Monthly and Interannual Variability of the Eastern Pacific Warm Pool

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Results indicate:

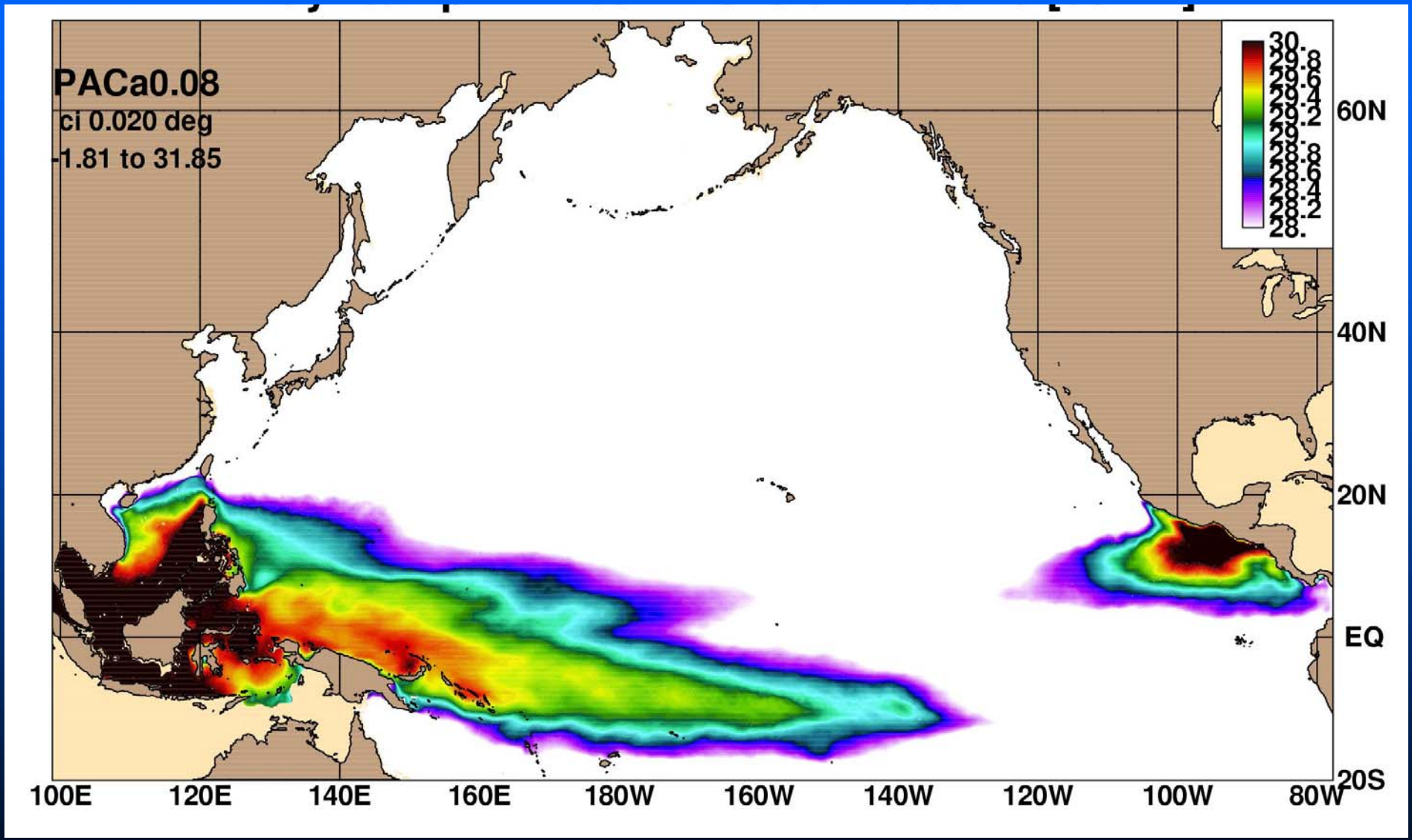
- The Eastern Pacific Warm Pool (EPWP) strengthens and weakens, but remains throughout the year.
- The monthly variability of the EPWP is forced by the surface heat fluxes.
- The interannual variability of the EPWP is modulated by the warm water advected poleward by interannual coastally trapped waves.

