

Interactive comment on “Modes of Vertical Thermodynamic and Wind Variability over the Maritime Continent” by Jennie Bukowski et al.

Anonymous Referee #1

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General comments: The paper examines temporal and spatial modes of atmospheric variability over the Maritime Continent (MC) by applying principal component analysis to upper-air data from three “representative” sounding sites. With this approach they conclude that the fundamental modes of spatial and temporal variability of this region can be captured with small set of coherent structures. The manuscript is reasonable well written and organized but could you use some additional clarification in several places as noted in comments below. In addition, I was left wondering if the three sites examined, all of which border or are within the South China Sea, are truly representative of the entire the MC region which spans over 60 degrees of longitude and contains over 17,000 islands. It's unclear to what degree the RC analyses of these three sites capture the major modes of variability in this large MC region? What measures did the authors take to conclusively demonstrate this point? Were other sites examined, say

C1

sites bordering the Java Sea or coastal sites in Borneo or Papua New Guinea where topographic effects and the diurnal cycle dominate substantially more than the three sites examined here (see Peatman et al. 2014, QJRMS) or ENSO effects might be more prominent? Short of such efforts, the authors may need to temper their conclusions somewhat to reflect the more limited scope of their analyses. While it might be beyond the scope of this study, it would be helpful to put the variability of these MC sites in context by showing how they differ from sites in the Indian Ocean and West Pacific (e.g. Gan and Manus) where MJOs often typically initiate and dissipate and even a midlatitude continental site which should show dramatically different structures. Another natural extension of this work would be a PC analysis of rainfall at each site to better understand the relationship of the RCs presented in this paper to convection.

Specific comments:

Page 3, lines 23-24: Upon examination of Ciesielski et al. (2014), which documents the sounding types used at the sites in question during the DYNAMO experiment (October 2011 to March 2012), they note that the Singapore site changed sonde types during DYNAMO. Did the other sites use the same sonde type for the entire period examined (2008-2016)?

Page 3, line 24: In what fields are the constant bias corrections available (e.g., humidity, temperature)? Do biases remain constant when the sonde type changes such as occurred at Singapore in late December 2011. Is there any evidence that the characteristics of the RCs changed at Singapore when they switched sonde types?

Page 5, line 14: I'm assuming you mean “temporal range”? Please clarify.

Page 8, line 6 and page 9, line 20: Past studies (e.g., Houze et al. 1981 MWR, Ciesielski et al. 2006 MWR) would suggest that during certain seasons, the Ranai site is not entirely free of the diurnal cycle or the influence of land convection.

Page 8, line 24: are the wind reversals noted here a reflection of the QBO?

C2

Page 9, line 7-8: Please clarify what you mean that the active and suppressed phases are unique to Ranai and not representative of the entire MC.

Page 9, line 9-10: In addition to presenting the time-height plots, which are informative, showing the temporal behavior of the RCs might help clarify what physical phenomena the different RCs are associated with. For example, does RC1 for temperature vary seasonally (page 8, line 20), is RC5 for zonal wind associated (page 8, line 25) with the QBO time-scale changes, do variations in RC1 and RC2 for meridional wind vary on a monsoonal time scale as suggested, and so on?

Page 9, lines 11-12: Are the moistening and the mid-tropospheric temperature changes noted here associated with an MJO?

Page 9, line 25: How high is the topography on this island? How does this compare with other sites in Indonesia that might be impacted by steep topography? This relates back to my earlier comments on the representativeness of this site.

Page 9, line 26: What is meant by a “portion region of the southwest monsoon”?

Fig. 9. Is perturbation temperature being plotted here? If so, please specify in figure caption. What are the differences between the black and white spaces? Would it be possible to linearly interpolate in time the missing data, at least for reasonably short time gaps, shown in the right-hand panels? This would make the structures referred to in the text easier to identify. In the last sentence of the caption are colors red and blue reversed.

Is any ENSO time-scale signal detected in the RCs?

Page 10, lines 9-10: Does RC1 of temperature shown in Fig. 10 reflect differences in mean tropopause height of these sites with Singapore have the highest mean height and Ranai the lowest? If so, would it be possible to list the mean tropopause heights of these three sites?

In Fig. 1 instead of using some random MTSAT image it would be more instructive

C3

if the long-term mean rainfall map for this region were shown. For example, this map could be based on MERRA analyses or preferably TRMM or GPCP observations which are easily accessible. In this manner the reader could see how the sites chosen were located with respect to regions of major convection.

Page 3, line 27: Please state when RH is first mentioned in the paper whether it was computed with respect to ice or water at temperatures less than 0°C.

Technical corrections:

Page 1, line 9: continent misspelled.

Page 1, line 13: I suggest changing “sounding release sites” to “upper-air sounding sites” here and other places where this phrase is used.

Page 5, line 29: decomposition misspelled.

Page 4, line 9: Suggest rewording, “... the database was subjectively analyzed in the following fashion.”

In Table 1 title and caption change “Control Flags” to “Checks”. Also suggest changing “checkpoint in” to “pass at”. Finally suggest changing last sentence in caption to: “This is not a comprehensive list as additional subjective QC was applied.”

In a few of the figures (Figs. 6, 9 and 10) where lines overlap, it's difficult to distinguish between black and dark blue lines. You might try using cyan instead of dark blue to make the lines more distinguishable.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-843, 2016.

C4