Eastern Pacific Ocean Circulation: Vertical motion

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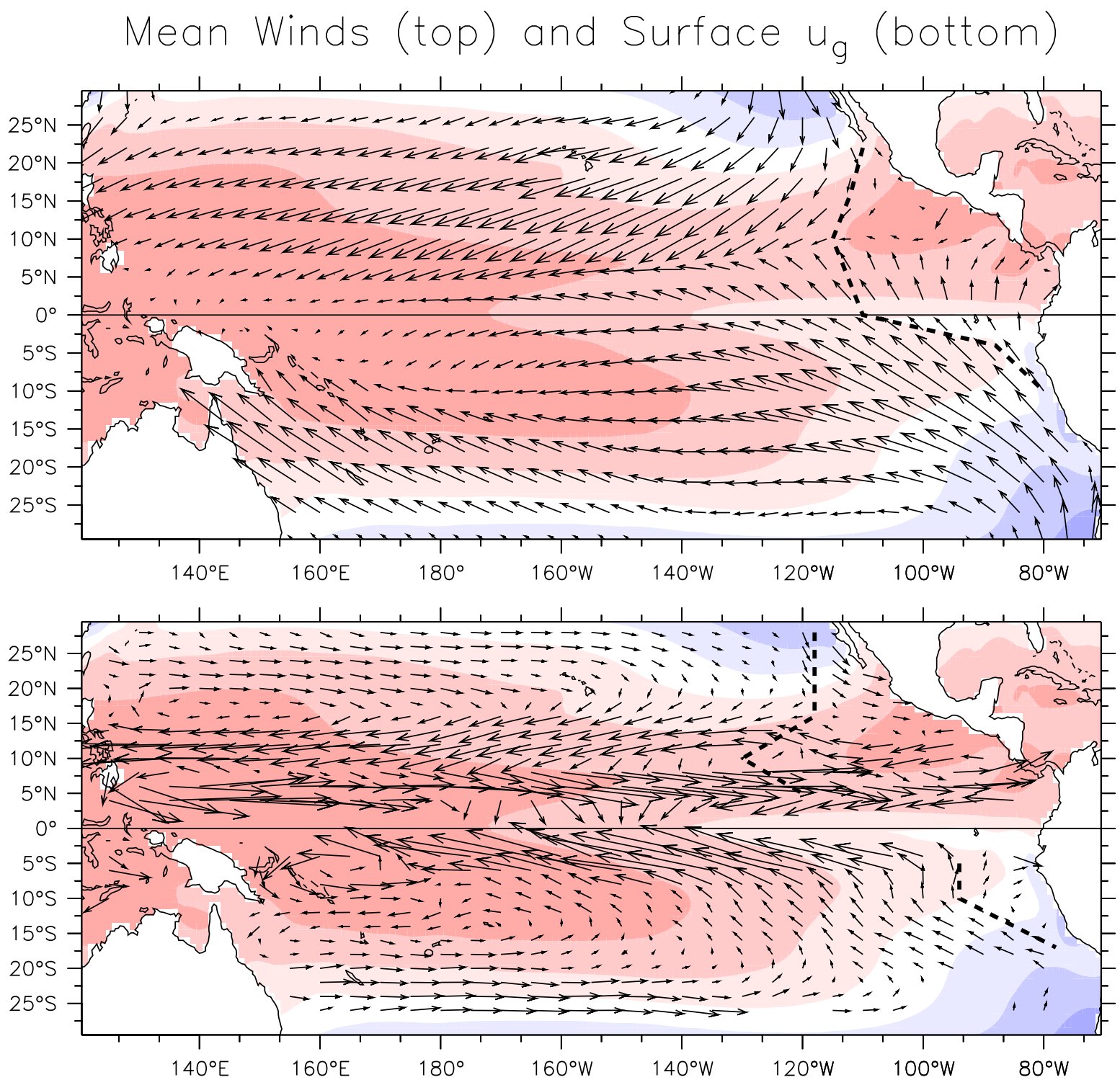
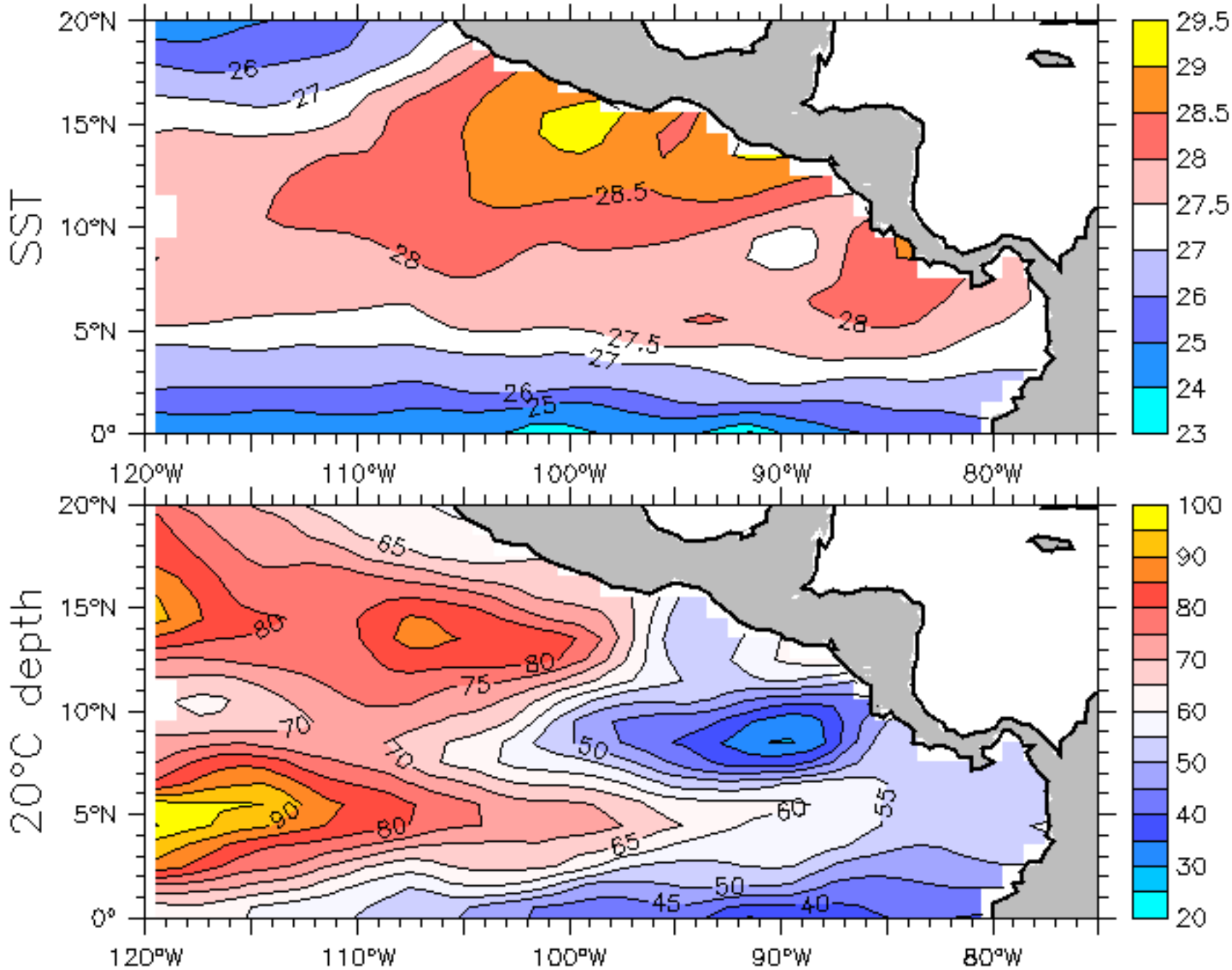