Tools

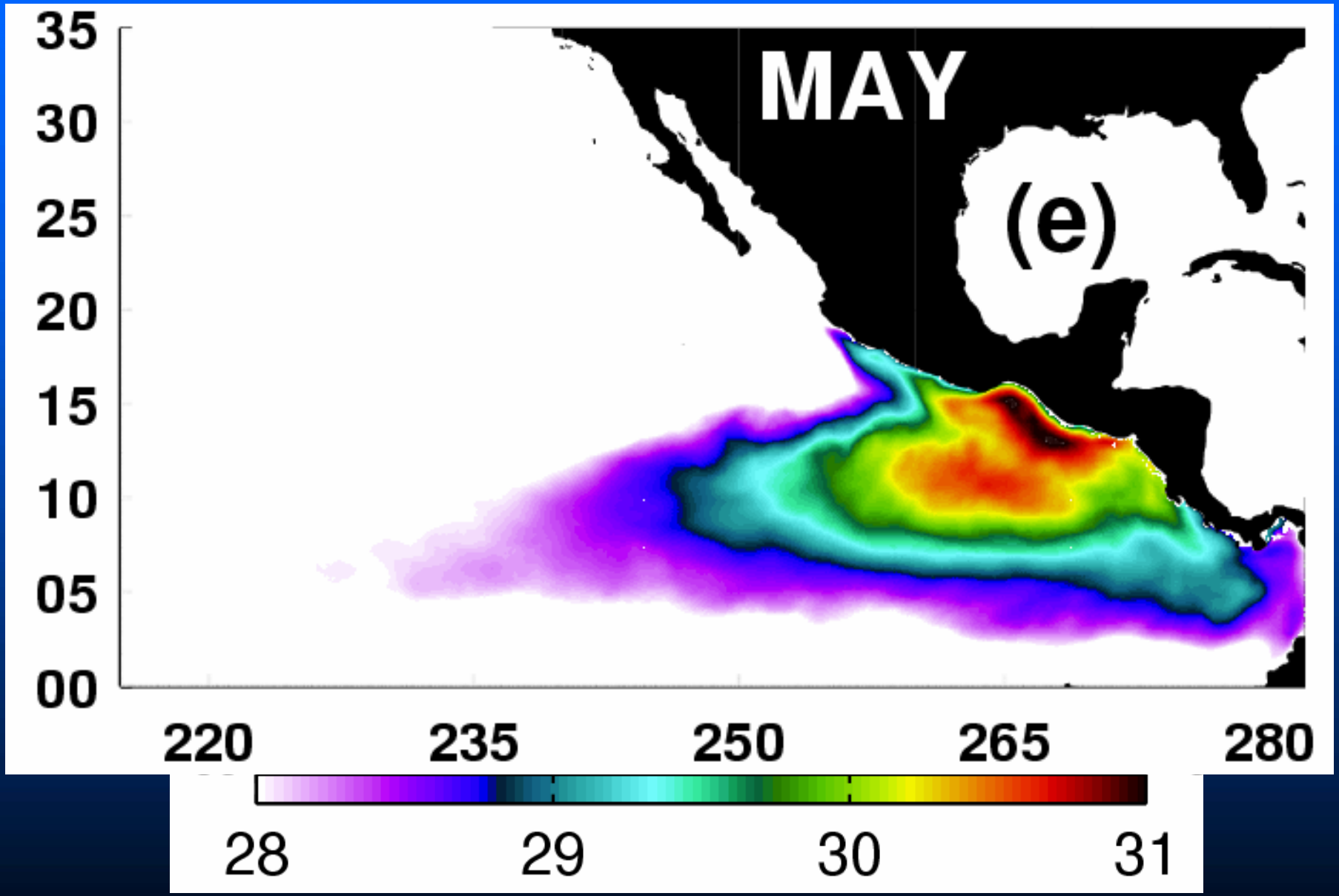
- 25 year non-assimilative simulation (1979-2003) of a Pacific configuration of HYCOM.
- 13 year (1993-2006) of Sea Surface Temperature data from the Modular Ocean Data Assimilation System (MODAS).

