Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Cloud responses to climate variability over the extratropical oceans as observed by MISR and MODIS" *by* Andrew Geiss and Roger Marchand

Anonymous Referee #1

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Summary: The authors perform a maximum covariance analysis (MCA) on joint trends in cloud fraction histograms and meteorological variables in four ocean basins. The analysis yields modes that contribute to the joint trends. Several of these modes are correlated with known modes of variability, such as ENSO and the PDO.

Comments: The analysis seems clean and the results are interesting, although I felt it was difficult at times to interpret the findings physically. Fig. 3 shows an almost overwhelming amount of information. My main comment would be to better link the modes in Fig. 3 to the trends in cloud fraction histograms in Fig. 1, see below.

- This isn't fundamental, but I was wondering why the analysis was restricted to pre-

2013?

- Justification for the number of modes in MCA analysis: you justify this later in the text (L382), but it would be better to explain from the start how many MCA modes you are retaining and why.

- I think a disadvantage of the analysis method is that each of the modes is assumed to have a fixed vertical structure. Only the sign and magnitude of the mode can vary spatially, but the structure of the anomaly pattern is set. I could imagine that, say, the PDO would have distinct vertical signatures in different parts of the North Pacific. Can the authors comment on this?

- It's hard to make the link between the cloud histogram trends introduced in Fig. 1 and the modes in Fig. 3. To what extent do the modes explain the total trends? In each basin, does the sum of the two or three modes retained in the analysis yield something similar to the total trend?

Other minor comments: L140: Can you motivate your choice of detrending the indices? If the trends in some of these indices explain part of the cloud trends that you're interested in, you might be losing part of the signal. For example, wasn't there a negative trend in ENSO during this period? L217,674: Hashing → hatching? L417: Change to "6. Conclusions"