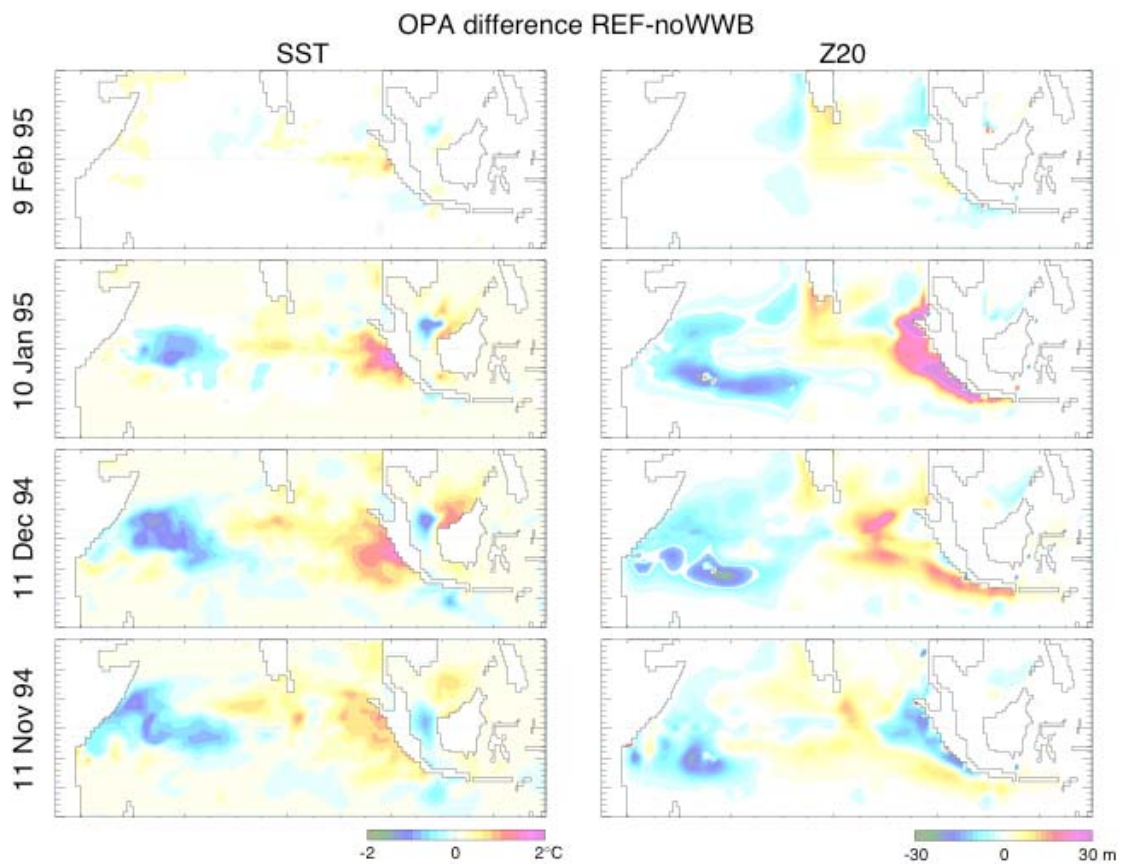
Strategy :

- 1- Study the impact of the Nov 1994 MJO in an ocean model (OPA model)**
- 2- Study the atmospheric sensitivity to the oceanic impact of the Nov 1994 MJO (LMDZ)**

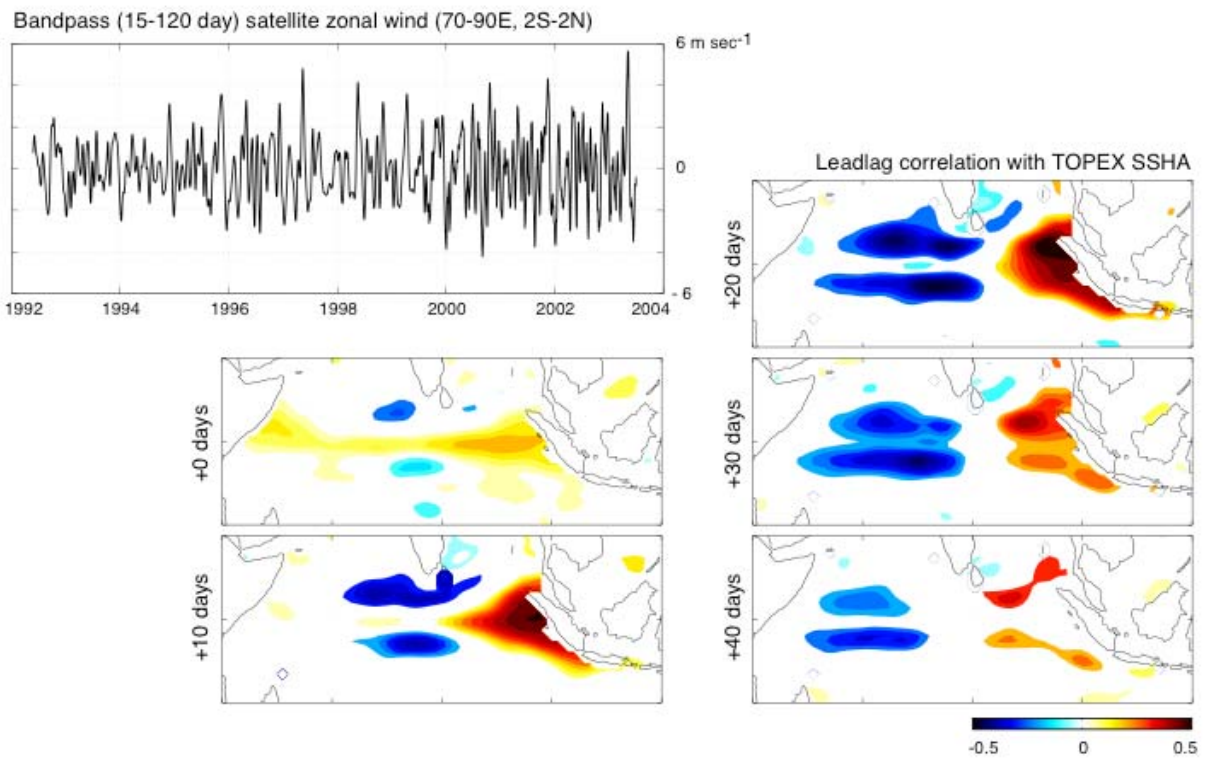
OPA model response at the equator to the MJO zonal wind stress signal



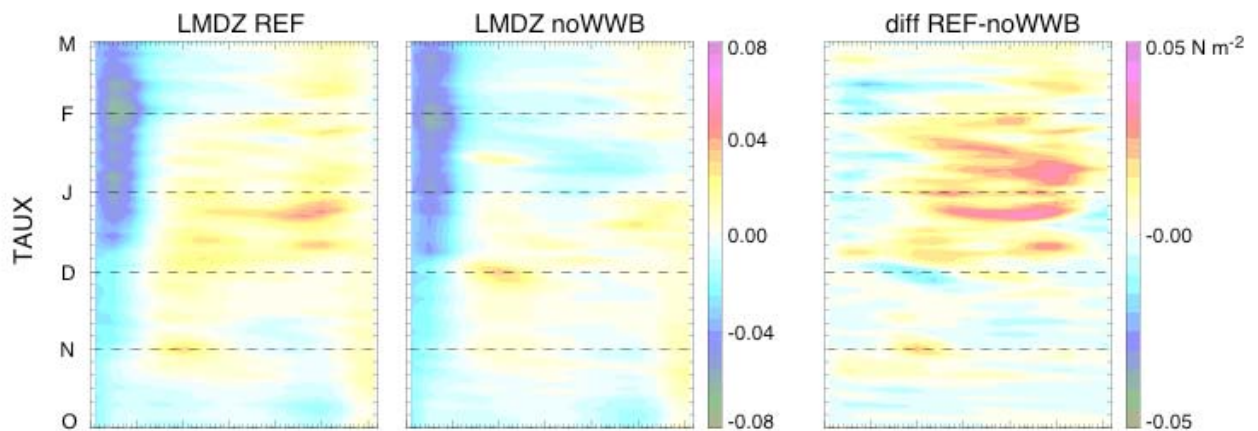
Role of an MJO event in the termination of the 1994-1995 Indian Dipole Event