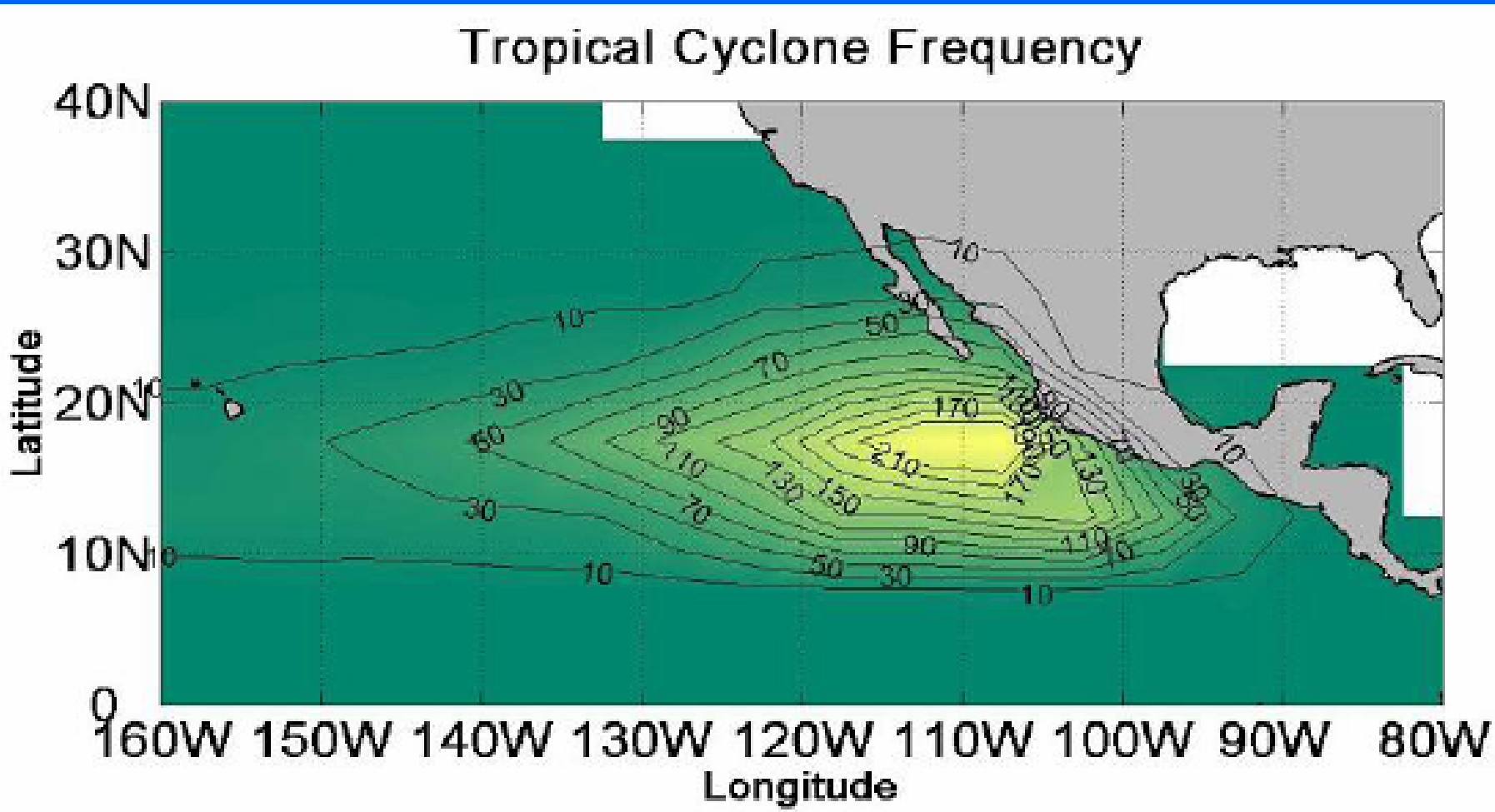
1/12° Pacific HYCOM Basin-scale Temperature

