

Interactive comment on “Atmospheric Torques and Earth’s Rotation: What Drove the Millisecond-Level Length-of-Day Response to the 2015–16 El Niño?” by Sébastien B. Lambert et al.

Anonymous Referee #2

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This is a well-written paper but unfortunately one of limited scope and little science progress, with the analysis being essentially a repeat of Ponte & Rosen (1999) and de Viron & Dickey (2014, both studies cited in the manuscript). It is not clear in which way other disciplines or even the Earth rotation community will benefit from elaborations concerning the relative role of mountain and friction torques during different flavors of ENSO. For a non-linear phenomenon such as ENSO, it is not too surprising that the torques shape up differently for each event, and it will thus be difficult establishing any real ‘paradigm’.

So does the finding of anomalous friction torques due to Hadley-type convection have

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any implications for atmospheric modeling or our understanding of how ENSO evolves and to which physical processes it is connected? What will be the value added to measurements/predictions of Earth rotation? Will geodesists benefit from using atmospheric torques instead of AAM values or does this just lead to a loss of accuracy? Without addressing these points properly, it is difficult to see how the manuscript can be a sound contribution to a first-tier journal such as Earth System Dynamics. The authors could turn to Ponte and Rosen (1999) for thoughts on the larger context, but even their discussion might not convince everybody as to why studies of atmospheric torques during ENSO events matter.

Some minor points:

- To strengthen the description of the characteristic torque patterns (presently time-invariant snapshots in Figure 3), would it be possible to plot the space-time evolution of the mountain/friction torques in the Pacific using some kind of Hovmoeller diagram? This might support the plain textual description of the various flows and circulation anomalies in Section 3 (page 5).
- The following recent review of the 2015/2016 ENSO should be cited in the manuscript: L’Heureux et al. (2017) Observing and Predicting the 2015/16 El Niño. BAMS vol. 98(7): 1363–1382.
- After Eq. (6), $\overline{\text{LOD}}$ is referred to as "conventional mean LOD". Do you mean the nominal length of the solar day? If so, update the formulation.

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