Geophysical Research Abstracts, Vol. 9, 01735, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01735
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The Nordic Seas thermohaline system response to the large-scale atmospheric and advective anomalies

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The oceanographic database compiled for the Nordic Seas (NS: Norwegian, Greenland, Iceland and Barents Seas) for the 1900-2005 under the INTAS-4620 project allows tracing changes in water mass properties as well timing of formation/decay, magnitude and pathways of the large-scale thermohaline anomalies. The research focuses on the two distinct hydrological regimes that control intensity of the vertical exchange in the NS. The first regime was settled during the late 1960s - early 1970s which can be characterized by enhanced intermediate and deep water formation. The regime was initiated by water column preconditioning (intensive Atlantic water spreading) and abnormal atmospheric forcing (prolonged severe cooling). As a result, the region with an active convection, normally located in the central Greenland and Iceland Seas, had been extended to the south-eastern areas of the NS. Observations confirm that during the period of the first regime the warm and salty Atlantic Water penetrates great depth filling underlying intermediate and deep layers. Large-scale positive temperature and salinity anomalies were formed and had been preserved for decades. It is obvious that the mechanism responsible for the regime formation was not simple and composed of diapycnal/isopycnal mixing and diffusion processes with different spatial/temporal scales. Almost simultaneously the high salinity climatic signal was registered in the Faroe-Shetland Channel (FSC) in dense overflow water flowing to the North Atlantic (NA). We argue that the period should be regarded as an abnormal period caused by the formation of the large-scale subsurface positive salinity anomaly. Salinity time series provided by the ocean weather ships in the NA (operated during the 1960s-1970s) also show pronounced salinity maximums around 1970. The second regime was estab-

lished during the late 1970s -1980s when the well known “Great Salinity Anomaly” was advected from the NA. Contrary to the previous regime, both the upper layer freshening and the mild atmospheric conditions favored the horizontal advection with reduced vertical exchange as well as the reduction of the downward salt flux.