SST Climatological Mean (1979-2003) for May

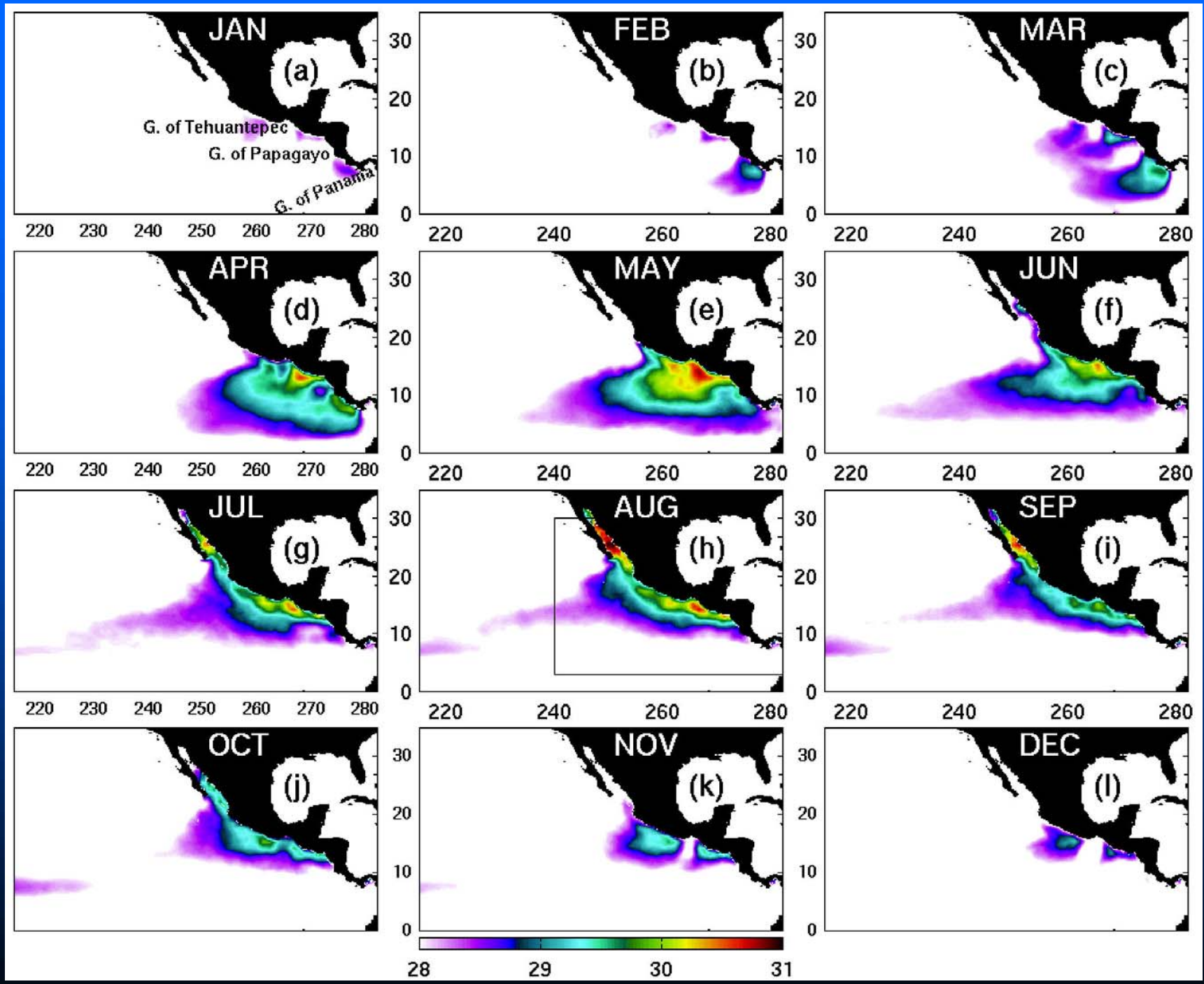


SST Climatological Mean (1979-2003) for May





The eastern Tropical Pacific area of cyclone formation accounts for ~17% of the global total of tropical storm development (Amador et al., 2006).


