

Summary of Discussion of Cane, 1983 and Wang and McPhaden, 2000

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The Seasonal Cycle in SE Pacific SSTs

Cane claims that the seasonal cycle in SE Pacific SSTs is due to the relaxing of the trade winds in austral spring and summer, weakening the advective cooling from the Peru and South Equatorial Currents and the coastal upwelling. We hypothesize that the SST warming at this time is also due to a weakening of the subtropical high and poleward shift of the jet during the austral warm season, reducing atmospheric drying due to subsidence and hence the evaporative cooling. However, one student raised the possibility that the causality could be reversed -- the subtropical high may be weaker in summer because the SSTs are warmer.

The relationship between the seasonal cycle and ENSO

It appears that El Nino starts in austral summer, and yet the Kelvin wave that deepens the thermocline could in principle happen any season. We hypothesized that the SE Pacific seasonal cycle in SSTs projects onto the thermocline deepening in order to produce El Nino. In other words, a 2-3 degree SST warming during austral winter, when east Pacific SSTs are climatologically around 20 degrees C, will probably not be warm enough to cause a significant atmospheric response. However, in austral summer a 2-3 degree warming will produce SSTs warm enough to produce significant deep convection in today's climate.

What causes SST warming in the Central and East Pacific during El Nino?

Wang and McPhaden separate different terms in the temperature tendency equation and analyze each at four different locations in the TAO Array. At 110 degrees W, the zonal advection term and the residual (which the authors associate with upwelling) are well correlated with the tendency term. We noted that it appeared that the zonal advection term seemed to frequently lead the storage term, and was of smaller magnitude, while the "upwelling" term seemed to lag slightly and was of similar magnitude. Hence we wondered if zonal advection initiates some of the SST warming but that upwelling eventually overtakes advection in importance. On the other hand, in the central Pacific (140 W) the zonal advection term appears to dominate.

Outstanding Questions

Why do the trade winds in the Central Pacific initially relax at an El Nino onset? Cane suggests the role of the seasonal migration of the monsoons, but we could not understand how that would work.