Equatorial upwelling:

pulled from above or pushed from below?

Popular understanding tries to explain vertical motion using horizontal forces.

ENSO theory argues upwelling is pulled from above by wind-driven divergence.

Decadal variability studies assume that upwelling can be pushed from below.

COLUMBIA CLIMATE SCHOOL LAMONT-DOHERTY EARTH OBSERVATORY

Work by: N. Brizuela, C.Y. Lee, A.H. Sobel, R. Seager, S.J. Camargo, J. Zhuo



Wyrtki (1981)

20-50% of Pacific equatorial upwelling is pushed from below

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Energetic cost of upwelling a) 0 100 Push from below happens in blue area 200 (upwelling produces KE here) 300 Potential energy supplied by advection b) 0 Depth [] Depth [] Depth [] Potential energy that enables this is produced by off-equatorial downwelling. 300 Diabatic potential energy supply 0 100 Energy cycle implies that off-equatorial 200 momentum and buoyancy forcings shape 300 -180 200 220 240 260 160 equatorial w. Longitude 40 -60-40-20 -5 5 20 60 80 $[10^{-6} \text{ W m}^{-3}]$