Role of an MJO event in the termination of the 1994-1995 Indian Dipole Event

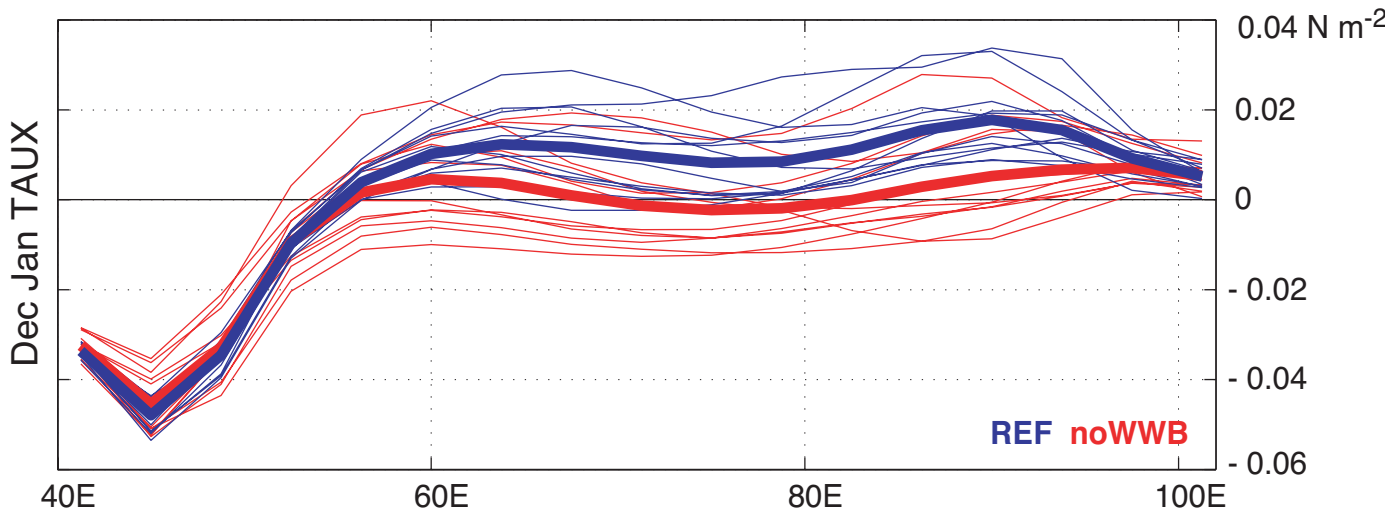


LMDZ Atmospheric response to the simulated OPA SST patterns

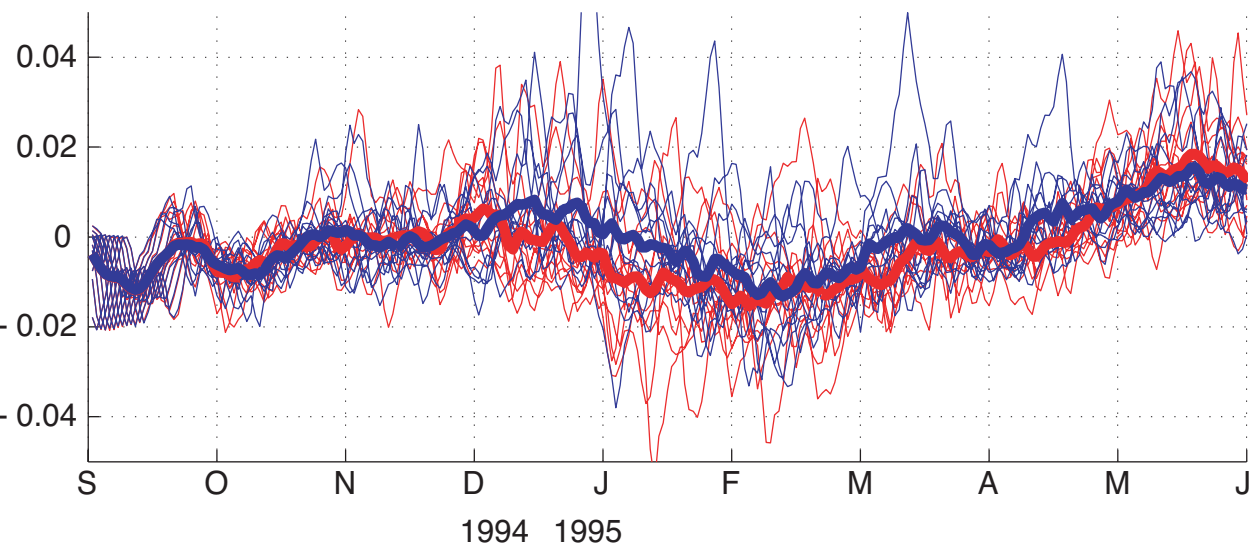


LMDZ Atmospheric response to the simulated OPA SST patterns

LMDZ Indian Ocean zonal wind mean and ensemble

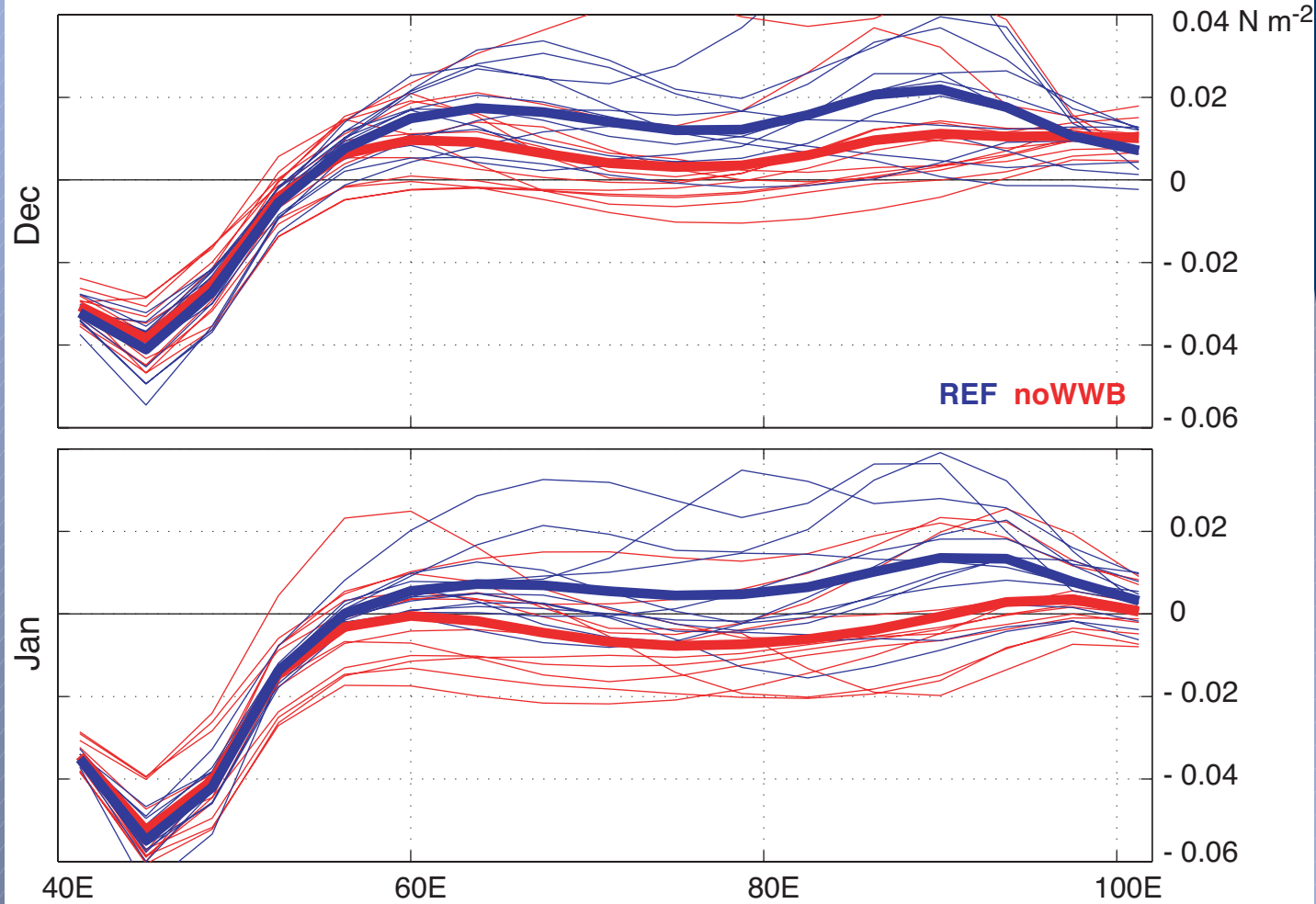


Indian Ocean zonal wind index (70-90E 2S-2N) time evolution



LMDZ Atmospheric response to the simulated OPA SST patterns

LMDZ Indian Ocean zonal wind mean and ensemble