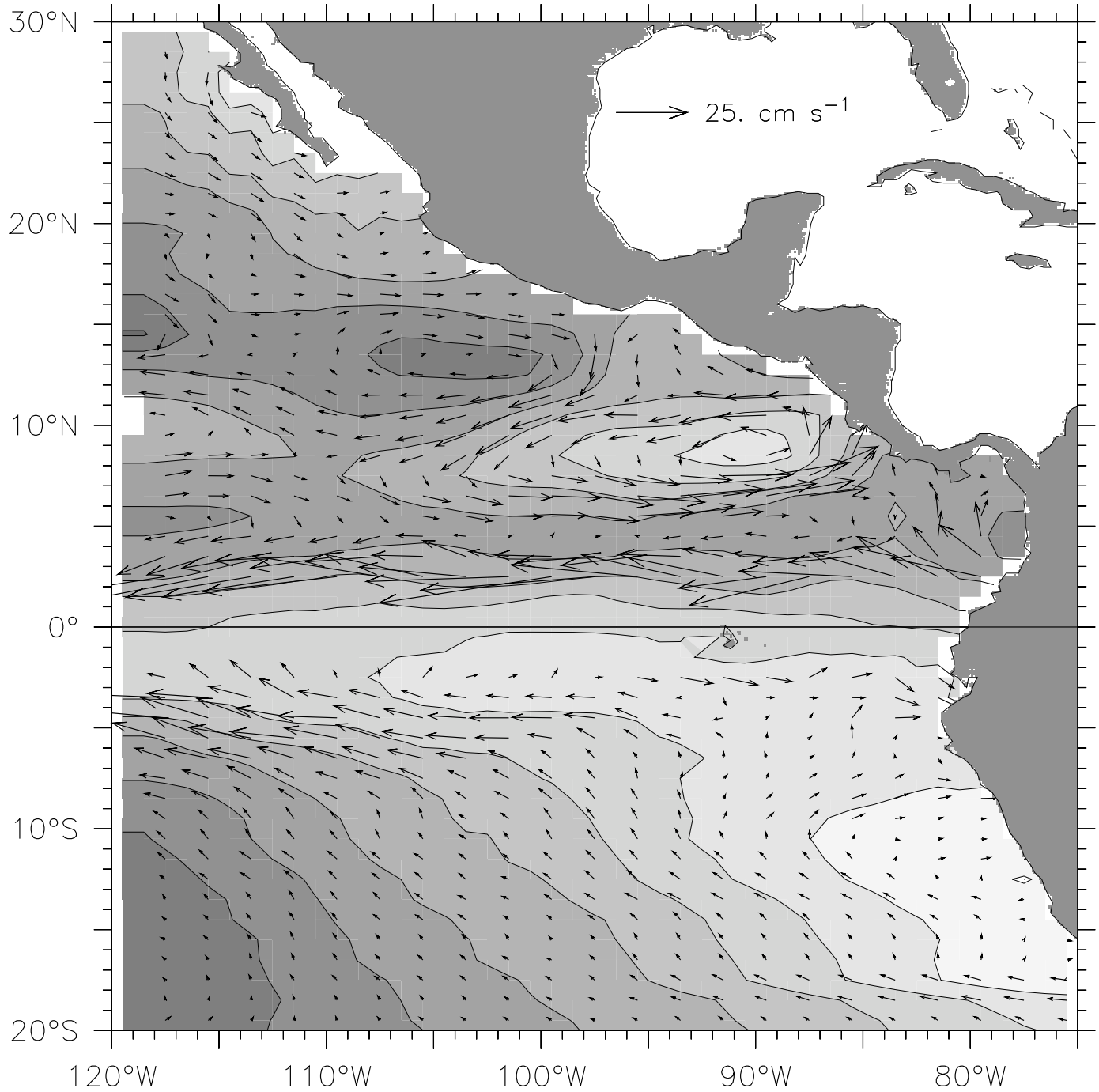
The off-equatorial eastern Pacific is one of few regions with easy communication through the thermocline.


