Interactive comment on "Atmospheric teleconnections between the Arctic and the Baltic Sea regions" *by* Liisi Jakobson et al.

Anonymous Referee #1

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I found this manuscript generally well written and using sound statistical methods with some novel appearing concepts, related to the partial correlation applied in the context of downscaling to southern Estonian region. I have some comments and suggestions I would like the authors to address before I can recommend the publication.

Main comments:

1) More literature research should have been done to discuss on physical mechanisms behind statistically identified teleconnections. This discussion should include how AO/NAO are dependent, and therefore to some degree redundant, and the role of PDO, SCA, and PEU. For example, some studies (cf. Vihma et al. 2014; Uotila et al. 2015) have found that PDO and SCA, in addition to AO/NAO, are important for the northern Baltic Sea temperature and for the maximum Baltic sea-ice extent. This ap-

pears to contradict the author's argument that only AO/NAO are important circulation modes in the Baltic Sea region. Also, there are studies identifying possible physical mechanisms behind teleconnections. For example, Wu et al. (2013) found a linkage between the winter Baffin Bay sea-ice anomaly and northern European atmospheric circulation. Such discussion on mechanisms would assist the authors to find out which of the numerous correlation associations are likely to be physically sensible. Finally, by adding such a discussion the manuscript would better address the "Dynamics of the Earth system" subject area of the ESD journal.

2) Title is misleading. TP is a location in Southern Estonia and is not representing the entire Baltic Sea region. I base this claim on findings of previous studies mentioned above. I suggest to change the title to 'Atmospheric teleconnections between the Arctic and Southern Estonia'.

3) Results section needs to be more focussed, now the large number of details confuses the reader. As a result, the reader is left wondering which correlation links are important which are not. Here, a summary table listing the most significant and physically relevant linkages would help the reader. Such a table would then support discussion.

4) The analysis is based on only one reanalysis, although it is known that reanalyses have significant biases in the Arctic. To ensure the robustness of results, would be good to check main results with another reanalysis. I was also wondering why CFSR was picked of all available products? I suggest carrying out the analysis with an ECMWF one, such as ERA-Interim.

5) Methods have not been adequately explained. In particular, the partial correlation method needs to be explained and a reference to literature added.

6) Statistical terminology is misleading at places. For example, I would not say that correlation is strong when r is 0.5-0.7. Such a correlation range explains only 25-50% of variance.

7) Although the manuscript is generally clearly written, some sentences are difficult to understand (please see minor comments for details).

Minor comments:

- lines 27-28. mention what could be the mechanism linking the Arctic to the outside Arctic environment. For example, does the air advection from mid-latitudes to the Arctic change?

- line 32. 'all kinds of heat conservation changes' is obscure, be more specific.

- lines 33-34. I found this argument rather weak. So far, it has been very difficult to show that the observed Arctic warming has actually had impact on mid-latitudes.

- line 36. 'patterns of high pressure'?

- line 69. 'One of the reasons for incomplete understanding ...'

- line 71. '... vice versa due to their close proximity.'

- line 71. Where does 'Therefore' point to?

- line 100. Which correlation coefficient? Spearman?

- line 102. Why was the Arctic defined as north of 55N. Why not north of the Arctic circle?

- lines 155-160. When explaining your correlation findings, it would help if figure sub-panels are cited more frequently to specifically indicate where you see the regions. Some geographic regions mentioned are rather local and many readers may not know where they are (e.g. the Gulf of Alaska).

- line 156. 'the AO index as the controlling factor', better?

- line 171. 'change in one parameter due to climate change'?

- line 176. '... partial correlations, controlled ...'

- line 180. I can't find negative correlation in winter above Greenland and the East Siberian Sea in Figure 6.

- line 184. Positive correlation around Greenland in winter looks rather weak and not clear.

- line 188. Change to 'It means that climatic conditions'. Weather is chaotic with no memory beyond two weeks.

- line 190-191. This sentence is unclear. Do you mean '... during the following spring?'.

- line 195. How can you say that 'whole Eurasian average spring temperature is highly controlled' based on your analysis?

- line 198. You can call the region between Greenland and Svalbard the Fram Strait.

- line 209-210. I don't understand this sentence.

- line 220-221. What do you mean by 'AO/NAO paradigm'?

- line 253. 'previous season's climate conditions'.

- Table 1. Add information on the sample size, N=36?

Literature:

Uotila, P., T. Vihma and J. Haapala, Atmospheric and oceanic conditions and the extremely mild Baltic Sea ice winter 2014/15, Geophys. Res. Lett., doi:10.1002/2015GL064901, 2015.

Vihma, T., B. Cheng, and Uotila, P., Linkages between Arctic sea ice cover, large-scale atmospheric circulation, and weather and ice conditions in the Gulf of Bothnia, Baltic Sea, Advances in Polar Science, 25(4), 289-299, doi: 10.13679/j.advps.2014.4.00289, 2014.

Wu, B. Y., Zhang, R. H., D'Arrigo, R. et al., On the Relationship between winter sea ice and summer atmospheric circulation over Eurasia, Journal of Climate, 2013, 26:

5523-5536, doi:10.1175/JCLI-D-12- 00524.1.

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