

Comments on revision of Yang et al.'s "The Arctic sea ice extent change connected to Pacific decadal variability"

The authors have generally responded well to the comments of the two original reviews, which were quite consistent in their assessment of the paper's weaknesses. Most notably, the study period has been extended through 2018 to capture the recent precipitous decline of sea ice in the Bering Sea. This extension has required that the variations be cast into a framework of decadal variability, as reflected in the paper's new title. The framework of decadal (or at least multiyear) variability seems interesting and appropriate for the past 20 years, although it is not an outstanding feature of the pre-2000 portion of the sea ice time series (see Figure 2).

A second major revision is the addition is the authors' attempt to address mechanisms, which they do largely by relying on the NPGO and its phasing with the PDO. In particular, the authors argue that the character of the NPGO has changed in recent decades, and this change is tied to the emergence of the decadal (multiyear) character of the sea ice variations. While the authors provide some diagnostics to support the change in the NPGO and its manifestations, the analysis and interpretation still seem somewhat tenuous. The authors even note that the reasons for the change in the NPGO "deserves further investigation that is beyond the scope of this paper (p. 7, bottom). The proposed linkage will certainly not be the final word on the driving of the Bering Sea's sea ice trajectory, but I do give the authors credit for putting forth a linkage that can improved upon (or disproven) by future studies.

One lingering item for clarification is the strength of the NPGO signal. As I understand from the text (p. 6, lines 15-20) the NPGO is defined as an EOF of Pacific basin-scale sea surface height anomalies. If so, what portion of the total variance does it explain? Alternatively, how much atmospheric variance do the NPGO's atmospheric manifestations explain?

Lastly, given the paper's increased emphasis on multiyear variations that fall under the umbrella of internal variability, it would be appropriate to refer to the work on this subject by Rong Zhang and her GFDL collaborators. Examples include

Zhang, R. 2015: Mechanisms for low frequency variability of summer Arctic sea ice extent, PNAS, 112,doi: 10.1073/pnas.1422296112.

Lee, H C., T. L Delworth, A.Rosati, R.Zhang, W.G. Anderson, F. Zeng, C. A Stock, A. Gnanadesikan, K. W Dixon, and S.M Griffies, 2013: Impact of climate warming on upper layer of the Bering Sea. Climate Dynamics, 40, DOI:10.1007/s00382-012-1301-8.

Zhang, R., and T.R. Knutson, 2013: The role of global climate change in the extreme low summer Arctic sea ice extent in 2012 [in "Explaining Extreme Events of 2012 from a Climate Perspective"]. Bull. Amer. Meteor. Soc., 94 (9).

As a final comment, the English has been improved in the revision but there are still instances of faulty or awkward English. Examples: p. 5, line 2; p. 9, lines 12-12; p. 10, line 32.