

Interactive comment on “On the Role of the North Equatorial Counter Current in Transporting Heat during a Strong El Niño” by David J. Webb

Anonymous Referee #1

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The ms examined the role of the NECC in water mass and heat transports during El Niño events by analyzing output of a realistic model simulation. The topic is of great interest to the scientific community because the origin of El Niño events are still in strong debate. Previous studies suggested roles played by warm water transfers from the western tropical Pacific to the east (McPhaden and Picaut 1990; Picaut et al. 1996; Meinen and McPhaden 2000; Jin 1997; Bunge et al. 2014). The present ms proposed the specific roles played by the NECC in the warm water transport frame used to explain El Niño onset. Some interesting results are obtained. However, the ms as it stands is a very preliminary draft and there are great needs to be improved. The author is asked to prepare a concise scientific paper for submission. Here are some details.

About the roles played by warm water transfers: Many excellent related papers need

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to be reviewed and cited as follows. Meinen, C. S. & McPhaden, M. J. Observations of warm water volume changes in the equatorial Pacific and their relationship to El Niño and La Niña. *J. Clim.* 13, 3551–3559 (2000). Jin, F.-F. An equatorial ocean recharge paradigm for ENSO. Part I: conceptual model. *J. Atmos. Sci.* 54, 811–829 (1997). McPhaden, M. J. A 21st century shift in the relationship between ENSO SST and warm water volume anomalies. *Geophys. Res. Lett.* 39, L09706 (2012). Bunge, L. & Clarke, A. J. On the warm water volume and its changing relationship with ENSO. *J. Phys. Oceanogr.* 44, 1372–1385 (2014). McPhaden, M. J. & Picaut, J. El Niño–Southern oscillation displacements of the Western equatorial Pacific warm pool. *Science* 250, 1385–1388 (1990). Picaut, J., Ioualalen, M., Menkes, C., Delcroix, T. & McPhaden, M. J. Mechanism of the zonal displacements of the Pacific warm pool: implications for ENSO. *Science* 274, 1486–1489 (1996).

A NECC-related mechanism has been proposed in the following papers Zhang, R.-H.* and Chuan Gao, 2016: The IOCAS intermediate coupled model (IOCAS ICM) and its real-time predictions of the 2015–16 El Niño event, *Sci. Bull.* 66 (13): 1061–1070. DOI 10.1007/s11434-016-1064-4 Zhang, R.-H. and Chuan Gao, 2016: Role of subsurface entrainment temperature (T_e) in the onset of El Niño events, as revealed in an intermediate coupled model, *Climate Dynamics*, 46(5), 1417–1435 doi: 10.1007/s00382-015-2655-5

About the roles played by the NECC, some studies are very relevant to this study as follows Zhang, R.-H., L. M. Rothstein, A. J. Busalacchi, and X. Z. Liang, 1999: The Onset of the 1991–92 El Niño Event in the Tropical Pacific Ocean: The NECC Subsurface Pathway, *Geophys. Res. Lett.*, 26, 847–850. Zhang, R.-H., and A. J. Busalacchi, 1999: A possible link between off-equatorial warm anomalies propagating along the NECC path and the onset of the 1997–98 El Niño. *Geophys. Res. Lett.*, 26, 2873–2876. Zhang, R.-H., and L. M. Rothstein, 2000: The role of off-equatorial subsurface anomalies in triggering the 1991–92 El Niño as revealed by the NCEP ocean reanalysis data. *J. Geophys. Res.*, 105, 6327–6339

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The author is encouraged to read these papers carefully and then write a concise and coherent scientific paper for resubmission.

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