

Interactive comment on “The Pacific Ocean heat engine: global climate’s regulator” by Roger N. Jones and James H. Ricketts

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The authors provide analysis of consequence of temperature shifts, which were previously observed in a number of studies related to various regions. They as I know are the first who showed that temperature shifts at tropical west Pacific warm pool precede most of the globally important shifts in other regions. Then they described proposed mechanisms of the way how tropical Pacific heat engine maintains surface temperatures behaves as quasi-steady regimes punctuated by abrupt shifts. Both data analysis and description of proposed underlying energy flows provide new insights to the understanding of climate phenomena previously observed by many authors but still not fully understood. Nevertheless, I suggest minor revisions before publication for the clarification descriptions of tropical Pacific heat engine: 1) The authors numerous times use

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the words sink and source (and also “absorbing heat”, “losing heat”) describing energy flows of tropical east Pacific (TEP) and tropical west Pacific (TWP). But usually they don’t specify what energy exchange is considered in a particular part of text – radiative flows to/from space, exchange with atmosphere, with deep ocean, with nearby regions. I suggest making clear specifications to what energy exchange word sink or source is used in any particular part of text. 2) I suggest providing more detailed explanations for the consideration of the TEP and TWP as a separate reservoirs based on hydro-climatology. Because from the first view it seems that TEP and TWP are the same body of water commonly (excluding ENSO events) moving from west to east like in a big tube. 3) Sometimes authors use terms “negative feedback” and “absorbing heat” (correspondently, “positive feedback” and “losing heat”) like synonyms. For example, in the beginning of “Atmospheric feedbacks” section they wrote: “TEP represents a negative feedback at the ocean surface absorbing heat whereas TWP represent a positive feedback, losing heat.” By definition, negative climate feedback is any process where climate feedback decreases forced warming. So some initial forced warming (e.g. “anthropogenic warming”) causes a secondary change that reduces forced warming (by absorbing additional “anthropogenic” heat in deep ocean, reflecting it back to space and etc.). In general negative feedback may be provided by region losing heat also. Thus in the cited sentence, for example, it is not clear if “negative feedback” is a consequence of “absorbing heat”, or a coincidence of these two properties is a result of various other processes. Also in “Atmospheric feedbacks” section it is not clear how this negative/positive feedbacks are related to observed regimes and shifts of surface temperature anomalies. Thus I suggest to add in this section paragraph clarifying authors view on underlying processes.

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