•Role of the March 1997 WWE in El Niño onset

Observations

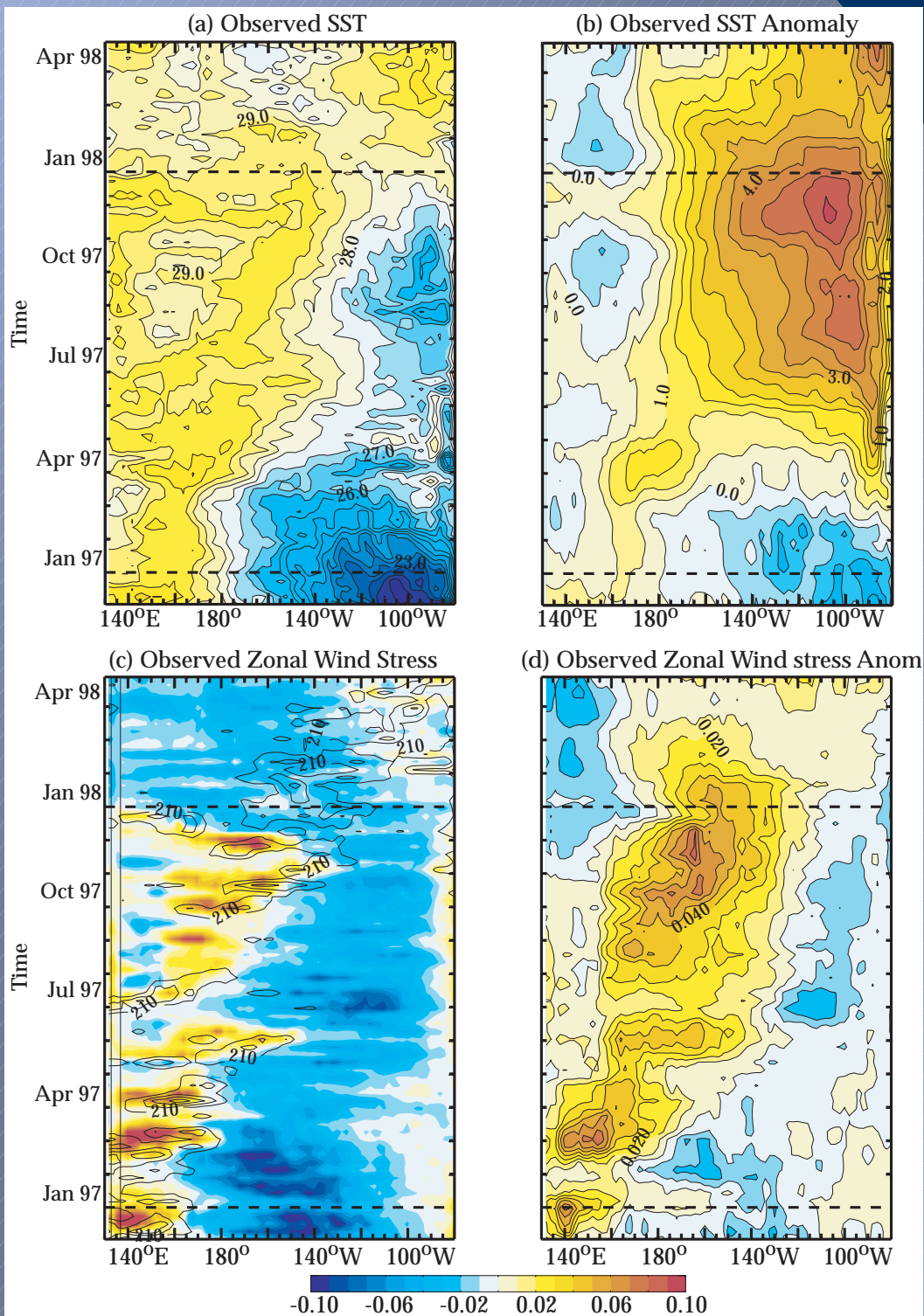
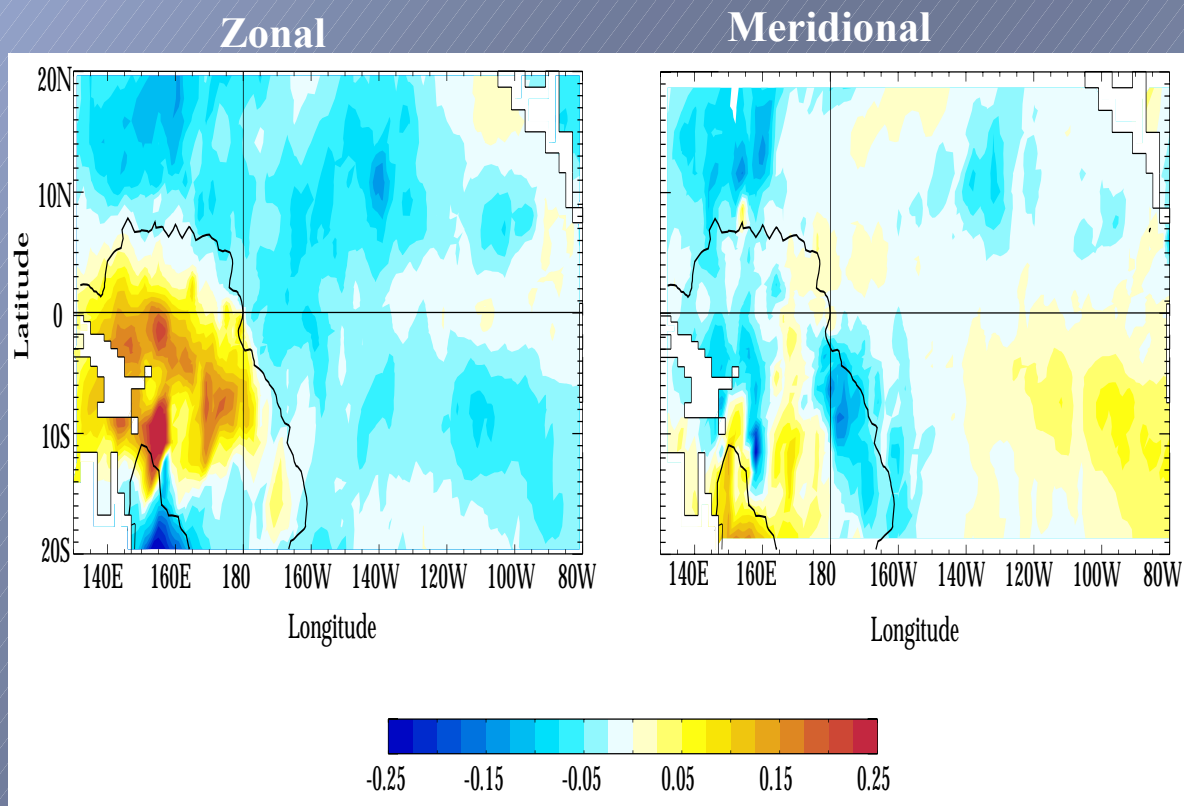


Figure 11

Zonal and meridional wind stress on March, 14th, 1997



Strategy :

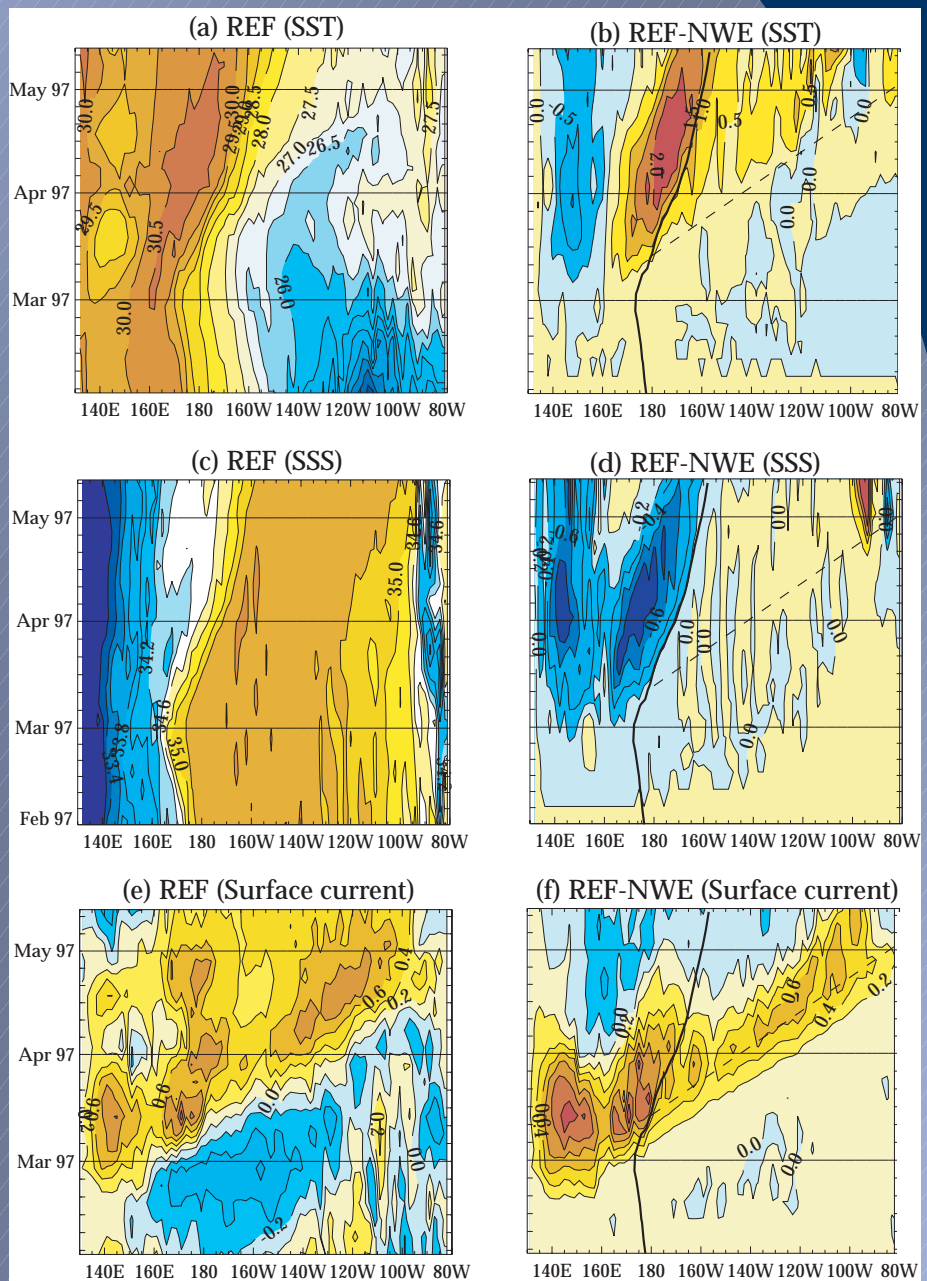
1- Study the impact of the March 1997 WWE in an ocean model (OPA model)

2- Study the atmospheric sensitivity to the oceanic impact of the March 1997 WWE (Hadam)

3- Study the impact of the March 1997 WWE in a coupled model (HadOPA)

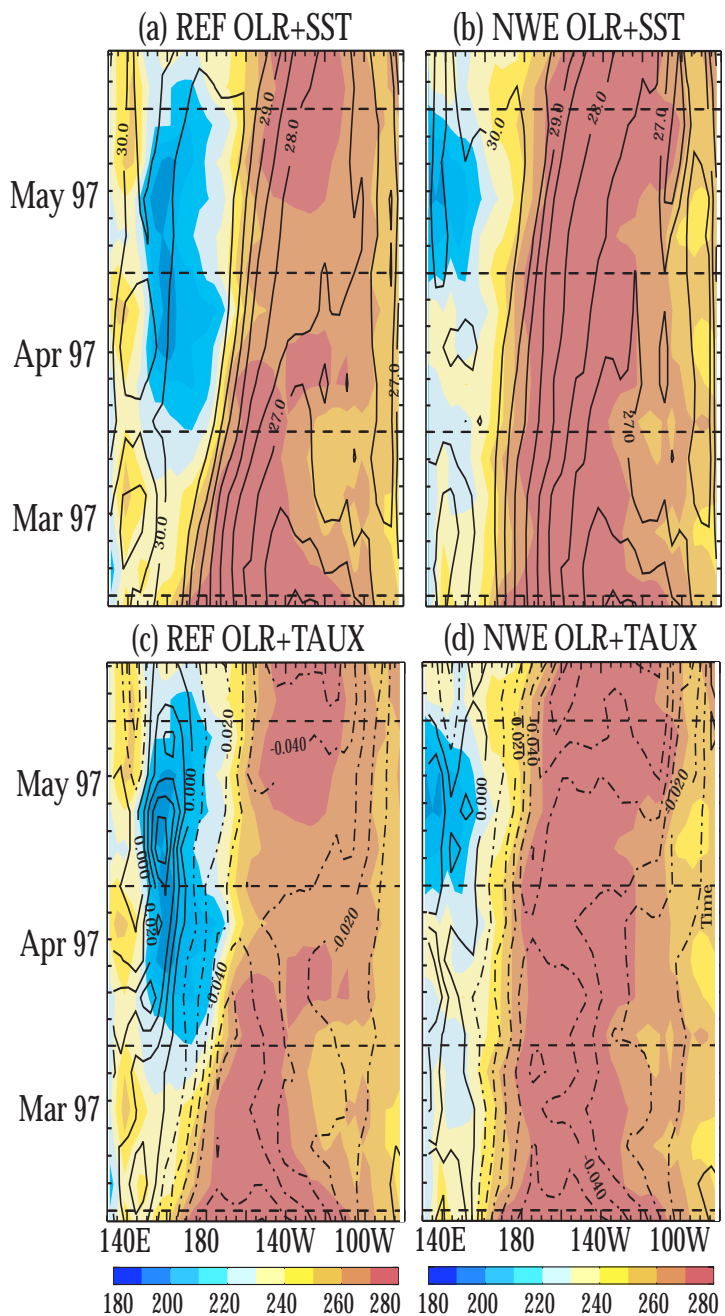
Role of the March 1997 WWE in El Niño onset