Mean Winds (top) and Surface u_g (bottom)
25°N
20°N
15°N
10°N
5°N
0°
5°S
10°S
15°S
20°S
25°S
140°E
160°E
180°
160°W
140°W
120°W
100°W
80°W

Mean SST and 20°C depth

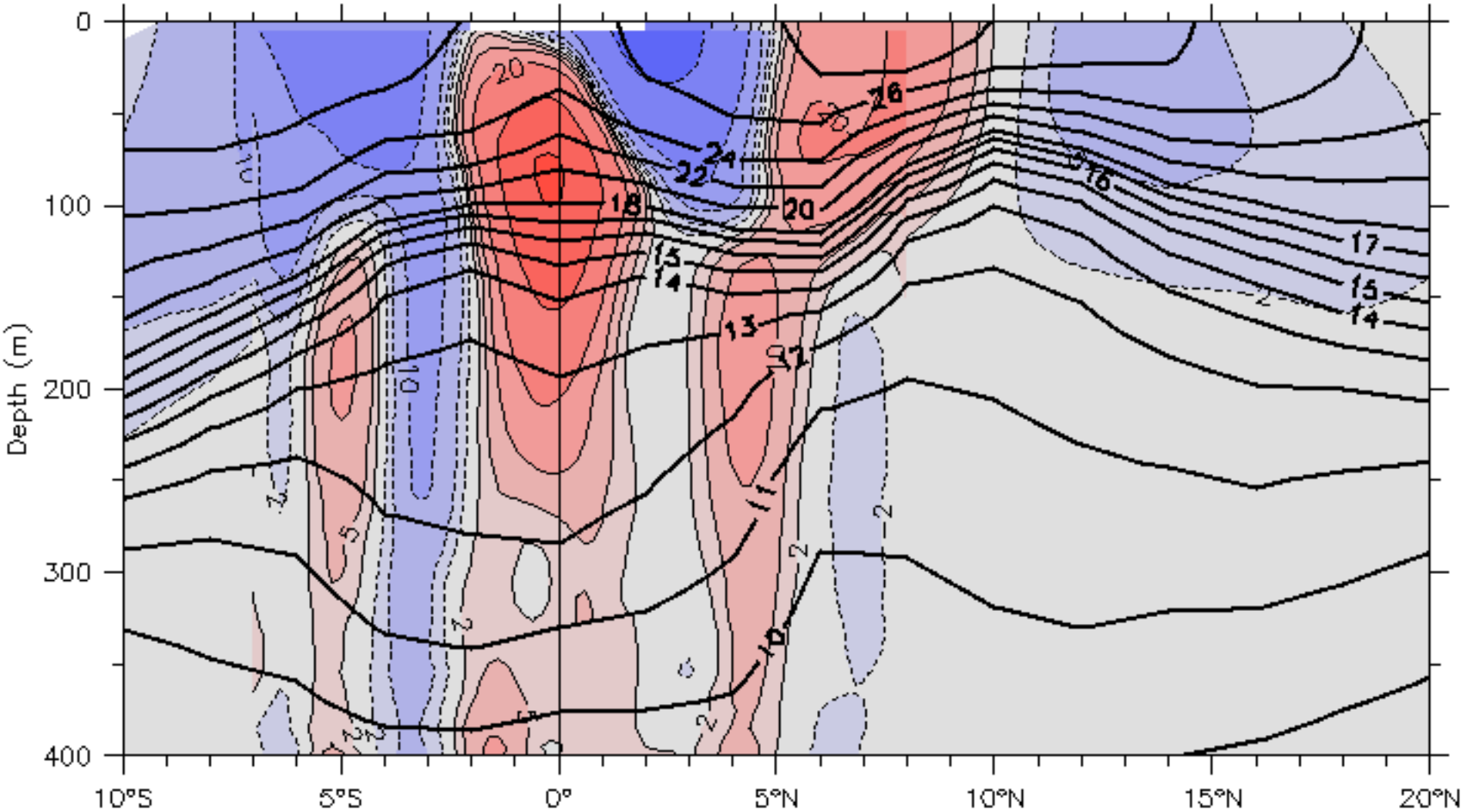
AOML XBT data set

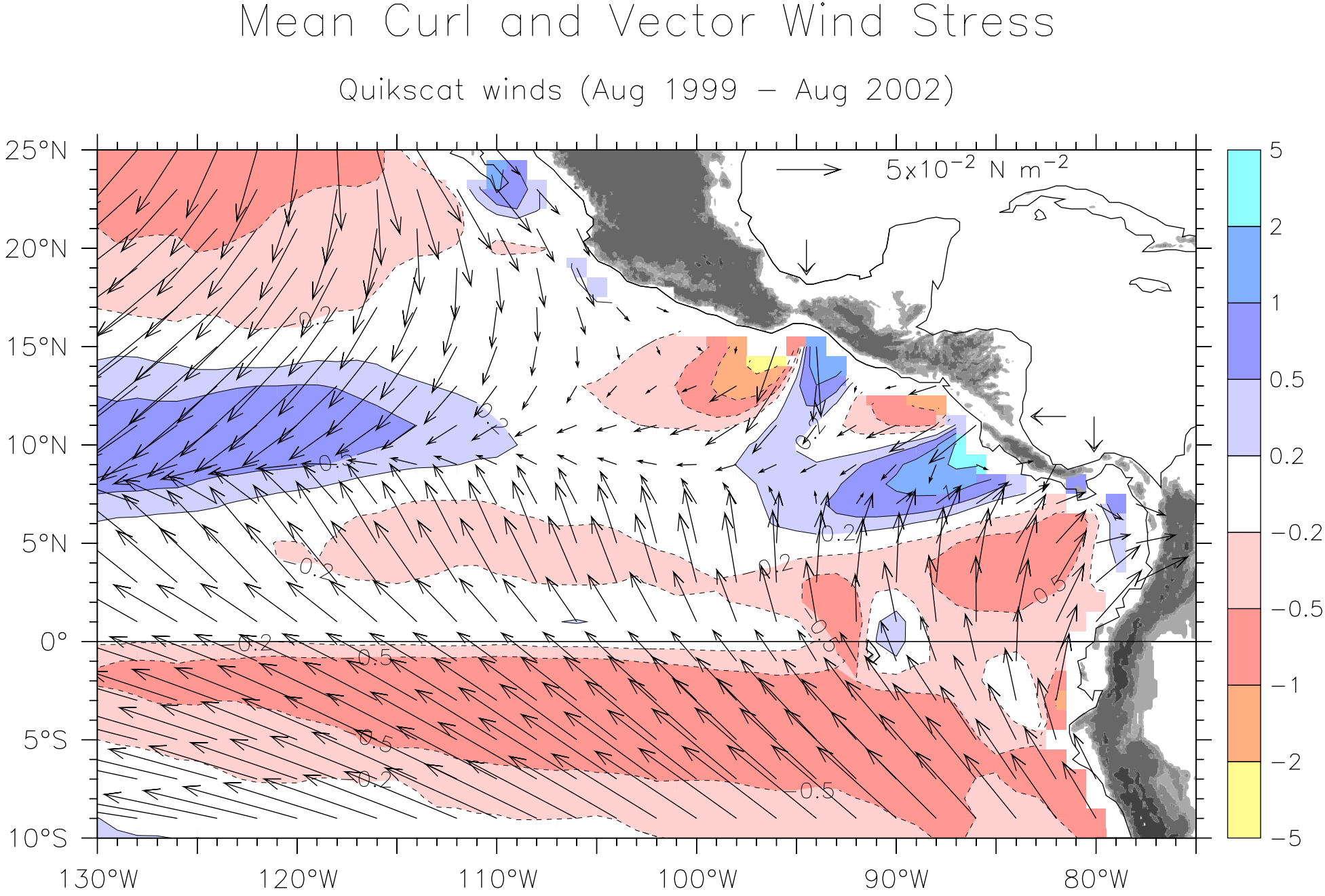



Dynamic ht and surface geostrophic currents
25. cm s^{-1}
30°N
20°N
10°N
0°
10°S
20°S
120°W
110°W
100°W
90°W
80°W

Temperature and zonal current at 125°W

XBT temperatures and u_g. ADCP u within 7°S–8°N




