Link of the Barents Sea ice extent with El-Nino phenomena

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The most rapid current climate changes are detected in the Arctic. One of the brightest proofs of the current changes is the rapid reduction of the Arctic sea ice extent (Mokhov, 2015). The strongest interannual variations of the global climate are associated with El-Niño phenomena and it is natural to expect the manifestation of El-Niño effects in different latitudes, especially in Arctic latitudes. An important indicator of changes in the Arctic basin is the Barents Sea (Mokhov, 2018). It is a key reservoir of heat accumulated in the Arctic Ocean. At the same time, climatic conditions in the Barents Sea basin are sensitive to possible variations in oceanic thermohaline circulation, which is formed in the North Atlantic and is dependent on the global climate. A number of studies have noted a relationship between climatic variations in the Barents Sea basin and El-Niño phenomena (see (Byshev, 2003)). Here we analyze the changes in the features of the connection between the Barents Sea ice extent (BSIE) by data from (http://nsidc.org) with El-Niño phenomena (EN) of various types characterized by different indices.

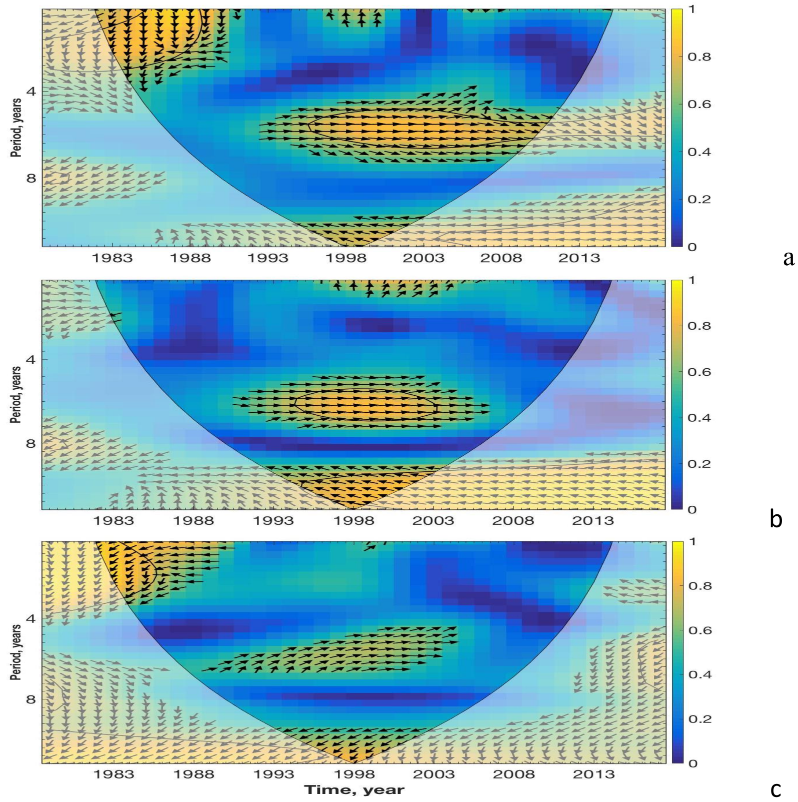

Fig. 1. Local coherence of BSIE in February (a), April (b) and September (c) with EN (Nino3) in January from observations (1979-2018).

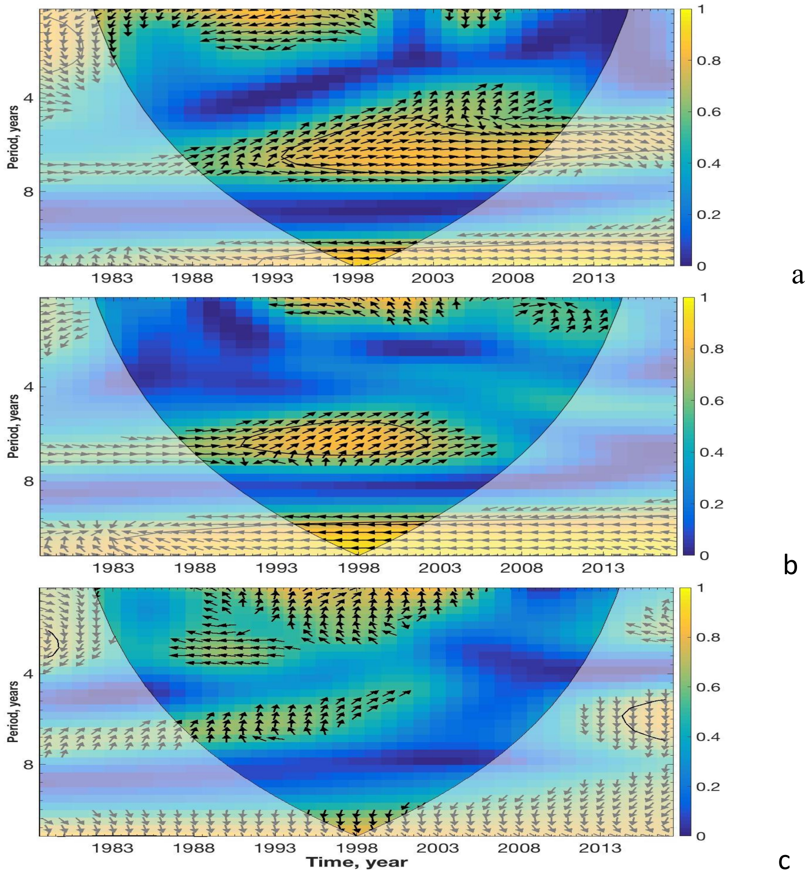

Fig. 2. Local coherence of BSIE in February (a), April (b) and September (c) with EN (Nino4) in January from observations (1979-2018).

Figures 1,2 show local coherence of BSIE in February (a), April (b) and September (c) with EN characterized by Nino3 and Nino4 indices in January from observations (1979-2018). The significant BSIE-EN coherence is exhibited for variations with periods about 5-6 years and for interdecadal (long-term) variability. It should be also noted the manifestation of the relationship of Barents Oscillation to the El Niño phenomena.

There are remarkable differences for different months. In particular, the BSIE-EN coherence is more significant in February and April (with a large BSIE in winter and spring months) than in September (with BSIE intra-annual minimum at the end of summer - beginning of fall). Figures 1, 2 display essential differences in the BSIE coherence with different EN types detected by Nino3 and Nino4, especially in the interdecadal variability. According to Fig. 1 the long-term BSIE coherence with EN (Nino3) is insignificant in September during two first decades of the 21st century while it was significant during last two decades of the 20th century. The obtained results can be explained by the existence of a critical BSIE value below which its relationship with EN becomes statistically insignificant.

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References

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