- Three oceanic responses in SST
 - (1) warming along the Kelvin wave path
 - (2) large warming along the EEWP
 - (3) cooling in the western Pacific
- Strong zonal currents at the EEWP associated to a non-linear response of the thermo-halo-dynamical front and the wind-forced zonal currents

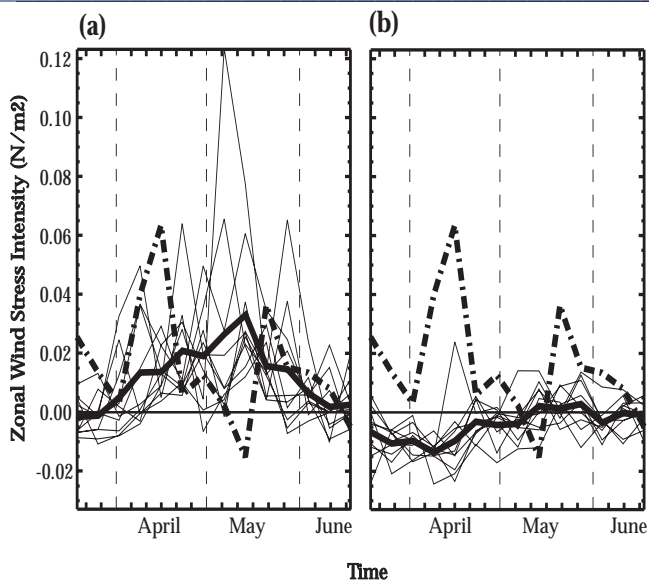


Atmospheric response to the simulated SST patterns

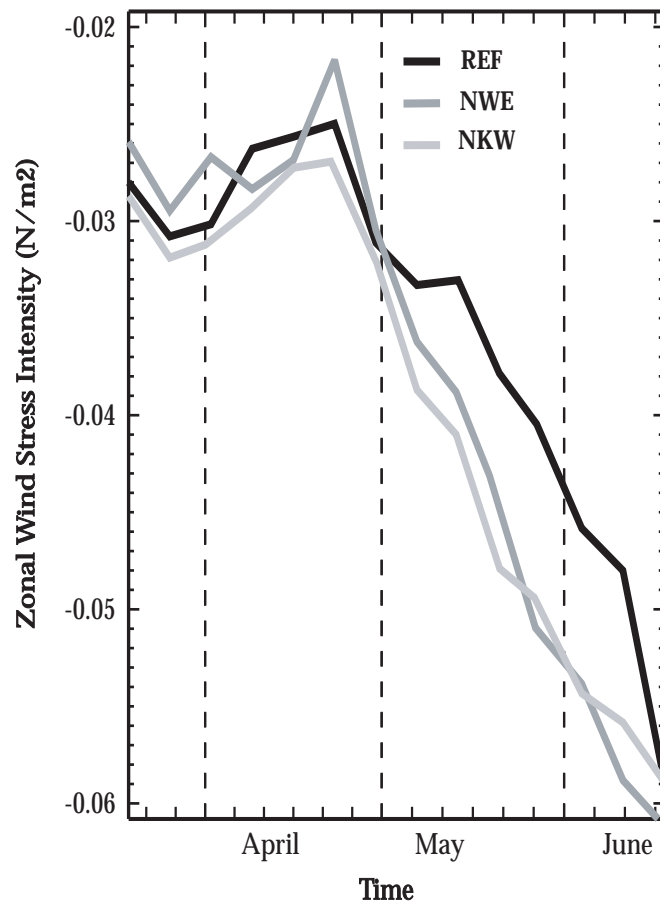
- Strong convection near 160°E in REF
- Large westerly winds near 160°E in REF



Stronger WWE
activity in REF
than in NWE:
positive feedback

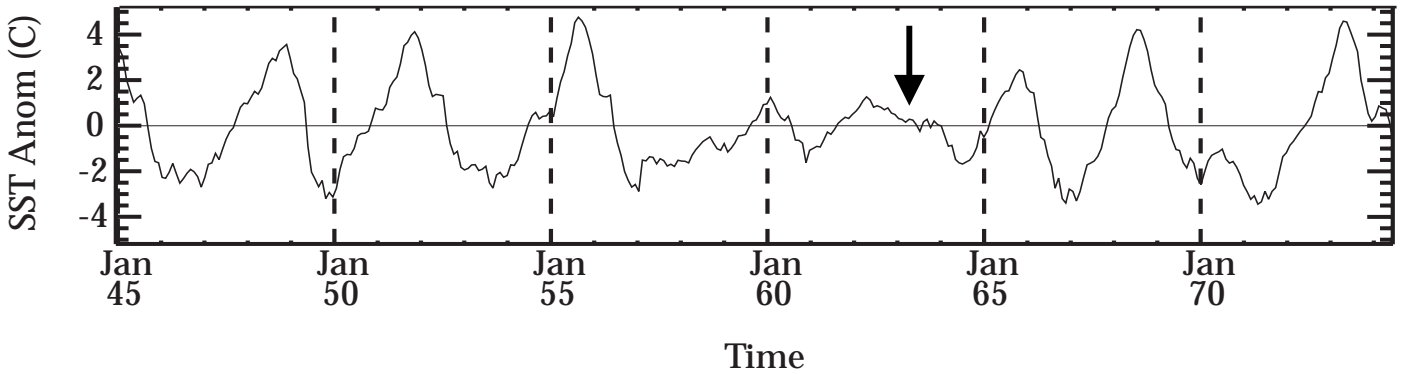


Eastern Pacific warming leads to a reduction of the Trade Winds

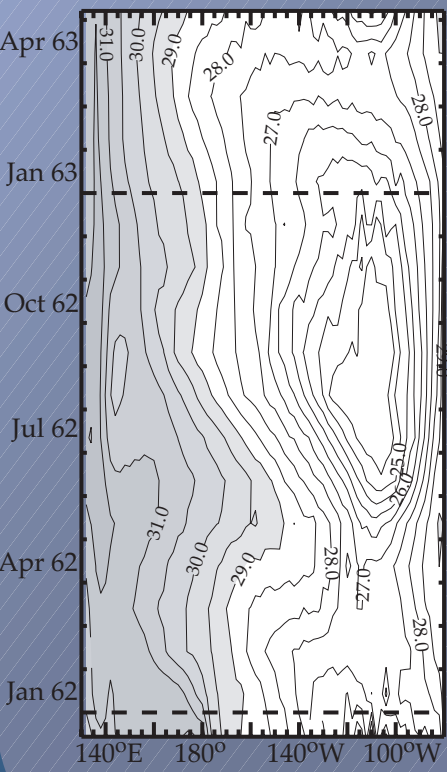


HadOPA coupled model experiments

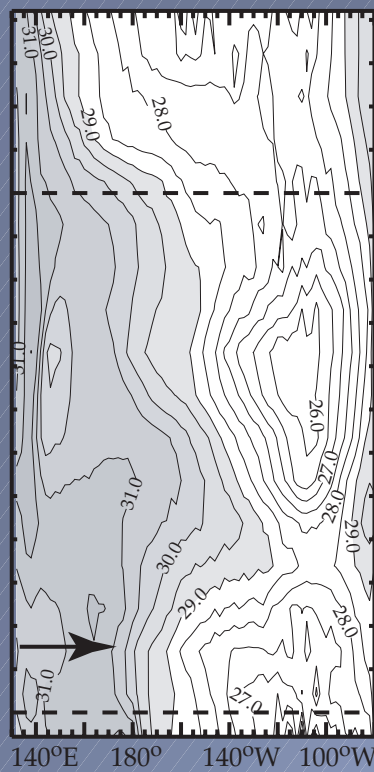
HadOPA Nino3.4 SST Anomaly [year 45-75]