JAN
(a)
G. of Tehuantepec
G. of Papagayo
G. of Panama
FEB
(b)
MAR
(c)
APR
(d)
MAY
(e)
JUN
(f)
JUL
(g)
AUG
(h)
SEP
(i)
OCT
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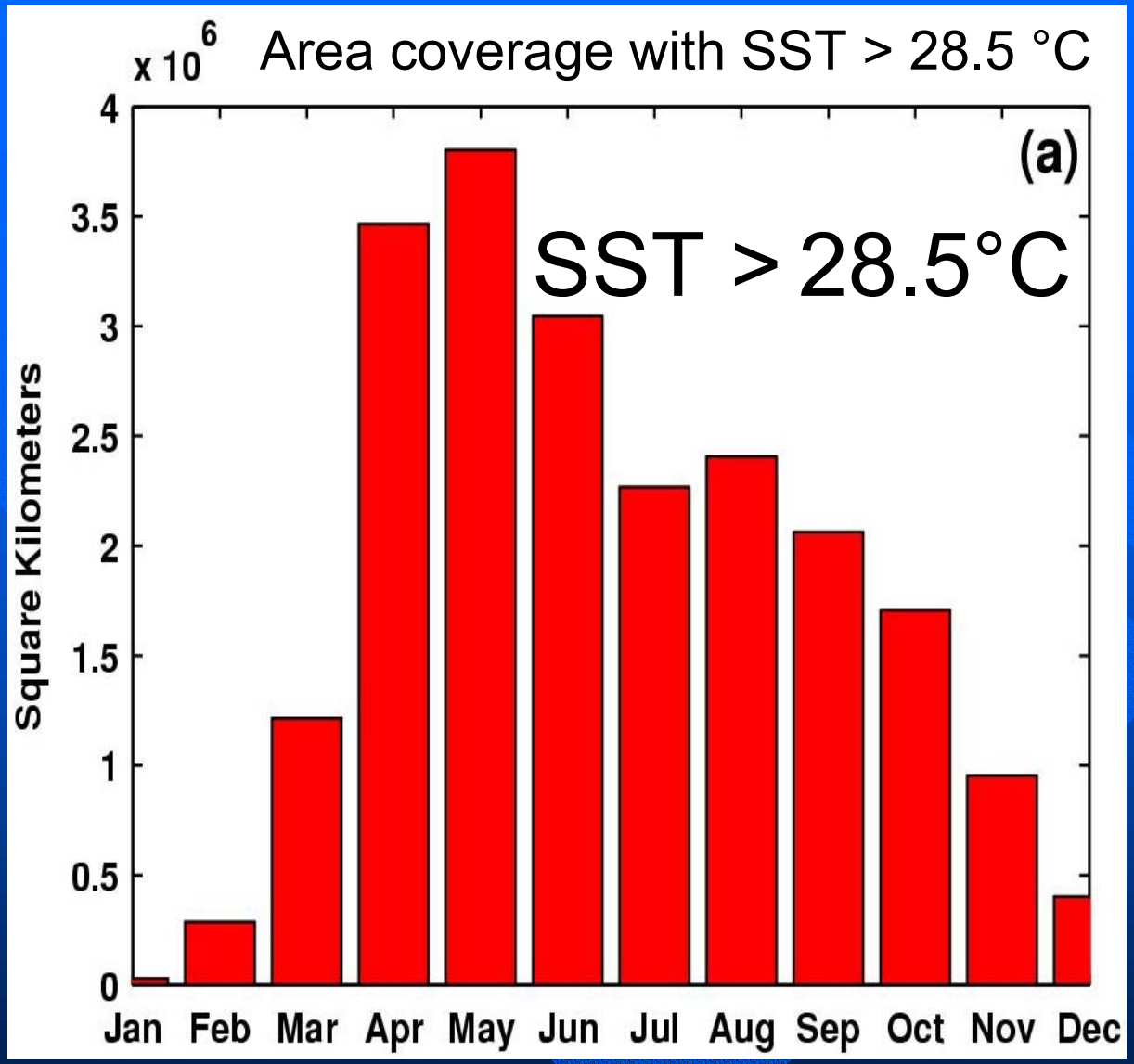
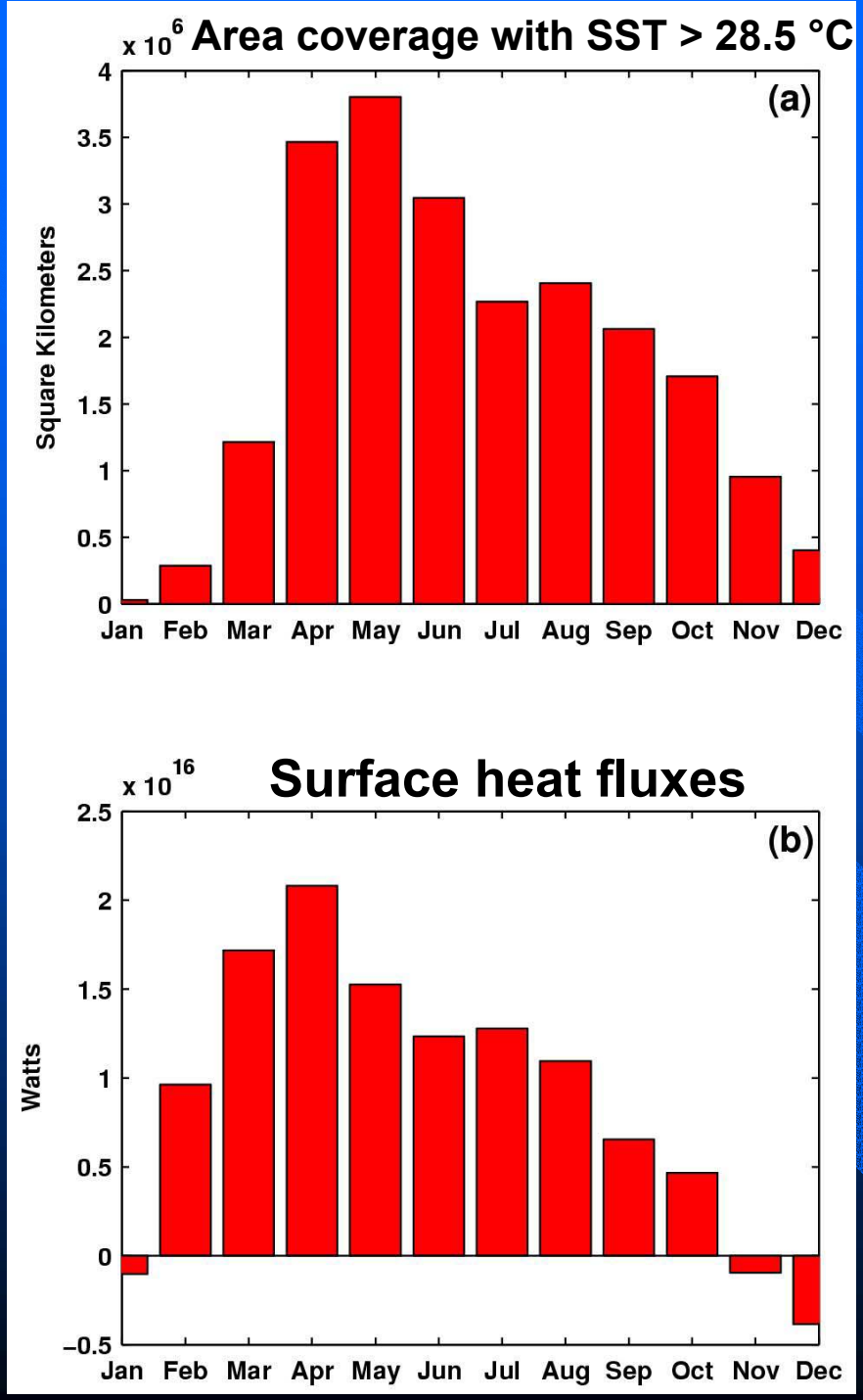
NOV
(k)
DEC
(l)
220 230 240 250 260 270 280
0 10 20 30
28 29 30 31



