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Labrador Sea Salinity Variability on Multiyear Time Scales

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We analyzed freshwater variability in the upper Labrador Sea on multiyear time scales. Freshwater changes in the Labrador Sea have large impact on the stratification of the water column and play a key role in Labrador Sea deep water formation. This stratification as well as atmospheric forcing defines to first order the intensity and density - thus depth - of the convection. A large amount of data sources were combined to get the best possible results, including two online databases of CTD data, pre-Argo and Argo-floats and thermosalinograph data from the North Atlantic. The analyses concentrate on 6 regions within the Labrador Sea that have low horizontal salinity gradients and represent all important surface water masses. All major freshwater anomalies are found in the 6 regions, and a pathway analysis of decadal variations in salinity like the Great Salinity Anomaly (GSA) of the 70's is performed. Measurements in the West Greenland Current region during times of large anomalies in the central Labrador Sea ('57, '70, '85), show the origin of these anomalies in the salty Irminger Sea waters with salinities above 34.7, prior to any other region. With an average lag of two years, these anomalies are found in the fresh shelf water of polar origin, thus significantly past the occurrence in the water of North Atlantic Current origin. This order suggests that a salinity anomaly origin in the source of the Irminger Current, making the North Atlantic Current a more likely source than the Nordic Seas. These findings contradict the general belief that all major Great Salinity Anomalies observed in the Labrador Sea originate from the Arctic.