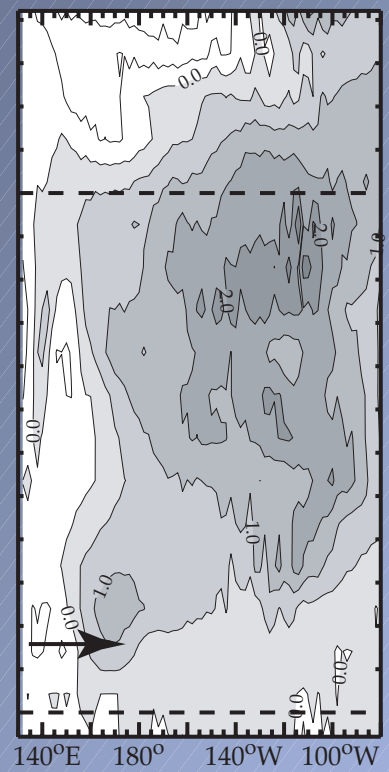
(a) CREF mean SST



(b) CWWE mean SST

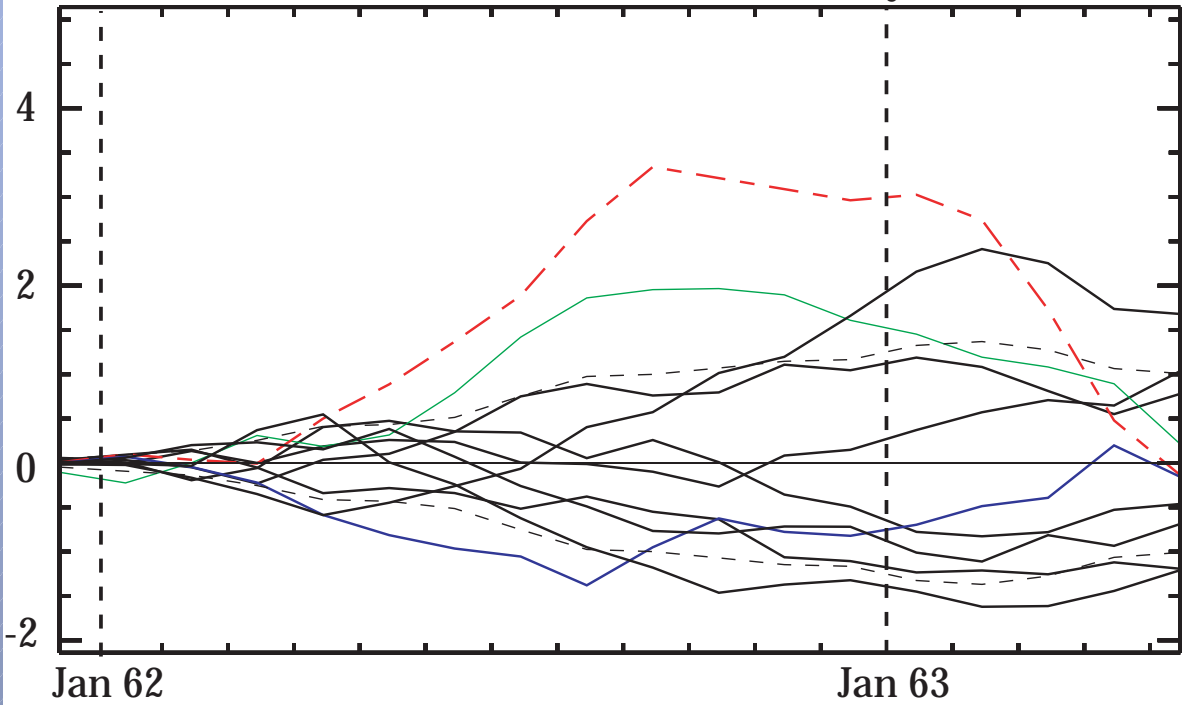


(c) CWWE-CREF mean SST

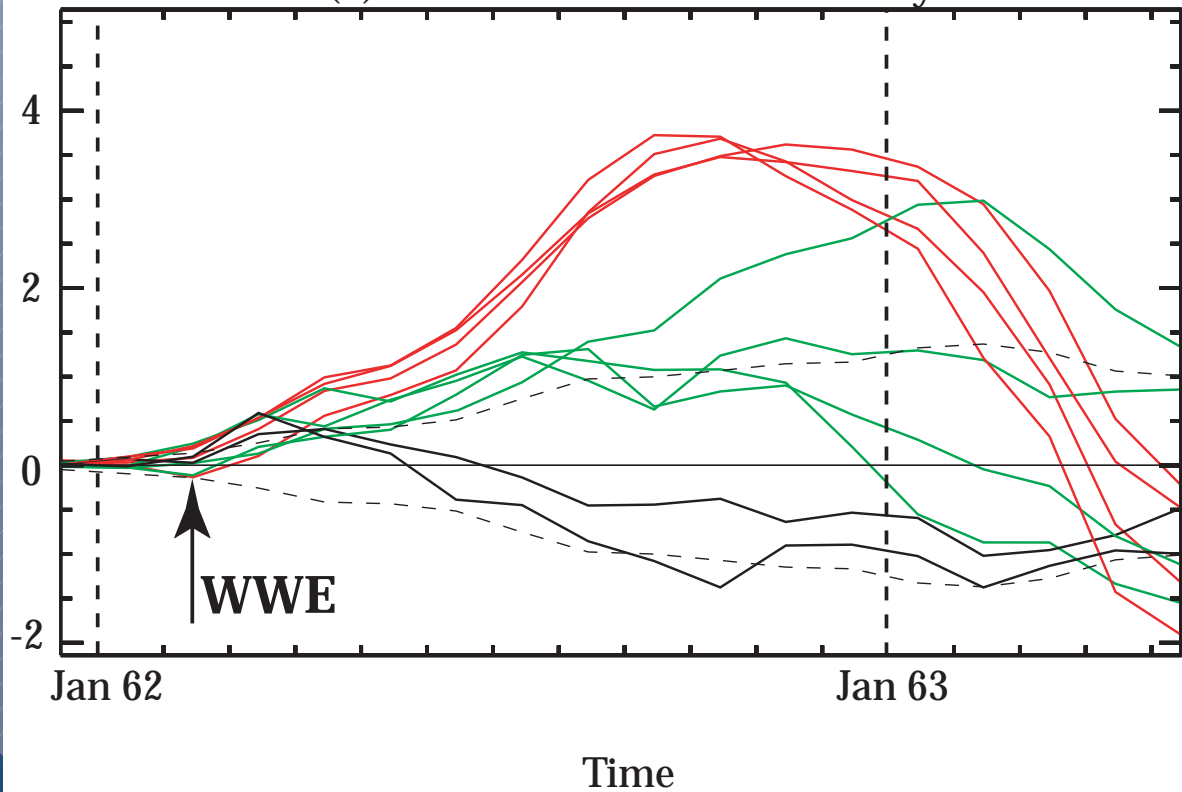


Role of the March 1997 WWE in El Niño onset

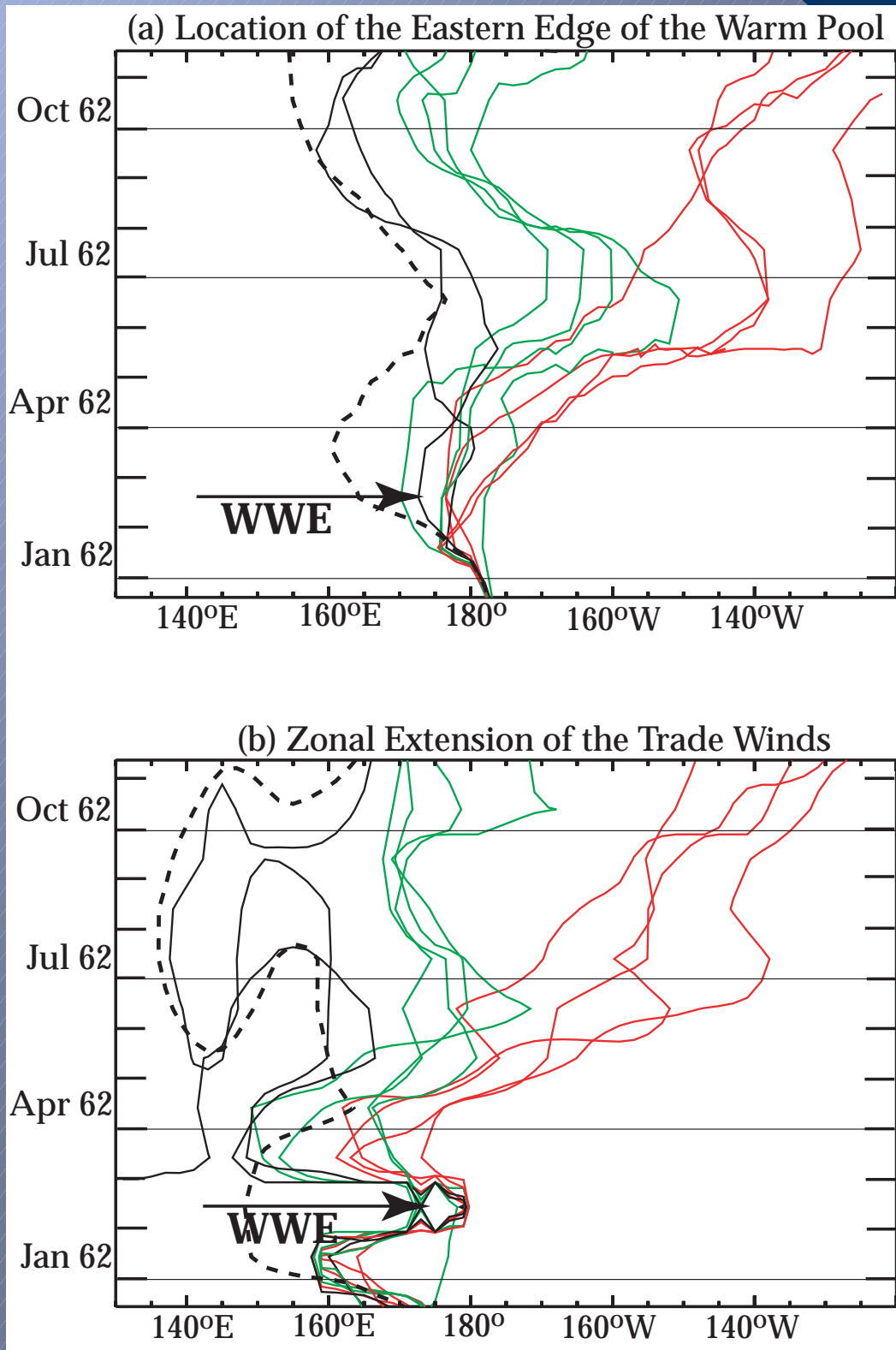