Mean Curl and Vector Wind Stress
Quikscat winds (Aug 1999 – Aug 2002)
5x10^-2 N m^-2
25°N
20°N
15°N
10°N
5°N
0°
5°S
10°S
130°W
120°W
110°W
100°W
90°W
80°W
5
2
1
0.5
0.2
−0.2
−0.5
−1
−2
−5

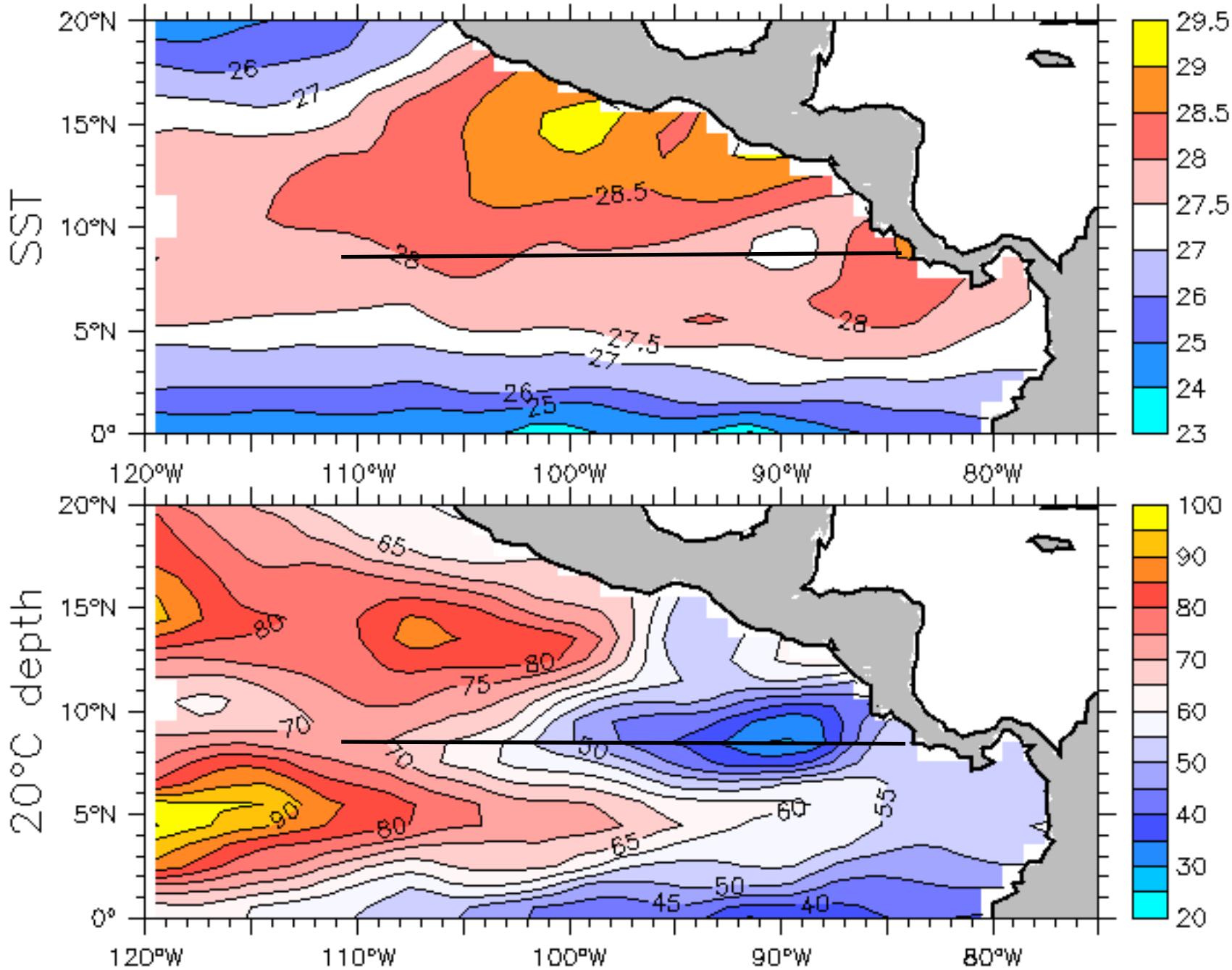
Sverdrup balance (steady, conserving potential vorticity)

The stretching due to Ekman pumping: $w_E = Curl(\tau/f)$

is balanced by stretching due to meridional motion: $f\frac{\partial w}{\partial z} = \beta v_g$