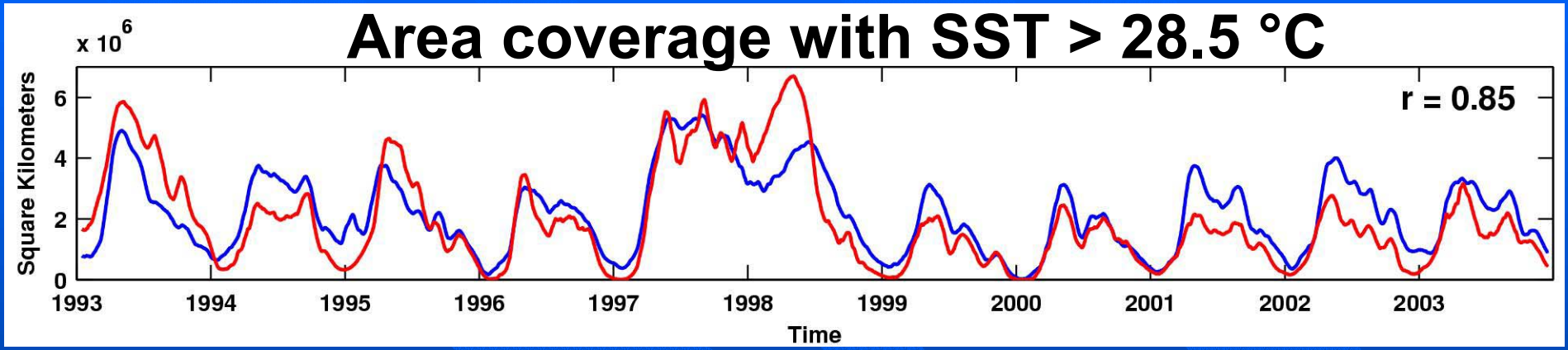
- Why does the EPWP reach its maximum during May ?
- Why does the EPWP weaken during mid summer ?



SST > 28.5°C

- EPWP's May maximum of ~4,000,000 km^2
- EPWP's January minimum of ~30,000 km^2
- EPWP's July mid-summer minimum of ~2,300,000 km^2
- EPWP gains heat through the surface from February to October
- EPWP loses heat from November to January.

