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Third Report of Joint Russian/German Project "Assessment of Short-time Climatic Variations in the Labrador Sea"

by

M. Stein *) and V.A. Borovkov**)

*) Institut für Seefischerei (ISH)
Hamburg, Palmaille 9, D-22767 Hamburg, Germany
e-mail: stein.ish@bfa-fisch.de

***)Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO)
6, Knipovich Street, Murmansk, 183763, Russia
e-mail: borovkov@pinro.murmansk.ru

A Workshop consisting of V. A. Borovkov (PINRO, Murmansk, Russia), M. Stein (ISH, Hamburg, Germany) and G. Nesvetova (PINRO, Murmansk, Interpreter) met at the Institut für Seefischerei, Hamburg during 10-14 May 1999. Terms of references and agenda as formulated during the second meeting of this project formed the basis for this Workshop.

Preliminary Results

Data acquisition

By means of data sets, derived from the World Ocean Atlas 1994 (WOA94) accessible from CD-ROM, and through the INTERNET pages:

<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS>

<http://www.cdc.noaa.gov/Correlation/>

<http://www.cdc.noaa.gov/Composites/>

interannual variability of the slope trapped boundary currents along the Seal Island-Cape Farewell Section, as well as the temporal changes of air temperatures and North Atlantic Oscillation (NAO) Index correlation patterns, and SLP anomalies in the Labrador Sea region were analysed.

Software acquisition

The most recent version (April 1999) of the OCEAN-DATA-VIEW 4.0 software (ODV 4.0.9), as provided by R. Schlitzer from the Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven, Germany through the INTERNET (<http://www.awi-bremerhaven.de/GPH/ODV>), was used.

Air temperatures/NAO correlation

Analysis of the winter atmospheric conditions (December – March, 1958 - 1998) revealed a system of negative and positive areas of correlation (Fig. 1). The Labrador Sea and the Irminger Sea regions indicate negative correlation, whereas a band of positive correlation stretches from the coast of the New England States in a northeasterly direction to the west of Europe with highest correlation coefficients > 0.6 centered at about 38°N , 52°W . The Nordic Seas show weak positive correlation, a tongue of which is seen northeast off Iceland.

