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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Spring Transition of the North Pacific Jet and its Relation to Deep Stratosphere-to-Troposphere Mass Transport over Western North America" *by* Melissa Leah Breeden et al.

Anonymous Referee #1

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This study presents the results of a thorough statistical analysis of springtime stratosphere-to-troposphere transport to the boundary layer (STT-PBL) over the western USA, in the context of the jet structure transition between the winter and summer regimes. The authors use wind fields from the ERA-Interim and JRA-55 reanalyses to identify the dominant Pacific wind patterns at the jet level by the way of EOF analysis and employ previously developed methods to calculate STT-PBL and associated diagnostics. They demonstrate that the intensity of springtime STT-PBL is a function of the timing of the jet transitions, with early transitions leading to more intense STT-

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PBL driven by deeper and more frequent tropopause folds. Furthermore, they show that the transition timing is correlated with ENSO, and carefully investigate the mechanisms involved, by performing a simultaneous analysis of Rossby wave propagation diagnostics, tropopause folds diagnostics, and PBL depth distributions. The paper is really well written, logically constructed and easy to follow, which is no small feat given the complexity of the subject. It also does a great job referencing the sizable body of literature on the topic. I think the analysis and conclusions are very solid and the paper meets all the ACP criteria for publication. Despite my best efforts (it's my job after all;)) I couldn't find almost any issues with the analysis or presentation. It's a great and important paper and I enthusiastically recommend it for publication almost as is. I do have a few very minor suggestions for edits. The most important one concerns the methods section that, I think, would benefit from adding some more details (even if those details can be found elsewhere) that would make the paper more self-contained.

Minor and technical comments

L82-86. What's the vertical resolution of each reanalysis and why is it sufficient for the present purposes, particularly for driving the trajectory model?

LL85-89. Can you comment on how the changing observing system (pre-satellite to satellite to more satellites) in JRA-55 impacts the results?

L91-93. Can you expand this paragraph a bit? This is one of the main tools used here, and I found it hard to get even a general idea of what's being done there without reading Skerlak et al. 2014. For example, how are the trajectories calculated? Perhaps a simple diagram in the supplementary material?

LL 116-118. Is it possible that this is resolution dependent? Can you comment on that?

LL207-210. I like the idea of stating the main results in the first concise paragraph. However, at the initial pass, it wasn't clear to me if the second and third sentences are the results or something that we already know. How about something like "The main

findings are:. . .” after the first sentence?

L220. I’m guessing the bimodality in 5b arises from an oscillation between the two phases during the transition period. It’s pretty neat. Can you add a one/two-sentence comment on that?

L275. Variability reflected in Fig. 3, right? If so, can you reference Fig. 3 explicitly?

LL344-345. I’m struggling to understand this sentence. Please rephrase; it looks like an important point is being made there.

Fig. 3 caption. The dashed lines are +/-1 sigma, right?

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