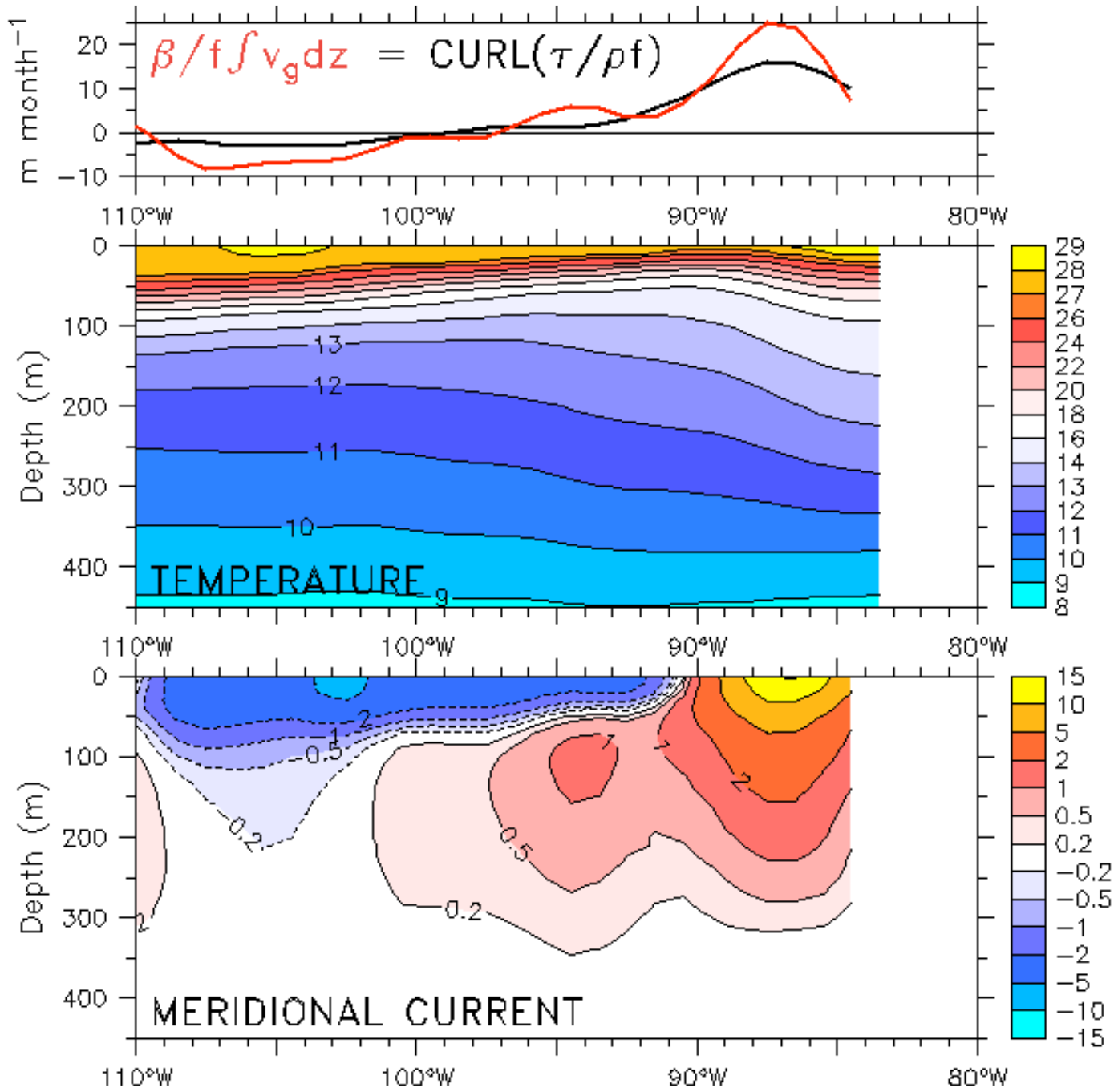
Mean SST and 20°C depth

AOML XBT data set



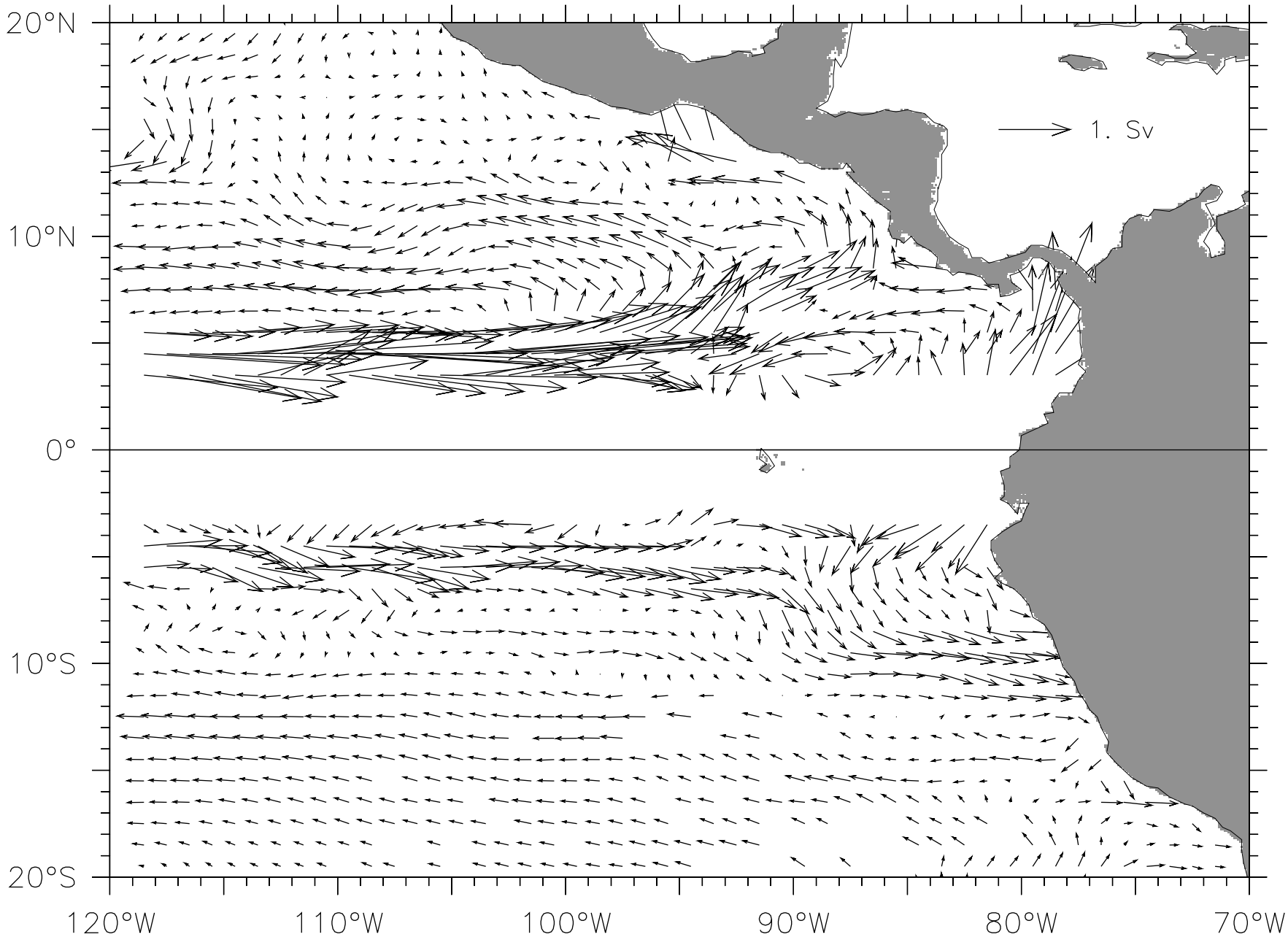
Mean Temperature and Meridional current along 8.5°N