(a) CSTA Nino34 SST Anomaly



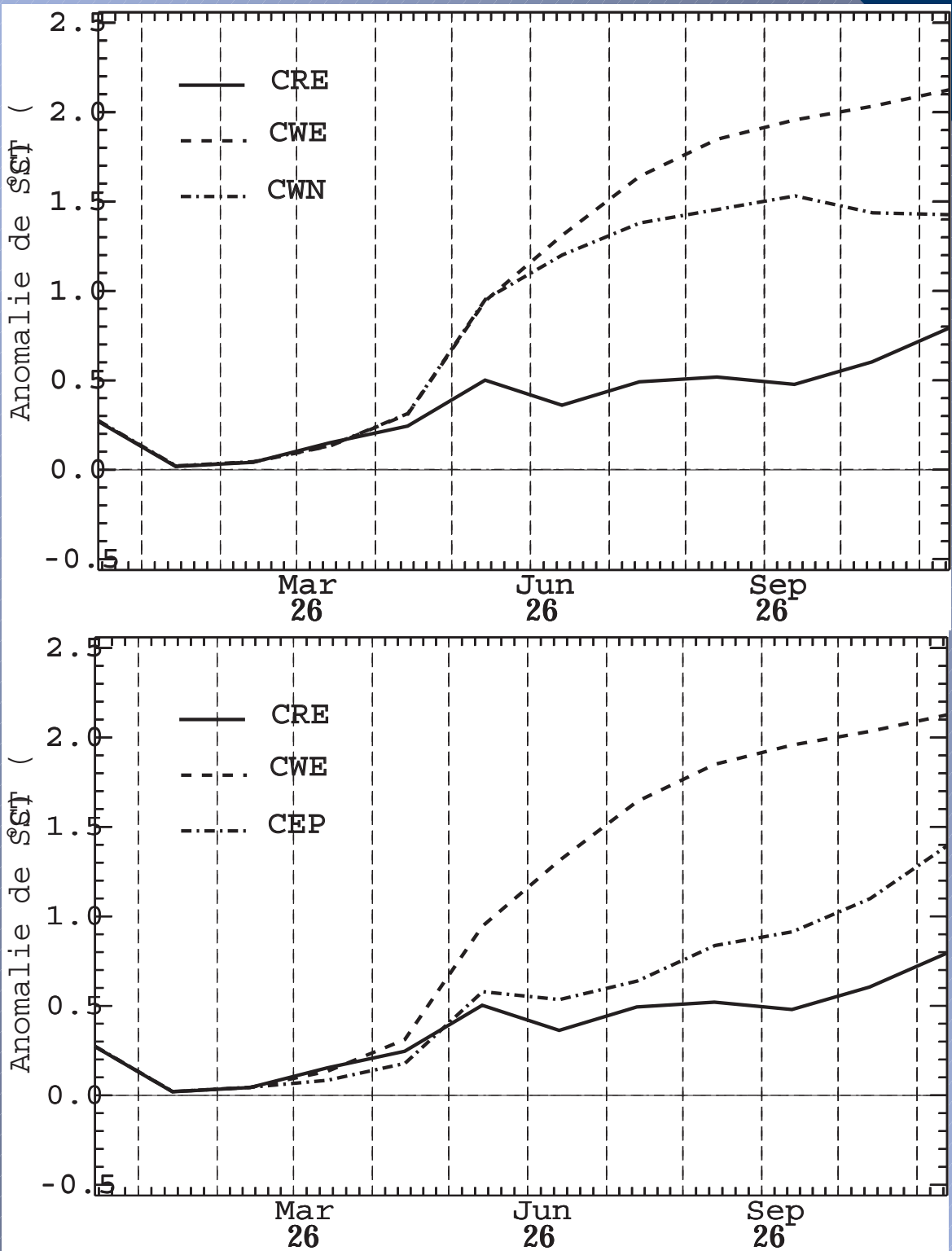
(b) CWWE Nino34 SST Anomaly



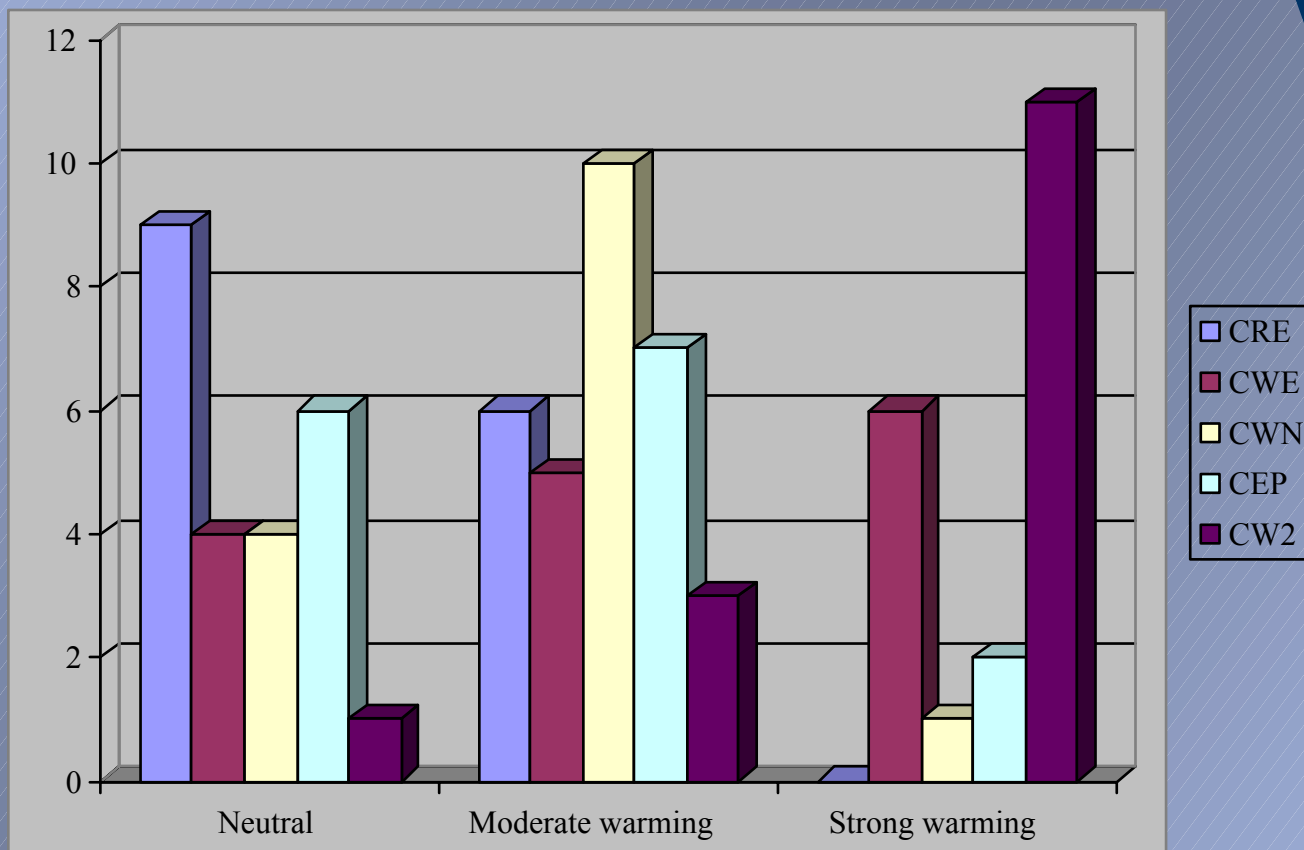
Role of the March 1997 WWE in El Niño onset



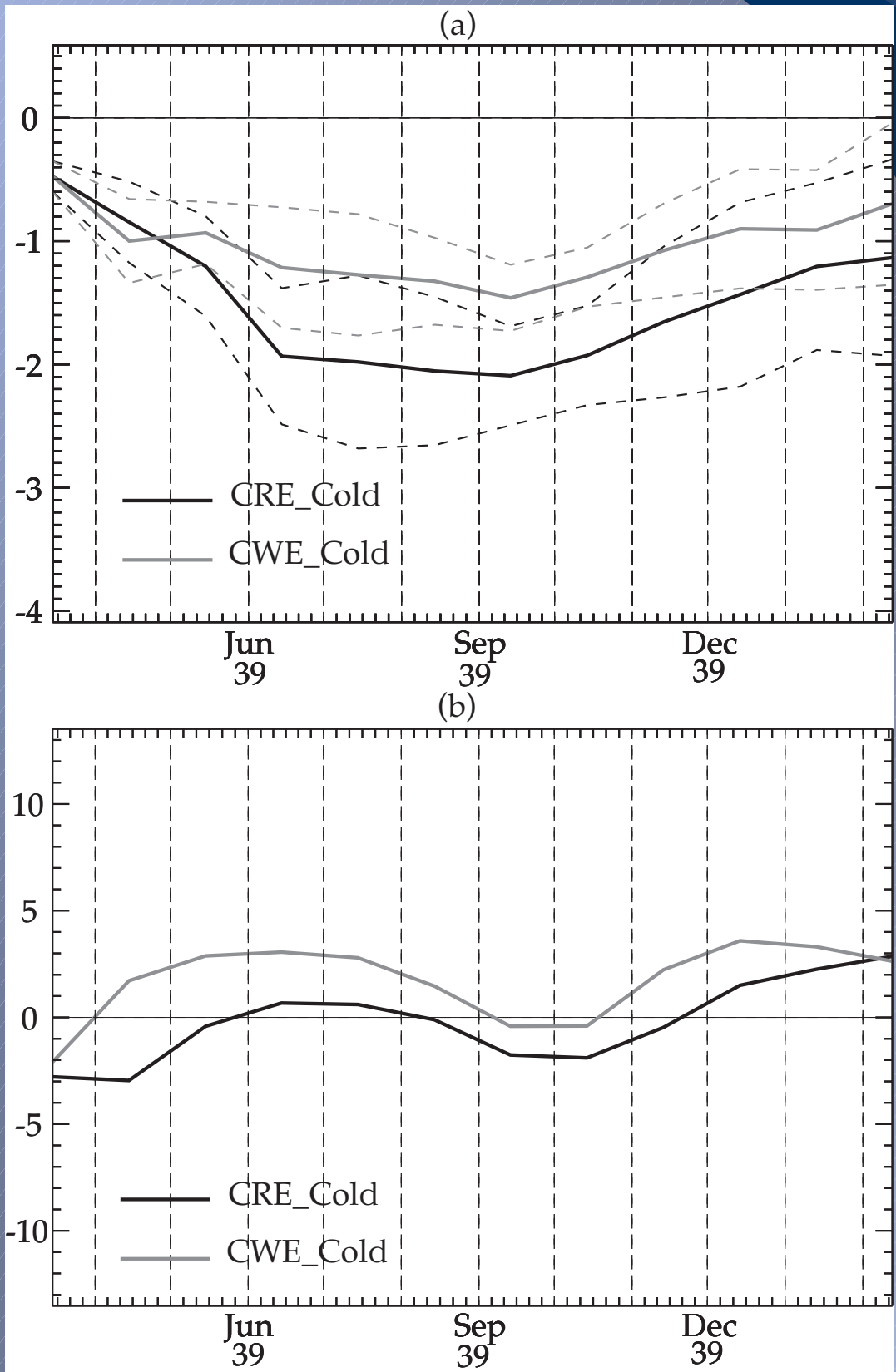
Role of the March 1997 WWE in El Niño onset



