

## ***Interactive comment on “Potential causes of 15th century Arctic warming using coupled model simulations with data assimilation” by E. Crespin et al.***

### **Anonymous Referee #2**

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This is an interesting paper which uses the opportunity presented by a simplified (& therefore fast) model to make numerous simulations forced by natural and anthropogenic factors. From these, the model simulation with conditions closest to those seen in proxy records can be selected to direct the next step of the simulation. In this way the proxy data guide the direction of the model to optimize the overall track of Arctic temperatures. The temperatures constrained in this way can then be compared with a model without data assimilation to try and distinguish between factors internal to the climate system (unforced) and changes more directly related to the major forcings. This approach leads the authors to conclude that the warm period in the 15th century was the result of warm air advection into the region, resulting from circulation

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anomalies at that time.

No attempt is made in the analysis to try and understand why the anomalies were persistent over several decades, which would seem to be an essential question. Why do some atmospheric circulation anomalies remain in place for a prolonged period? This seems to point in the direction of some slow-moving component of the climate system&#8212;perhaps in this case, sea-ice [absence of&#8230;?] or SST anomalies. This seems likely in the case of the Aleutian Low pressure anomaly, for example. It would be useful for the authors to examine the model results and comment on this. It would also provide a test of the simulation (Figures 5 and 6) if some additional proxies, not included in their data assimilation scheme, were compared. Several new time series were recently published in a Special Issue of the Journal of Paleolimnology (2009; vol. 41, #1) and these might provide some material from additional geographical locations to test the reconstruction, which is based on limited data. New ice core records from Mt Logan [Fisher et al, 2008, The Holocene] might also provide a critical test of air advection from the Pacific.

Technical issues- Page 2 Line 21- associated with... Line 26- only slightly less warm&#8230;

Page 9 Line 23- are shown Line 29- presents good results as well&#8230;

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