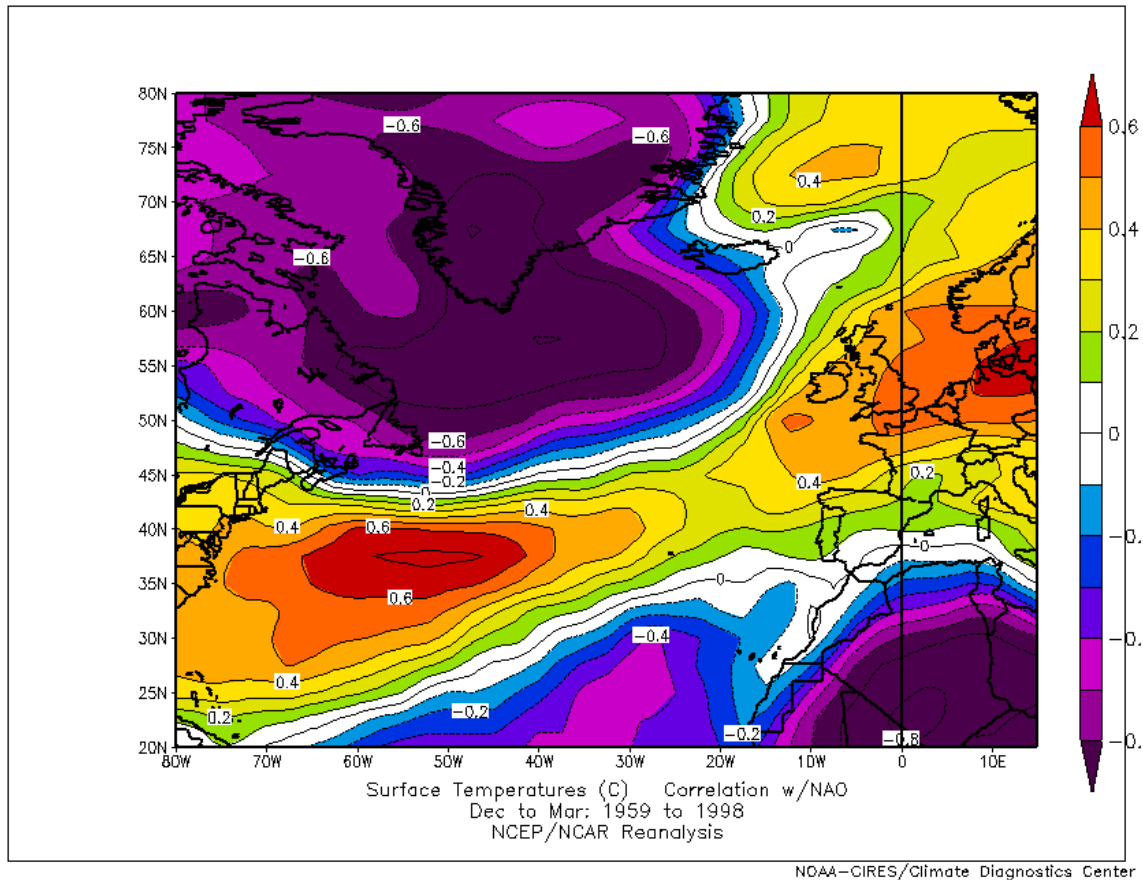


Fig. 1 Surface Air Temperature ($^{\circ}\text{C}$) correlation with Winter (DJFM) NAO Index

Sea Level Pressure Anomalies

Analysis of Sea Level Pressure (SLP) Anomalies of four decades, 1960s to 1990s, indicates a reversal of SLP anomalies when comparing the 1960s and 1990s: in the 1960s positive anomalies were encountered north of 55°N , and negative anomalies in the Azores High area (Fig. 2). The 1990s are characterised by negative anomalies in the north, and positive in the south (Fig. 3). During the 1970s and 1980s a transition from the 1960s mode to the 1990s mode is visible.

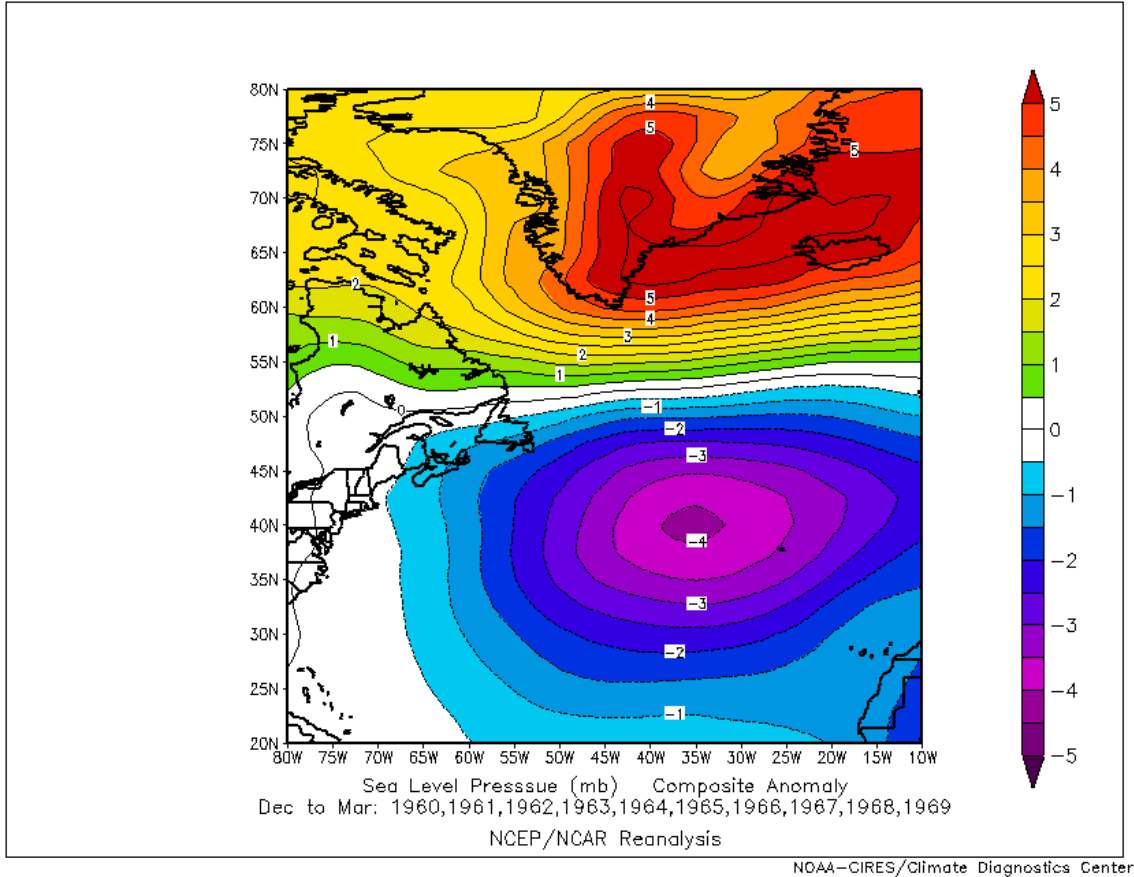


Fig. 2 Sea Level Pressure Composite Anomaly 1960s

In conclusion we see in the zonal band of positive correlation distribution two modes:

- the first mode which characterises the 1960s and 1990s, has its maximum of positive correlation in the central North Atlantic,
- the second mode which has a maximum in the western North Atlantic and a weaker maximum in the Northeast Atlantic.