AOML XBT observations (+Quikscat curl)



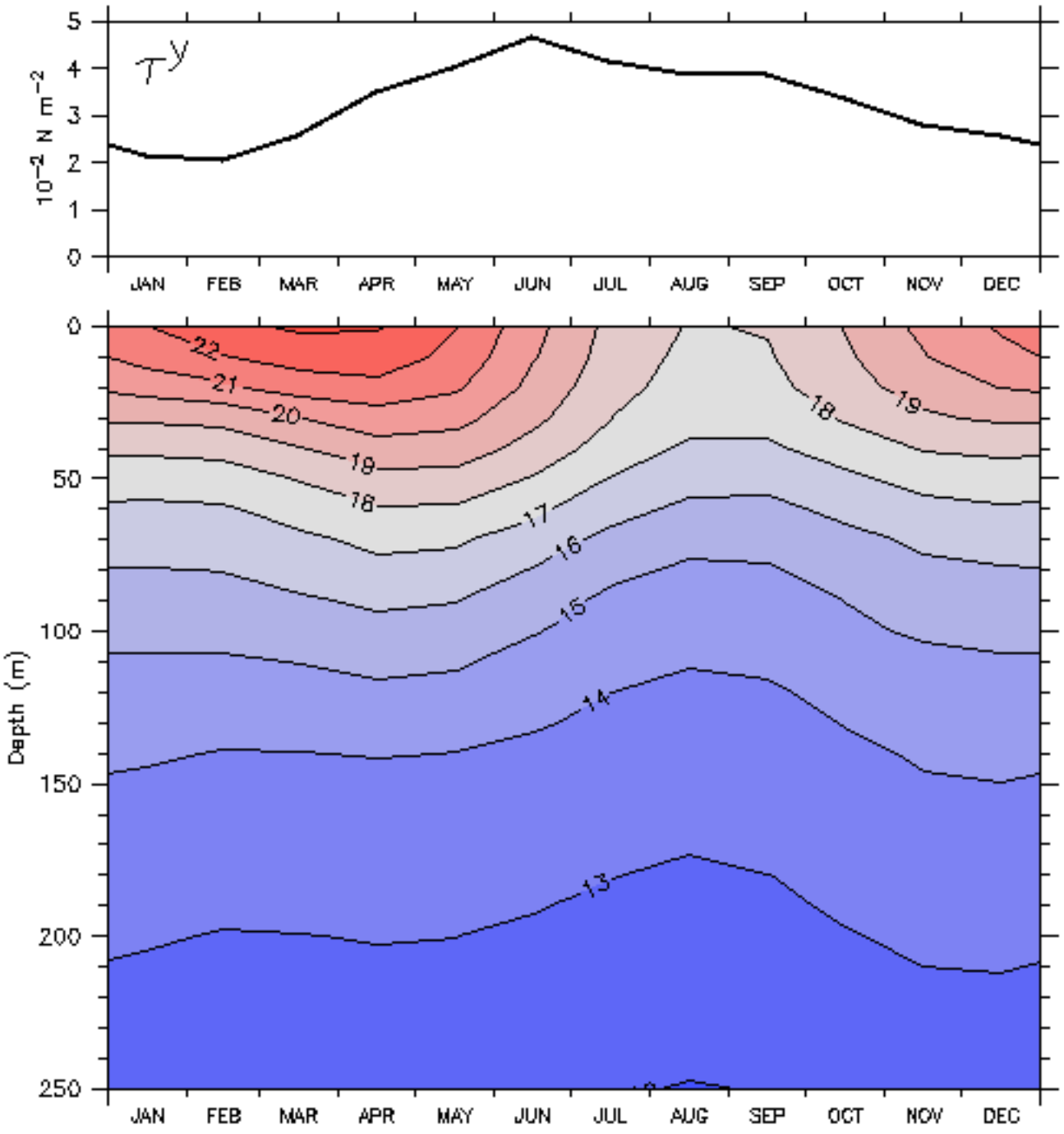
Circulation below the thermocline

Transport between 450m and 17°C (XBT geostrophy)



