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Interactive comment on "Siple Dome shallow ice cores: a study in coastal dome microclimatology" *by* T. R. Jones et al.

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Review of Jones et al.

How Pacific tropical climate variability affects West Antarctic is an important question that is receiving considerable attention at the moment. This paper assesses the signals found in a series of ice cores collected along a 60 km north-south traverse through Siple Dome and relates these to the Amundsen Sea Low and ENSO variability. The information presented on how the signals vary around Siple Dome is interesting, but I didn't think that a low of new insight was gained about the relationship to ENSO, possibly because the relationships are not simple. I think a lot hangs on Figure 1, which I feel is just too simplistic a representation of how West Antarctica is affected by ENSO, especially as Turner et al. (2012) found "no statistically significant difference in the zonal location of the ASL between the different phases of ENSO" based on 30 years of reanalysis data. Hoskins et al. (2013) should also be consulted and cited in this paper regarding the ASL. What seems clearer is that the DEPTH of the ASL is linked to the phase of ENSO. This goes back to the work of Hoskins and Karoly (1981) who found greater blocking/weaker ASL during the El Nino phase. My biggest concern is over the focus on the December – March period, which is then suddenly switched to December – January in Figure 11. The strongest teleconnection from tropical SSTs to West Antarctic is generally regarded at winter or spring, with recent papers on West Antarctic warming focussing on these seasons – see Steig, Ding, Schneider, O'Donnell etc. The summer is when the SAM has changed most because of the ozone hole so pre and post 1980 summer height fields will be very different, which makes me think that Figure 11 is just showing SAM variability. I think the paper needs major revisions to clarify some of these points raised.

Specific points Page 2683, Line 5. ENSO also affects the western part of the Pacific Ocean with greater precipitation over Indonesia/Malaysia during the La Nina phase. I'm not keen on the term "ASL-ENSO dynamic". Don't you just mean the "atmospheric circulation variability associated with the ENSO teleconnection"? Page 2688, Line 2. You should explain why you used the SOI index. These days the Nino 3.4 temperature is often favoured as a better measure of the ENSO cycle. Page 2688, Line 9. You need to explain why there is such a focus on the December – March months. This is a strange period of the year to examine since it is when the ozone hole has had the greatest impact on the surface climate so giving a jump around 1980. It's also when the tropical – high latitude link is rather weak, with earlier work stressing the winter (the work of Steig) and spring (the work of Schneider) seasons as being most important. There is also a clear minimum in storm activity over the southern Pacific Ocean during the summer, so giving less accumulation. Page 2689, Line 20. I always find terms such as "a systematic climate shift" and "large-scale ENSO reorganizations" rather unhelpful and don't really give any insight into the physical processes of what happened in the tropical Pacific. Page 2690, Line 5. How robust is the relationship shown in Fig 5?

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Is there a significant relationship? Page 2690, Line 9. “opposite temperature signal as tropical ENSO SSTs.”. Which part of the tropics are you talking about here? Page 2691, Line 1. “Mass accumulation is a direct measure of the amount of precipitation an ice core site experiences”. Shouldn’t this be the net accumulation? i.e. the precipitation – evaporation – the effects of blowing snow. Page 2691, Line 26. There is an annual cycle in the zonal location of the ASL, with the low being over the Bellingshausen Sea during summer and over the Ross Sea in Winter (Turner et al., 2012). Page 2692, Top. This is far too simple a picture of how the ASL moves at different stages of the ENSO. Is there any evidence to back this up? Or is it all based on the Bertler paper? That paper only contained a simple schematic and no separate analyses of the ASL location during the El Nino and La Nina phases. Page 2692. “ASL-ENSO system”. Is this really a system? There is a teleconnection between deep convection on the Equator and the ASL area, but other factors play a part, such as the large, intrinsic variability of the mean sea level pressure in the area and the effects of the Southern Annular Mode. Page 2692. “a completely diïňĂerent atmospheric circulation pattern is aïňĂecting the Inland Flank.” Have you looked at back trajectories to try and understand this? Page 2694.top. “During La Niña, the ASL circulation is strongest, which could pull atmospheric water vapour from more distant and warmer SST source regions. During El Niño, the ASL circulation is weakest, which could pull moisture from less distant and colder SST source regions.”. This all seems very speculative. Why not just use the reanalysis data sets to look at the meridional component of the wind during el nino and la nina events? Then we would have some numbers to look at. Figure 11. The Southern Hemisphere reanalysis data sets have no meaning prior to 1979 since there was no satellite sounder data include and they just reflect the model climatology. So the data for 1962, 1974, 1976 and 1958 should be removed. Some indication needs to be given as to whether these differences are significant at the 5% level. The ICAO mean 850 hPa height is 1,457 m, so the differences are quite small. Also the Antarctic-wide differences shown in Fig 11 look rather SAM-like to me, rather than the effect of ENSO variability, since the result of ENSO changes is a wave train from the tropics

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to the Bellingshausen Sea – the Pacific South American (PSA) pattern. It would be good to examine the phase of the SAM in these two sets of years. Rather than show the height differences between the El Nino and La Nina phases why not just show the mean 850 hPa height for the two phases? That would give a much better indication of the air mass trajectories.

Turner, J., Phillips, T., Hosking, S., Marshall, G. J. & Orr, A. The Amundsen Sea Low. International Journal of Climatology, DOI: 10.1002/joc.3558 (2012). Hosking, J. S., Orr, A., Marshall, G. J., Turner, J. & Phillips, T. The influence of the Amundsen-Bellingshausen Seas Low on the climate of West Antarctica and its representation in coupled climate model simulations. Journal of Climate, doi: 10.1175/JCLI-D-1112-00813.00811 (2013). Hoskins, B. J. & Karoly, D. J. Steady linear response of a spherical atmosphere to thermal and orographic forcing. Journal of Atmospheric Sciences 38, 1179-1196 (1981).

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