The position of maxima in both modes are associated with the approximate location of the extremes in the SLP anomalies of the Bermuda-Azores belt.

From the analysis of water mass differences in the Labrador Sea region during extrema NAO+ and NAO- years, preliminary results can be given in this report. It has to be stressed, however, that further detailed analysis is necessary and will be conducted during the next project meeting in PINRO, Murmansk to fully understand the results from this analysis:

To depths of about 1000m we see mostly positive differences in potential temperature, salinity and potential density when referencing to NAO+ or NAO+1931 year conditions (years of high positive NAO Index are characterised by cold conditions in the Northwest Atlantic). In the Labrador and Greenland shelf regions we see, however, negative differences in the arctic components of the water masses. This has to be explained by our future work.

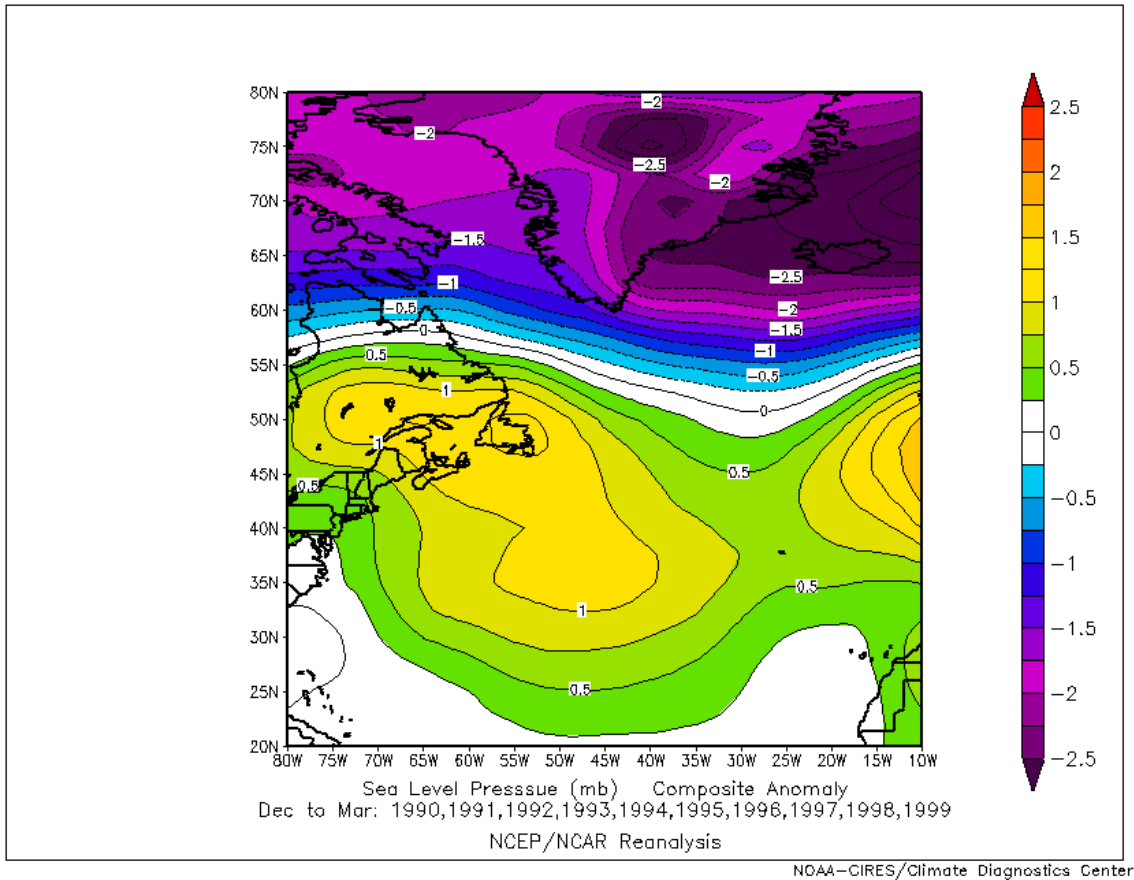


Fig. 3 Sea Level Pressure Composite Anomaly 1990s

Future activities

It is planned to publish the results in primary literature. First scientific results may be presented at the NAFO June 1999 meeting in Dartmouth, Nova Scotia, Canada. Compilation of results from the 1998 meeting in Murmansk, the 1999 meeting in Hamburg and in Murmansk will be published in NAFO Journal.

Next Meeting

The next Workshop meeting within the scope of the project will be held in PINRO, Murmansk, tentatively during 23 to 30 August, 1999.

Acknowledgements

The members of the workshop appreciate the administrative help given by the director of ISH, Hamburg, Dr. G. Hubold and his staff.

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