

Interactive comment on “The early twentieth century warming and winter Arctic sea ice” by V. A. Semenov and M. Latif

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This response and revised manuscript with tracked changes are attached in the PDF file.

Response to referee comment by Prof. James Overland (referee's comments are in quotes)

"Recent sea ice loss and temperature increase are Arctic wide and consistent with greenhouse gas increases. The Arctic wide average temperature in the ETCW was nearly the same as the 1990s but the anomaly was probably more regionally focused in the Atlantic Arctic; data from Alaska does not indicate any major sea ice loss. The ETCW is consistent with regional intrinsic natural variability."

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We fully agree with this comment. In the revised manuscript we explicitly state this in the Introduction section (1st par.) and also (Introduction, 2nd but last par.) specify later that temperature increase during ETCW in the Arctic is strongest in the Atlantic Sector and absent in the Pacific Sector. Paper by Wood et al. 2010 is cited.

"Note that Wood and Overland (2010) did not imply that the atmosphere created the ETCW on its own."

We agree. The reference to Wood and Overland (2010) was removed from that sentence.

"However, I do not think that multidecadal Atlantic Ocean variability is an explanation in itself. In fact Wood et al. (2010) suggest that the ETCW was a unique North Atlantic event in the last 200 years."

We agree. We do not imply that AMO is the only plausible explanation for the ETCW. Instead, we suggest that any perturbation of the coupled system, from the ocean or the atmosphere, could have triggered a long-lasting anomaly which can be amplified by a positive feedback mechanism. This is now explicitly written in the Discussion: "Analysis of extended Arctic temperature records since the 19th century suggests that ETCW in the Arctic was an irregular fluctuation rather than a part of a quasi periodic process (Wood et al., 2010). Changes in ocean heat transport or atmospheric circulation anomalies could trigger a prolonged natural fluctuation such as ETCW, as they can be amplified through local positive feedbacks between the sea ice, the ocean and the atmosphere (Bengtsson et al., 2004; Wood and Overland, 2010)." We also changed "variability" to "fluctuation" in the very last sentence thus stressing that ETCW was not necessarily a part of some multi-decadal variability but could represent a single fluctuation as proposed in study by Wood et al. (2010) that is now cited.

Response to referee comment by Prof. John Walsh

We would like to thank the referee for providing additional references that support a

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picture of considerable sea ice retreat during the ETCW. The reference are now cited.

Response to short comment by Prof. Genrikh Alekseev

We would like to thank Prof. Alekseev for pointing out several important studies about Arctic sea ice conditions during ETCW, particularly for the books reviewing Russian data sources (Zakharov 2003; Alekseev et al. 2007). The citations are now included.

Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/6/C1755/2012/tcd-6-C1755-2012-supplement.pdf>

Interactive comment on The Cryosphere Discuss., 6, 2037, 2012.