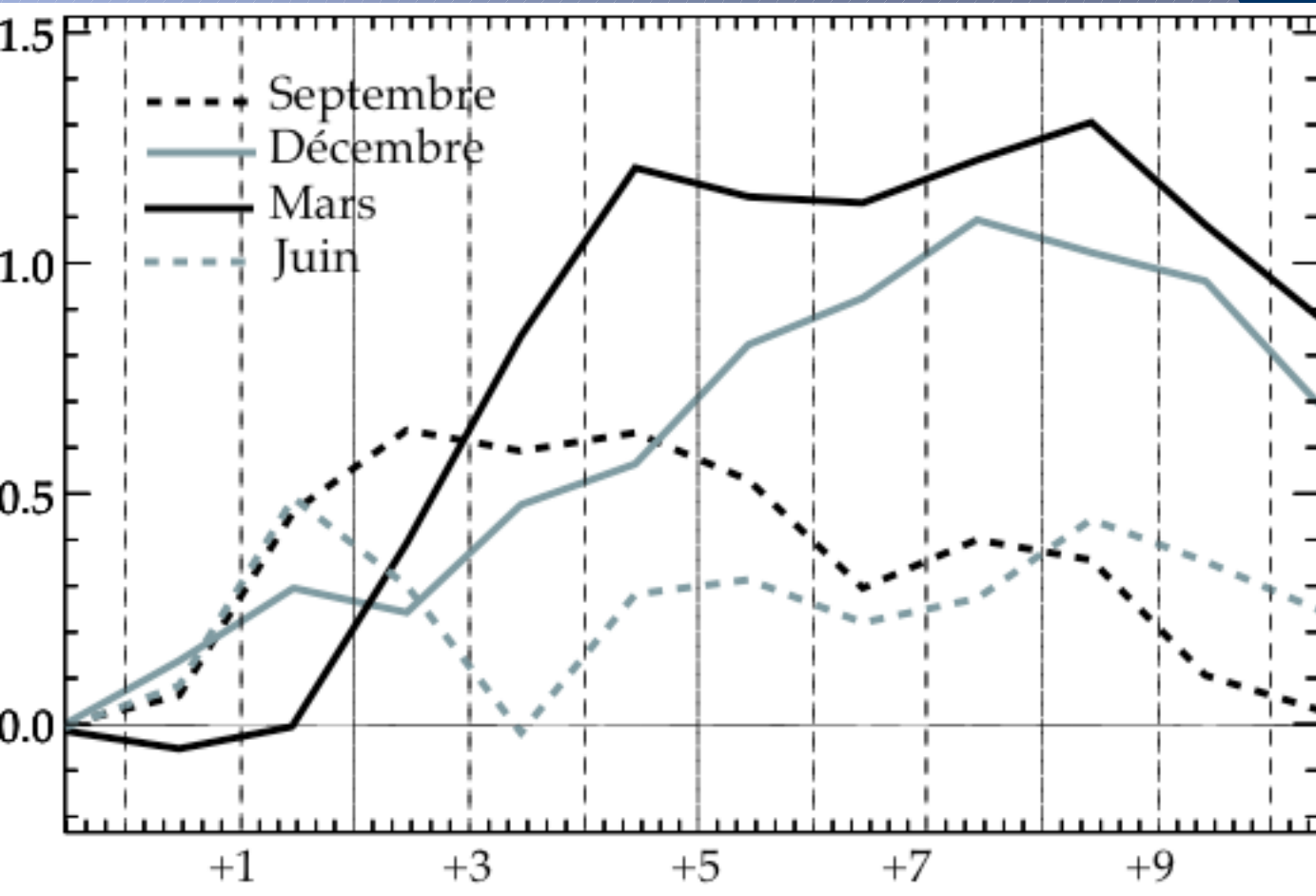
Role of the March 1997 WWE in El Niño onset



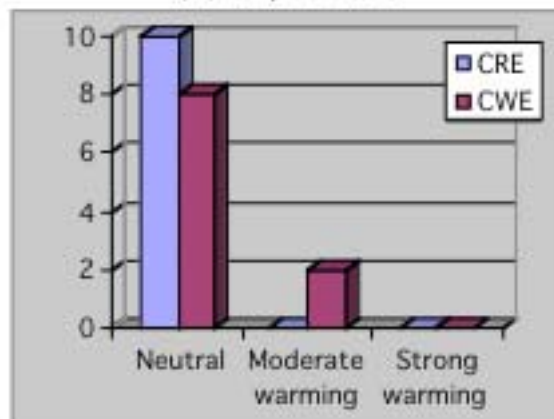
Role of the March 1997 WWE in El Niño onset



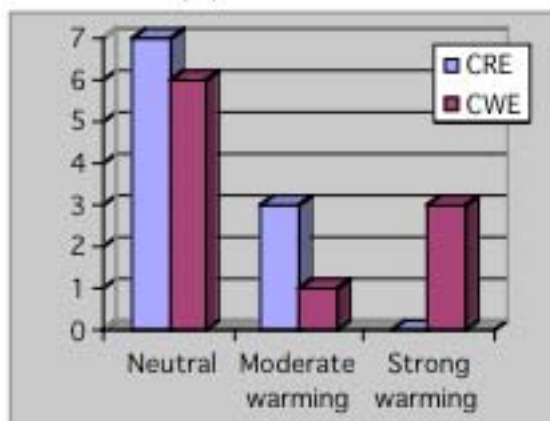
Role of the March 1997 WWE in El Niño onset