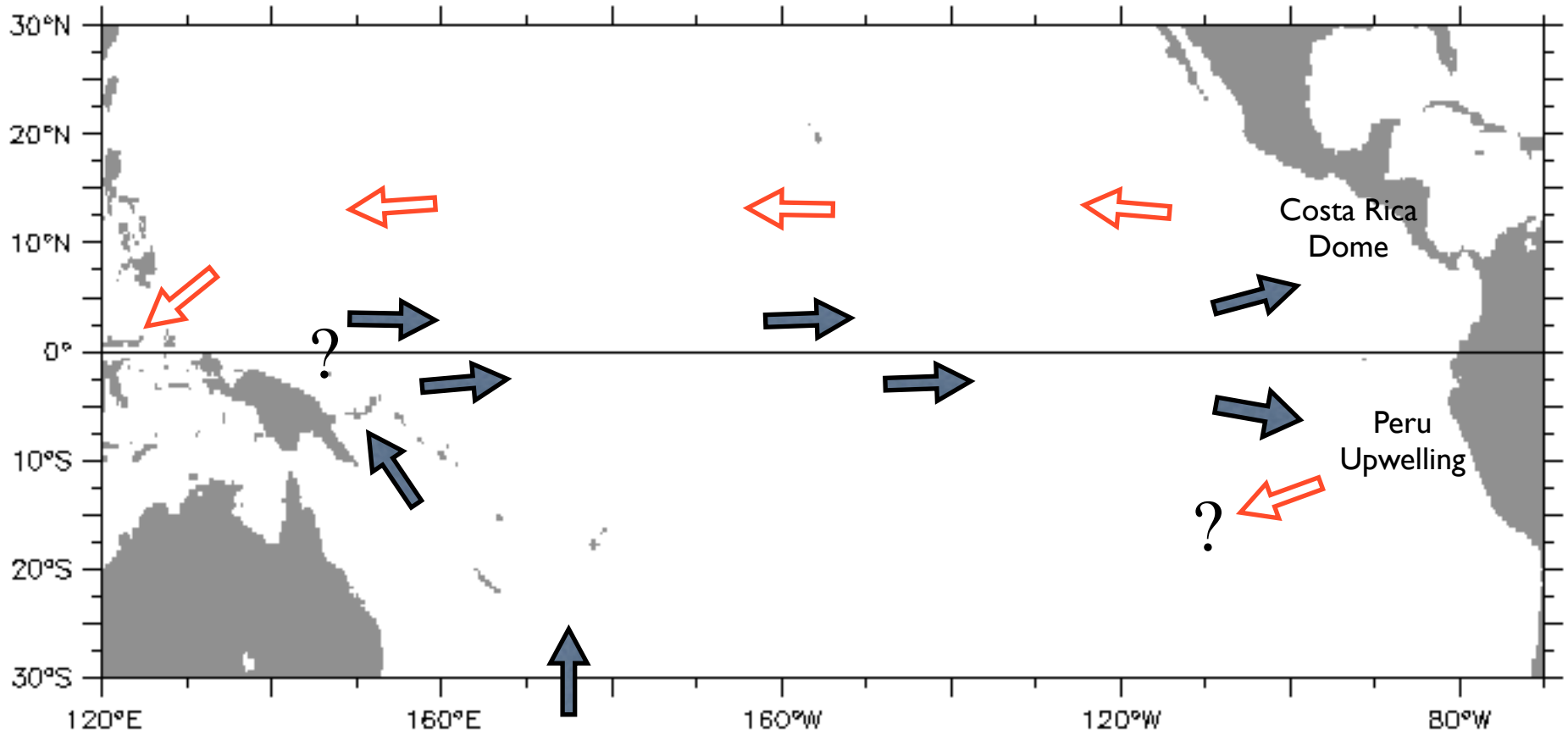
Winds and temperature at 10°S at the Peru coast