SST > 28.5°C



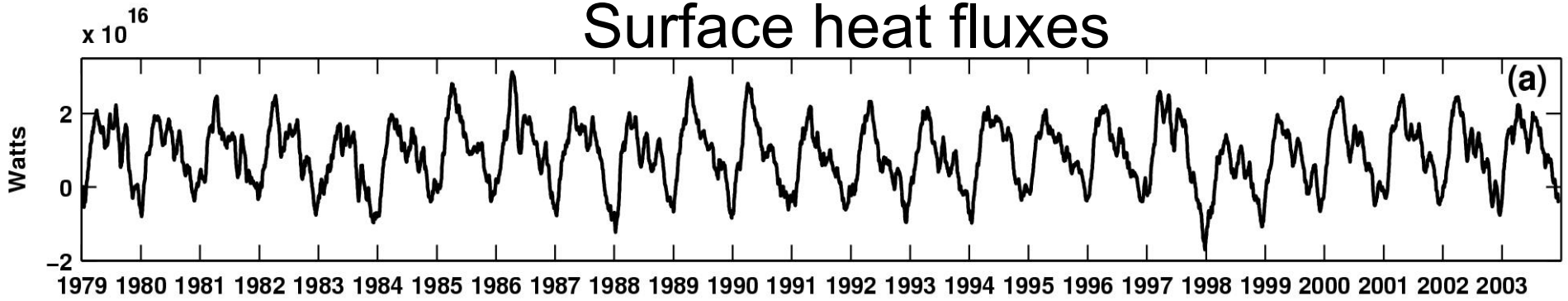
MODAS is blue

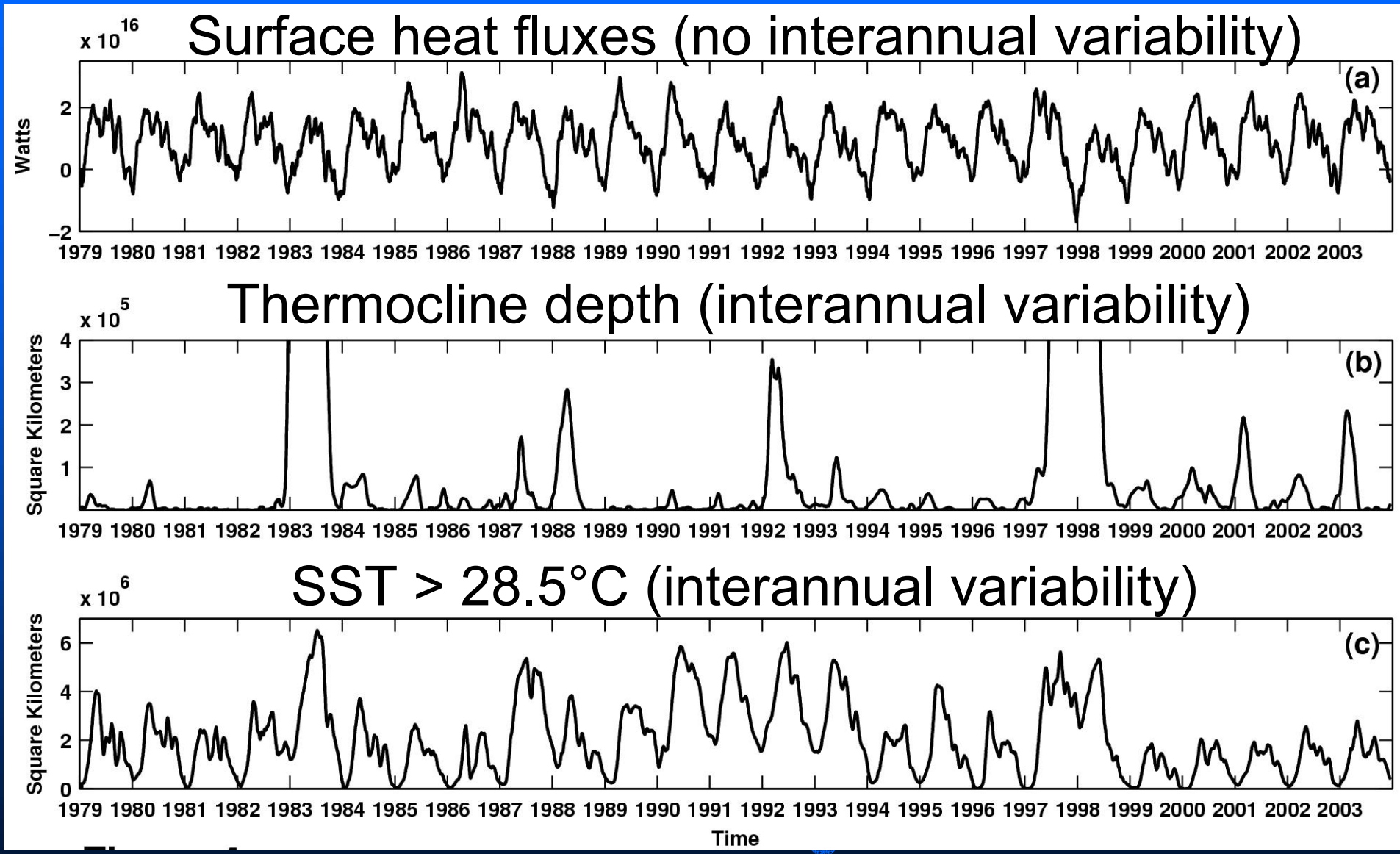
HYCOM is red

- The monthly variability of the EPWP is forced by the surface heat fluxes.

