Changes in Atlantic Water Inflow into the Nordic Seas

Broytingar í innráki av Atlantssjógvi til høvini fyri norðan

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Úrtak

Undirsjóvarryggurin, sum gongur millum Grønland og Skotland, skilir høvini norðan og eystan fyri okkum frá restini av heimshøvunum; men loyvir tó ráki báðar vegir. Í ovastu løgunum rekur heitur Atlantssjógvur norður og eystur um ryggin (Mynd 1), og hetta rák hevur stóran týdning fyri klimaviðurskifti bæði her um okkara leiðir og á jørðini sum heild. Aftan á drúgvar kanningar sæst nú vón fyri at fáa talfest mongdina av sjógvi, sum ferðast yvir um ryggin (Mynd 2). Eisini eru týðiligar ábendingar um broytingar í teimum ymisku greinunum. Mátingar, sum nú verða gjørdar, kunnu væntast at útgreina, hvussu stórar hesar broytingar eru.

Extended abstract

The Greenland-Scotland Ridge is a submarine ridge system separating the Nordic Seas (Norwegian Sea, Iceland Sea, Greenland Sea) and the Arctic Ocean from the rest of the World Ocean. North of the ridge a series of processes produce deep and intermediate water masses which flow into the Atlantic over the ridge to form a key component of the deep waters of the World Ocean. To compensate for the sinking water, there is a continuous inflow of Atlantic water into the Nordic Seas across the ridge and this inflow is therefore a main factor in the global thermohaline circulation. At the same time it transports heat northeastwards and is to a large extent responsible for the mild climate of the northeastern Atlantic and its surrounding landmasses.

The ridge extends above sea level in Iceland and in the Faroe Islands and these divide the water masses above the ridge into three gaps. The Atlantic water inflow occurs through all of these gaps (Fig. 1), but

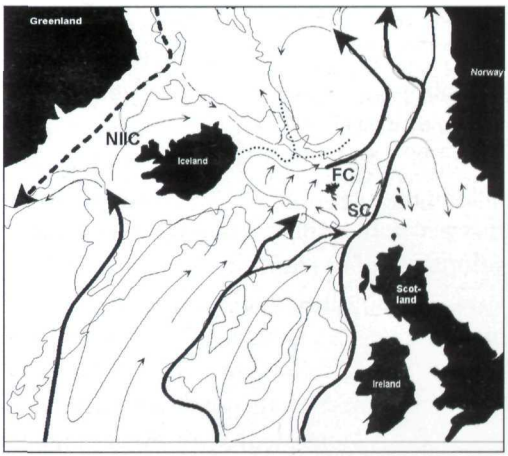

Fig. 1. Bottom topography of the Greenland-Scotland region with the main current paths in the upper layer indicated by arrows. NIIC: North Icelandic Irminger Current, FC: Faroe Current, SC: Shetland Current.
Mynd 1. Botndýpi og høvuðsrák í vatnskorpuni kring Føroyar.

the three flow branches (NIIC, FC and SC on Figure 1) have different origins, different properties (e.g. temperature) and to some extent they also deliver these properties to different areas northeast of the ridge. The westernmost branches (NIIC and FC) derive from the open Atlantic Ocean and are colder and less saline than the easternmost branch (SC) which has a more continental component. After crossing the ridge, the westernmost branches affect the southeastern parts of the Nordic Seas most directly while the Shetland Current (SC) probably has a larger effect on the North Sea and the Barents Sea.

Much effort has gone into establishing quantitative estimates of the Atlantic water flux across the ridge, but only with the development of modern current measuring instrumentation has this been possible and a quantitative flux budget may now be presented (Fig. 2) although it is still preliminary. It appears that the total exchange budget is fairly consistent with Worthingtons (Deep-Sea Res., Vol.17, 1970) suggestion, even though the pathways and details are quite different from his scheme and the most important inflow path seems to be the Iceland-Faroe branch.

For climatic and biological problems, the most important question is how much the inflow varies in strength on seasonal to decadal and longer timescales. Hydrographical investigations have indicated the existence of such variations. Thus, the Iceland-Faroe inflow branch seems to vary in extent seasonally and also seems to have decreased from the mid-eighties to the early nineties. Quantitative estimates of the flux variations are not available, however, and we do not know whether the three inflow branches vary in phase to give a significant variation in the total flux or switch the inflow between them, leaving the total flux more or less unchanged. For reliable answers to this question we will have to await the results of ongoing, long-term current measurement programmes.

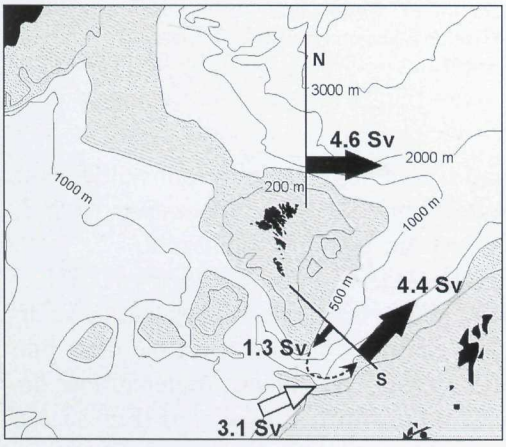

Fig. 2. Preliminary flux estimates for the inflow of Atlantic water through the Iceland-Scotland Gap in Sv (Sverdrup = 10^6 m^3/s) based on results from the Nordic WOCE project. An additional inflow of approximately 1 Sv occurs west of Iceland.
Mynd 2. Fyribils meting av mongdini av Atlantssjógvi, sum rekur inn millum Ísland og Skotland, grundað á úrslit frá Nordic WOCE kanningunum.