ERS winds (1991–2002). AOML XBT temperatures



~ 10 Sv of intermediate water enters the Pacific in the southwest

and leaves the Pacific as surface water in the Indonesian Throughflow

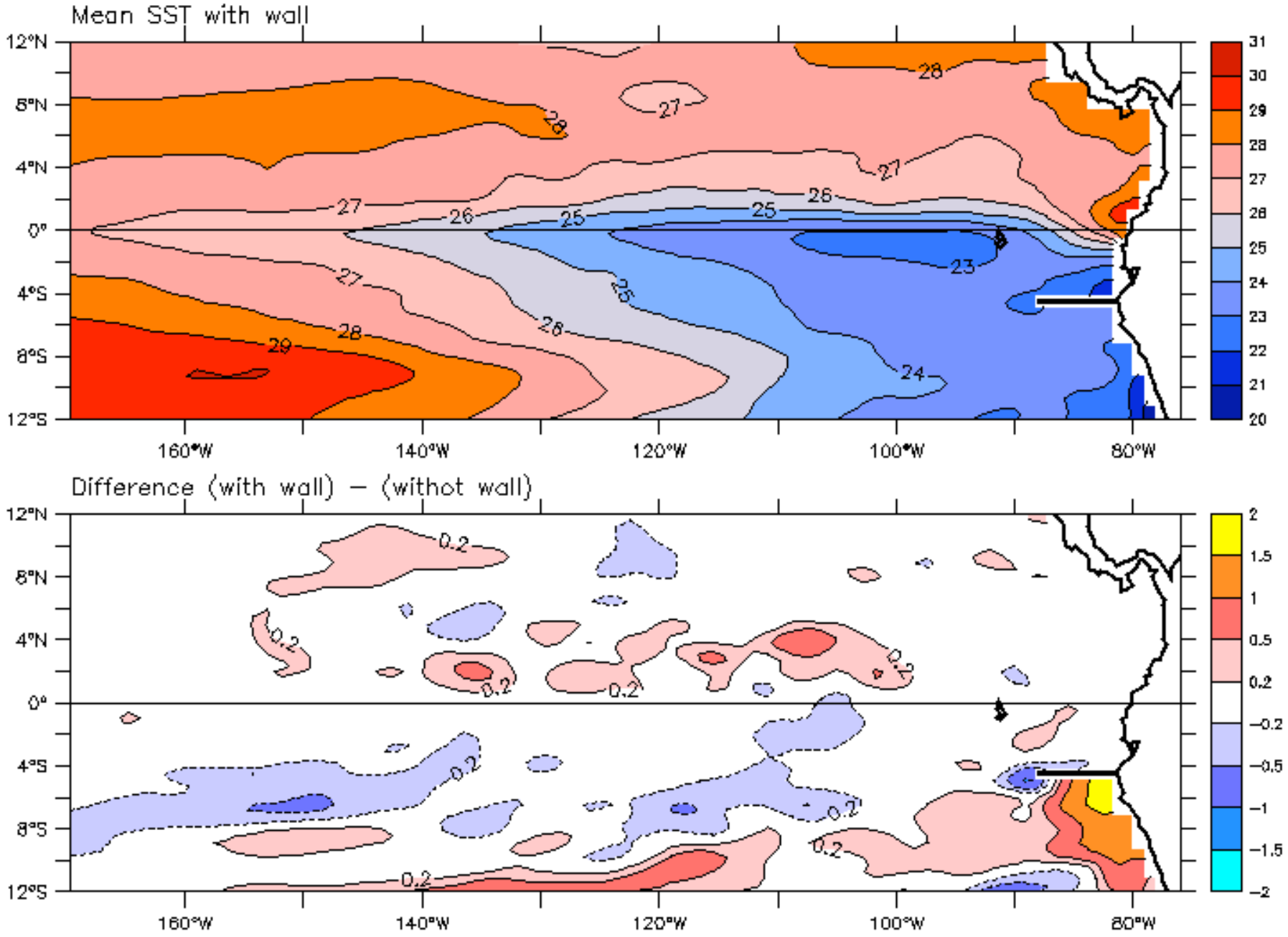


Cold, intermediate water

Warm surface water

Mean SST with artificial wall at 4.5°S

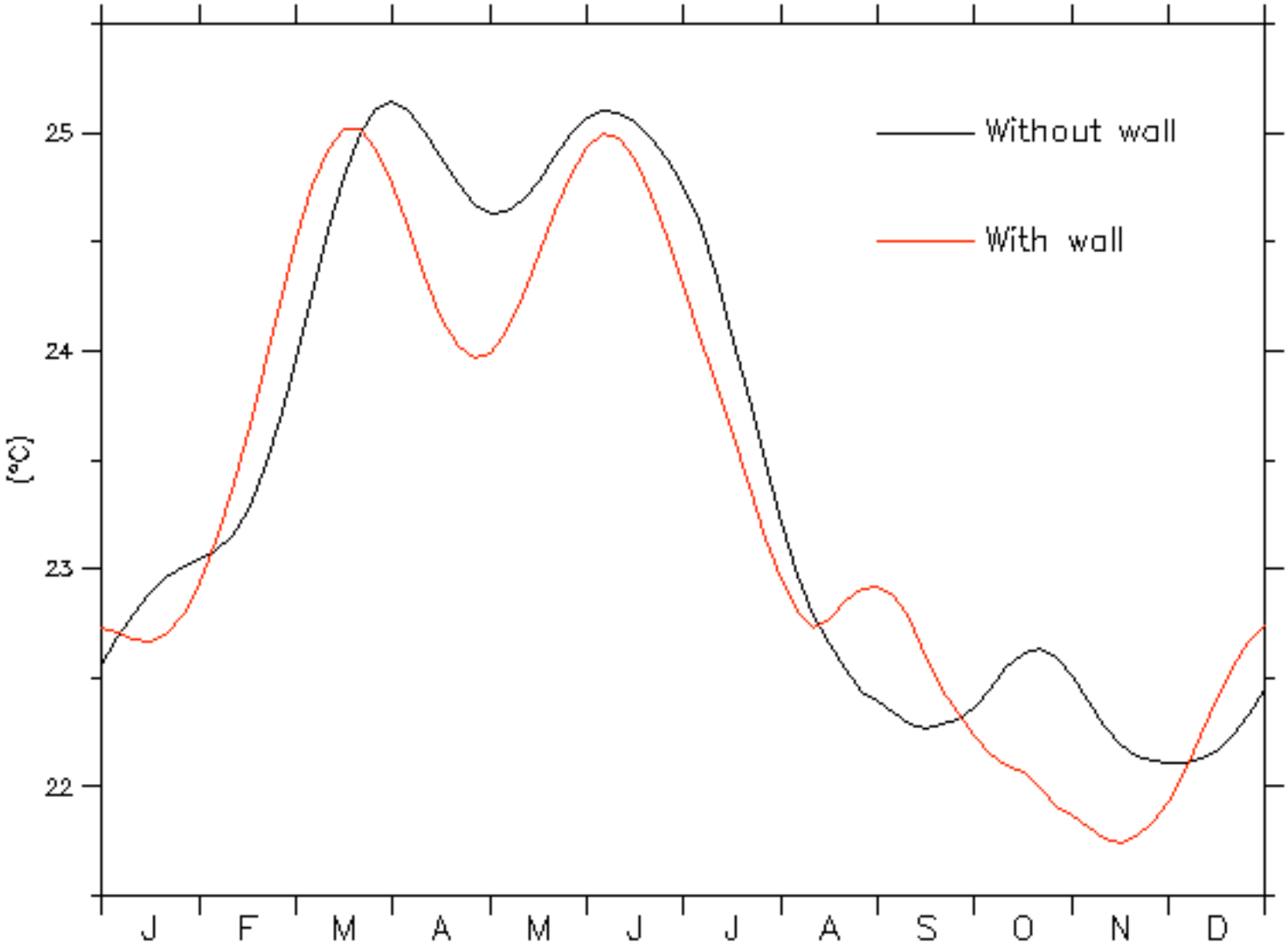
700 km wall separates coastal upwelling from equator



Gent/Cane model run with full annual cycle forcing: FSU winds, ISCCP clouds, Sun

Model cold tongue SST with and without wall along 4.5°S

700 km wall separates coastal upwelling from equator



SST averaged over 1°S–1°N, 110°W–100°W; Gent/Cane model with annual cycle forcing

Ocean circulation in the eastern tropical Pacific:

- is surprisingly poorly known
- is unlike the zonally-homogeneous central Pacific
- has substantial mean upwelling through a thick layer
- may be a crucial window of the general circulation