

Interactive comment on “A Comparison of Ocean Model Results with Satellite Observations during the Development of the strong 1997–98 El Niño” by David J. Webb et al.

Anonymous Referee #2

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This short paper presents a brief comparison between a model and data (sea level and SST) focusing on equatorial waves and tropical instability waves (TIW) during the 1997/98 El Niño event. The paper is a follow on of a previous recent paper by the lead author that also analyzes the same model and the same event. While I acknowledge the interest of investigating off-equatorial variability for understanding the build-up of heat content and the discharge process during strong El Niño events, it is not clear to me what is the specific motivations and objectives of the paper. The diagnostics are rather rudimentary and do not convey a clear message. The authors seem also to ignore the existing literature on this event that has been extensively documented and investigated. They should clarify what is their specific contribution compared to

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previous studies and resolve some methodological issues (see specific comments).

Specific comments:

Abstract “The results provide additional confidence in the oceanic mechanisms which model analysis implicated as being responsible for the development of both the 1982-83 and the 1997-98 El Niño”. This is quite a vague statement. The abstract should provide some hints of what are the results.

Introduction It does not convey a clear motivation and there is no references to relevant works (McPhaden (1999), Boulanger and Menkes, (1999), Vialard et al. (2001) amongst many others, see also all the literature on the ENSO-TIW interaction (see introduction of Holmes et al. (2019) for instance)

Holmes R. M., S. McGregor, A. Santoso and M.H. England (2019) Contribution of Tropical Instability Waves to ENSO Irregularity, *Climate Dynamics*, 52, 1837-1855.

Boulanger, J.-P., and C. Menkes, Long equatorial wave reflection in the Pacific Ocean during the 1992-1998 TOPEX/POSEIDON period, *Clim. Dyn.* 15, 205-225, 1999.

McPhaden, M. J., Genesis and evolution of the 1997-1998 El Niño, *Science*, 283, 950-954, 1999.

Vialard, J., C. Menkes, J.-P. Boulanger, P. Delecluse, E. Guilyardi, M. J. McPhaden et G. Madec, Oceanic mechanisms driving the SST during the 1997-1998 El Niño, *J. Phys. Oceanogr.*, 31, 1649-1675, 2001.

The statement “The study concentrated on the strong El Niños of 1982-83 and 1997-97 and found that equatorial Kelvin waves had no significant effect on the surface temperature of the eastern Pacific.” is surprising. It is recognized that the Kelvin wave during El Niño produce vertical advection of anomalous temperature, a process refers as the thermocline feedback and shown to be dominant in the eastern equatorial Pacific in previous ENSO studies. Model data comparison The model has no assimilation of data so it is difficult to compare model and observations in terms of TIW, the model simulat-

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ing eddies that are not necessarily collocated with observations owing to their chaotic nature. So the comparison should be based on statistics rather than the visual inspection of Hovmöller diagrams (e.g. Figure 2). See for instance An (2008) for relevant diagnostics for TIW activity.

An, S.-I., 2008 : Interannual Variations of the Tropical Ocean Instability Wave and ENSO, *J. Climate*. 21, 3680-3686.

Figure 4: It is not really possible to see an equatorial Kelvin wave at 6°N; its amplitude would be very weak. Also the difference between model and observation is not relevant here unless you focus on the low frequencies (periods > ~60 days), which would require filtering the data. Comparison should be done on anomalies relative to the mean climatology, otherwise this is just emphasizing the differences in seasonal cycle. If the authors want to discuss Kelvin and Rossby wave contribution to sea level anomalies, I suggest that they project sea level on the theoretical equatorial wave structures (see Boulanger and Menkes (1995) for the method).

Boulanger, J.-P., et C. Menkes, Propagation and reflection of long equatorial waves in the Pacific ocean during the 1992-1993 El Niño, *J. Geophys. Res.*, 100, 25041-25059, 1995.

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