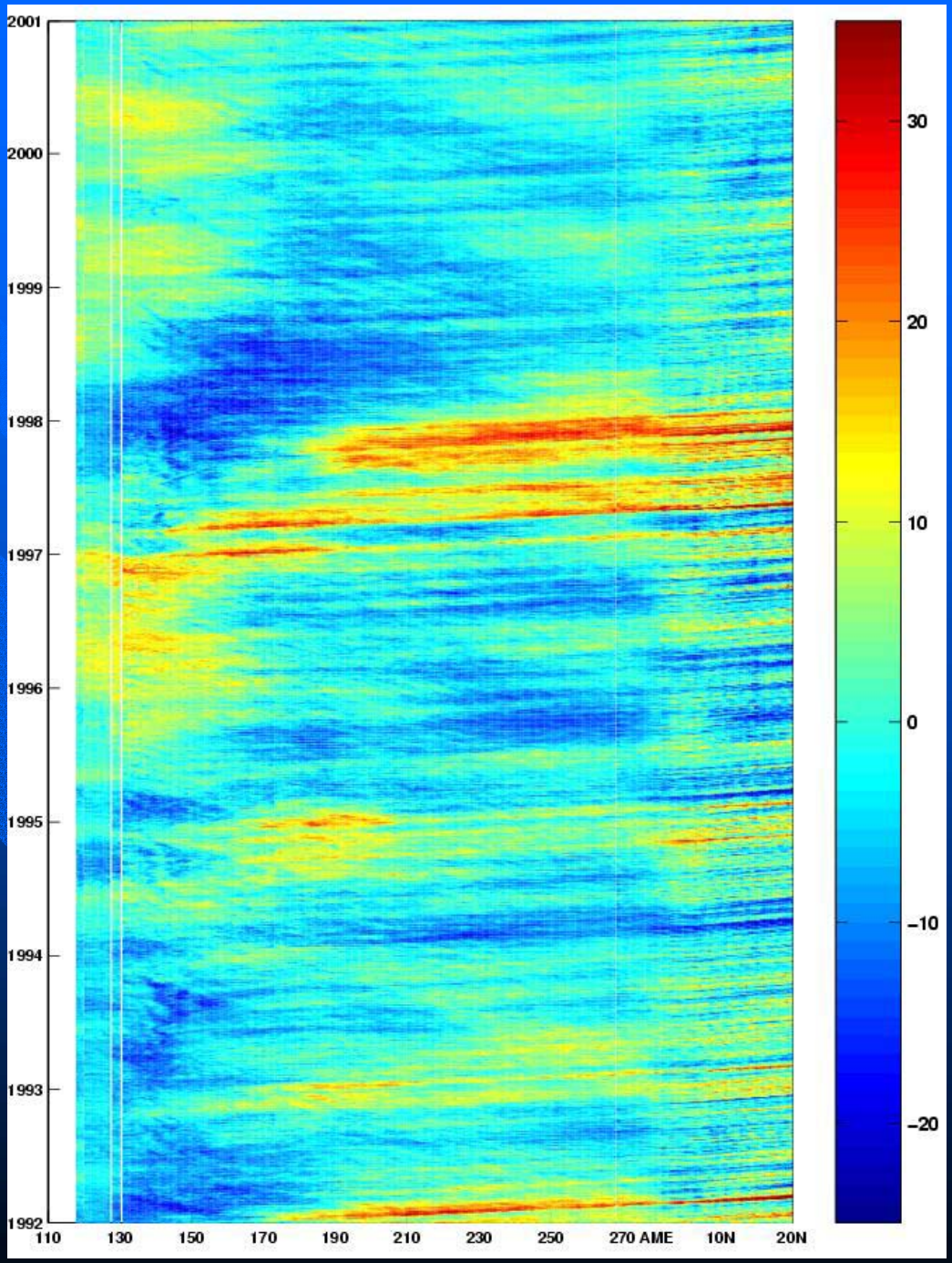
- If the surface heat fluxes are the main forcing of the EPWP, then the surface heat fluxes should include an interannual variability, since the EPWP includes interannual variability in extension and strength.

Surface heat fluxes




Surface heat fluxes (no interannual variability)
x 10^16
Watts
2
0
−2
(a)
1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Thermocline depth (interannual variability)
x 10^5
Square Kilometers
4
3
2
1
(b)
1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
SST > 28.5°C (interannual variability)
x 10^6
Square Kilometers
6
4
2
0
(c)
1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Time

- Sea surface height anomaly time series from 1/16° Pacific NLOM, first along the equator (starting in the western Pacific and propagating eastward until arrival at the Americas West Coast), and second along the coast to the 20°N.



Summary

- The EPWP includes maximums and minimums of ~4,000,000 km^2, and ~30,000 km^2 during May and January, respectively and a mid-summer relative minimum of ~2,300,000 km^2 during July. Those maximums and minimums are partially explained by the corresponding one month lagged maximums and minimums in the Surface heat fluxes.

- The extension of the EPWP has a strong interannual variability increasing (decreasing) during El Niño (La Niña) years. That is due to the interannual variability in the generation of Equatorial Pacific Kelvin waves.

Research in Progress