

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 #2

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General Comments The manuscript uses data from a high resolution ocean model, forced by atmospheric fields that stem from a reanalysis product, to evaluate the evolution of the 1982/83 El Niño event. The majority of the evaluation is qualitative, investigating the evolution of SSH, SST, wind stress, and current strength anomalies. Based on the analysis, hypotheses are given as to the relative role the NECC may play in the development of El Niño events. Although these hypotheses are interesting, they are not rigorously supported by the results and analysis. The paper makes bold claims about the relevance of the findings to all El Niño events, but only one El Niño event is considered through model simulations. Given that El Niño events often have distinct components to their formation, additional events and additional data (ideal some observational data) needs to be included before claims as to the applicability of these

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results to all El Niño events. In addition, more quantitative analysis would be necessary to support some of the claims made, particularly about the strength of heat transport by the NECC.

Specific Comments The following areas of the paper could use the most improvement/raise the most questions

1. Consideration of a Single El Niño Event - Only the 1982/83 El Niño event is studied in this paper. While a number of other events are mentioned briefly, no rigorous analysis is performed. With only a single event considered, how can hypotheses be made that are supposed to be universal to all El Niño development? To make such claims, more El Niño events should be considered. Without these claims, I think the paper does provide an interesting analysis of a single El Niño evolution.

2. Reliance Solely on Model Data - The author acknowledges model data is imperfect, but presumably some of these ideas should be testable with model data. While data likely would not cover the 1982/83 El Niño, the TAO/TRITON buoy array should give valuable observations of the 1997/98 El Niño that could be used to verify some of the hypothesis. In addition, Argo data could provide some insight as to heat transport in the NECC during more recent El Niño events. Finally, the only proof given of the model reliability is its ability to reproduce temperatures in the Niño regions - given that the model is used to assess more than just temperatures, a more rigorous evaluation of its reliability would be helpful.

3. Lack of Quantification - The authors state that due to the 5 day average fields provided by the model, quantification is not possible. However, some sense of order of magnitude of quantification would be helpful, even if there are uncertainties. How much heat is on average transported by the NECC? How much does this change during the 82/83 El Niño? This would help the reader evaluate the claim as to this being a key part of the El Niño evolution. In addition, how much heat would it take to move the convection region eastward?

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4. Writing Style - As is, the manuscript is challenging to read. Ideas are brought in, shelved, and returned to later on, creating a nonlinear storyline for the reader. Assertions made early on (as early as the introduction) are hard to evaluate, as none of the supporting evidence has yet been shown.

Technical Corrections Page 1, Line 17: therefore not therefor Page 2, Line 18: then not the? Page 3, Line 14: this should not be a new paragraph Page 4, Line 13: Run 6 mentioned, but no information as to what run 6 is Page 5, Line 2: 1982-83 El Nino (not 1982-82) Page 7, Line 8: a, not an Page 8, Figure 5: Boxes in figure should be labeled, as it is hard to figure out which box is which that Table 1 refers to Page 16, Line 8: the, not th Page 27, Line 8: the not th Page 33, Line 5/6: The following sentence is confusing ('as did' should be removed?): The strength of the tropical instability waves also dropped significantly as did possibly due to a reduced or reversed Equatorial Current

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