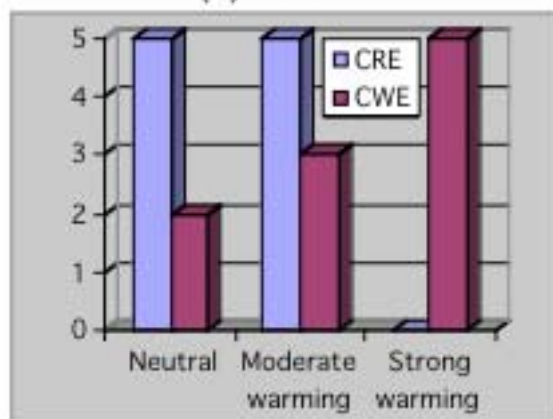
(a) Septembre



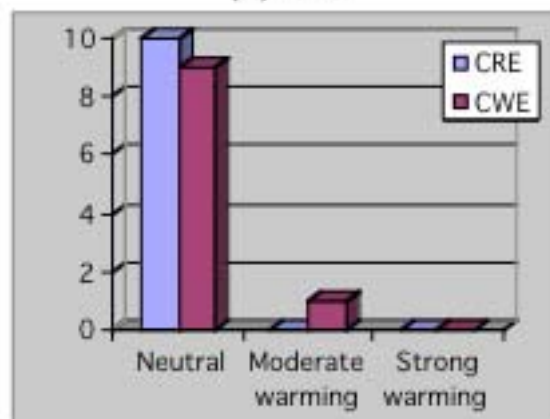
(b) Décembre



(c) Mars



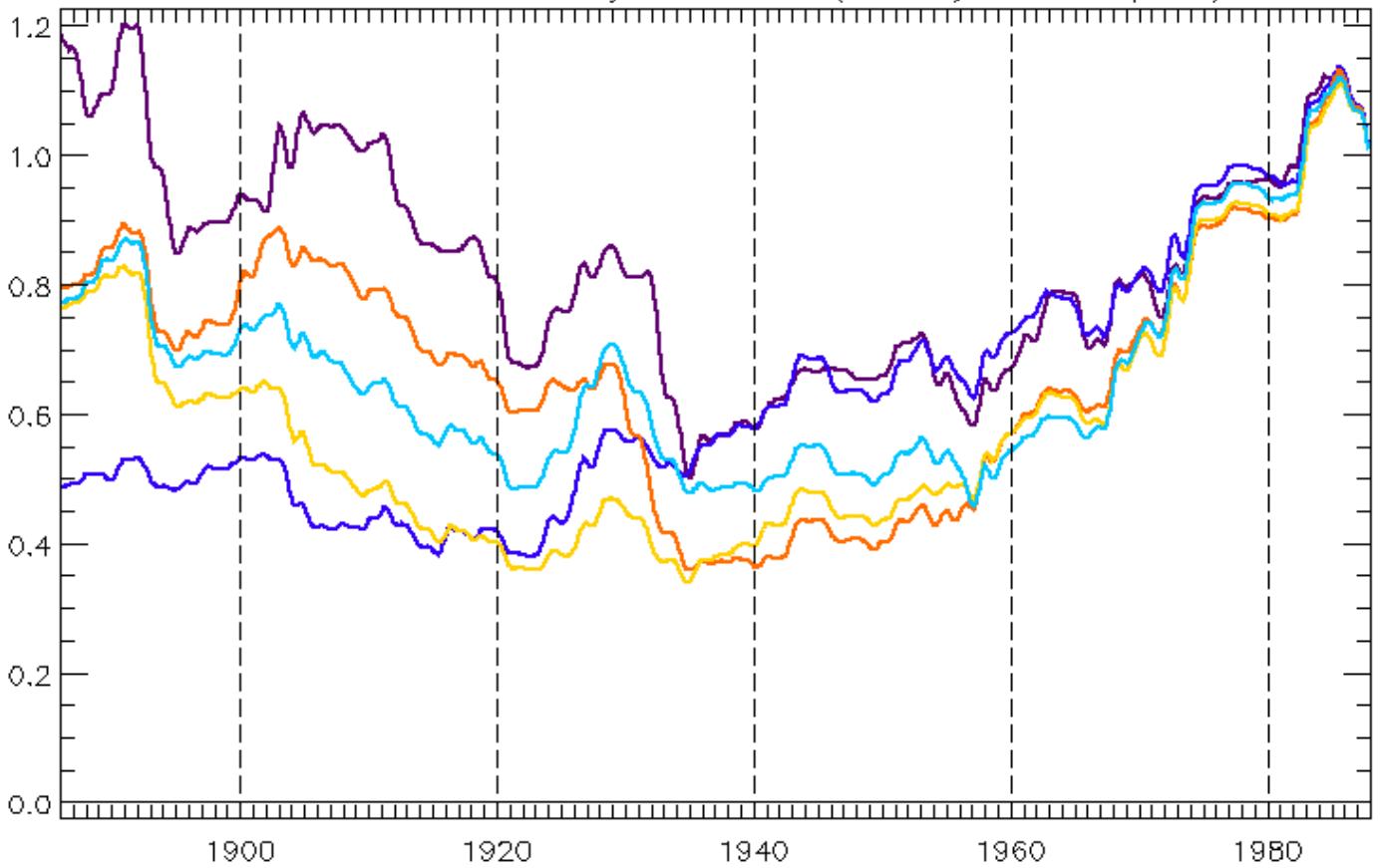
(d) Juin



WWE activity and ENSO dynamics

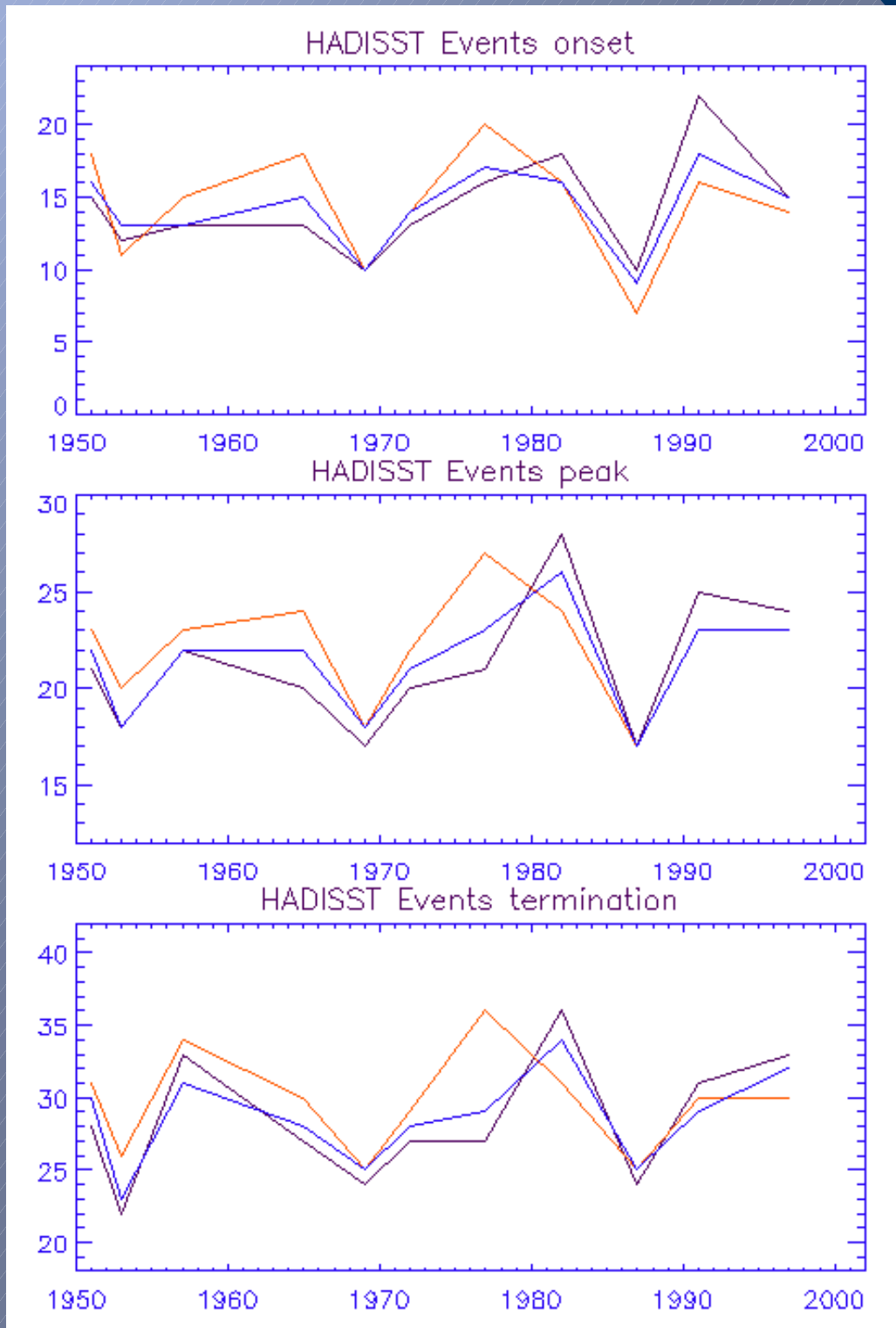
WWE activity and ENSO dynamics

Nino3.4 - Variance 30yr-window (2.5-8year bandpass)



ERSST (dark blue), GISST (orange),
HADISST (yellow), KAPLAN (light blue), SOI (dark line)

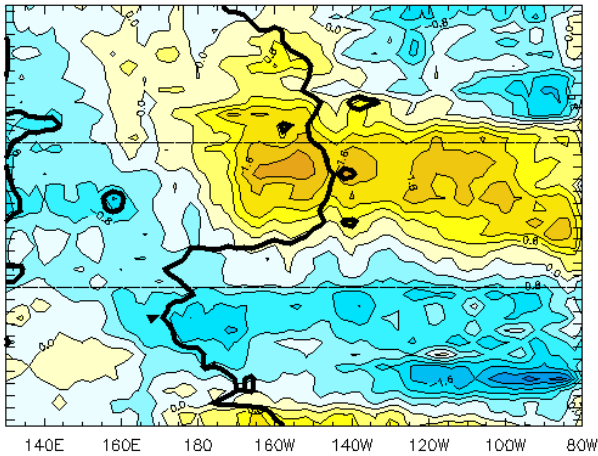
WWE activity and ENSO dynamics



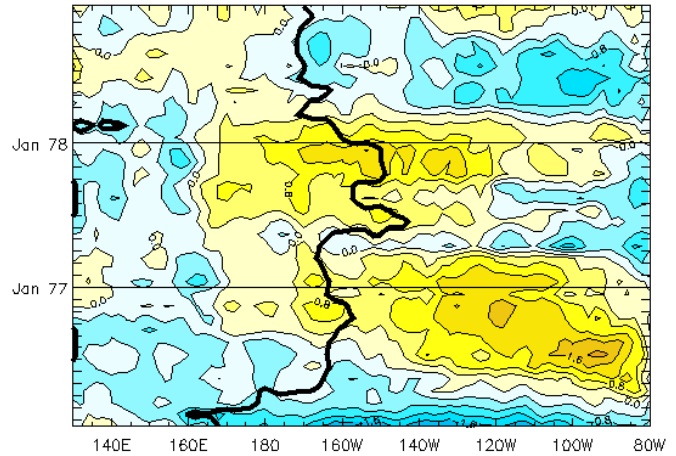
Recent changes in ENSO characteristics

HadISST

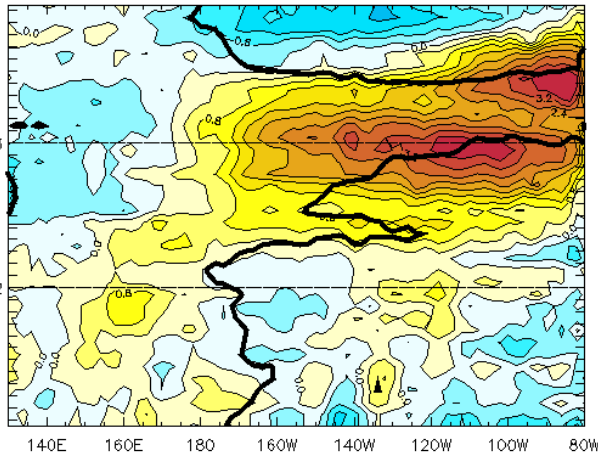
1964-1966



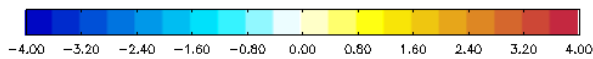
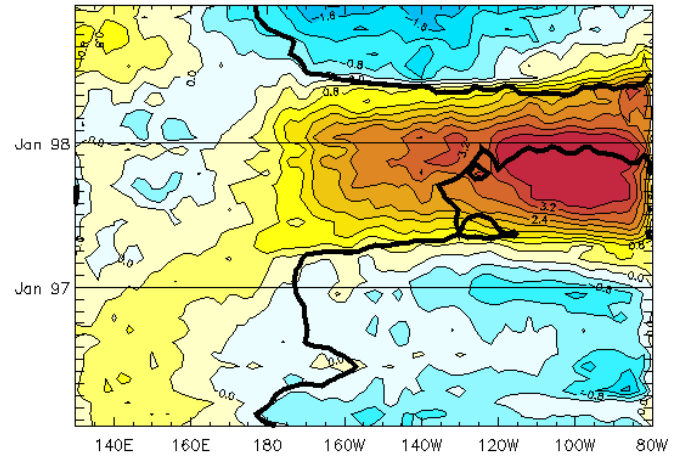
1976-1978



1981-1983



1996-1998



Conclusions

1- Clear impact of an MJO in the termination of the 94-95 Dipole event in the IO.

Questions:

-what favors the occurrence of such an MJO in 94 and not in 97? Is it stochastic or are there any large scale conditions favoring such an occurrence?

Conclusions

2- Strong impact of the March 1997 wind event on El Niño

-Positive feedbacks (more WWE activity)

-Large dispersion (is it model dependent or does it reveal a « natural » sensitivity of the coupled system?)

-Can we define criteria associated to a risk of extreme El Niño occurrence?

-What is the exact role of the MJO? Is it a real contributor to ENSO or one of the mechanisms by which a strong WWE can occur? In such a case, as much efforts should be put in modelling the other mechanisms (e.g. cold surges, cyclones, etc...) as in modelling MJO.

Conclusions

3- WWE and ENSO:

Is the change in dynamics observed with the 1982-1983 Event related to a different impact/sensitivity of IntraSeasonal Activity in the Pacific?