

The Role of Ice in Winter Convection in the Odden Region of the Greenland Sea indicated by Satellite and In-situ Data

Frank Carsey, John Crawford and I-Lin Tang (all at: California institute of Technology, Jet Propulsion Laboratory, Pasadena CA 91 109; 818-354-8163 F. Carsey/Omnet; fdc@pacific.jpl.nasa.gov)

Satellite microwave and ocean mooring and CTD data in the Greenland Sea for the winters of 1989 and 1992 are examined to better understand the surface processes active in convection. Previously published results showed that winter convection at the edge of the Odden ice protuberance is responsible for the formation of the large ice embayment called Nordbukta; the Odden and Nordbukta are ice extent events that occur in nearly every winter. The Nordbukta ice retreat process involves sensible heat and brine being brought by convective return water from depth to the surface. In this paper we use fall, 1989 CTD profiles to define initial conditions for winter cooling; we use SSM/I data to describe large (100 km) scale changes in the ice cover; and we use ERS - 1 SAR data to describe the areal extent of convective water. These observations are compared with the expected ice extent behavior as a consequence of mixed layer properties predicted using a simple model. In the model the upper ocean is cooled by surface fluxes, increases its brine concentration through ice growth, and undergoes a local transition to unstable vertical stratification, related to convection onset, such that the zone of convective water propagates to the SW along a mixed layer salinity gradient. On the whole the brine budget does not balance, that is to say the propagation speed is way off, unless some brine is brought from depth. A heat budget can be defined which appears to be approximately consistent with the observed phenomena, if access to heat from depth is assumed, and the flux of (preconvective) water into the mixed layer can be thereby estimated. Because the heat lost at the surface is partitioned into latent and sensible sources, the exact origin of the brine added to the upper water (prior to convection) is difficult to state; the role of the ice growth brine may be mostly to initiate the mixing. Interannual variations in ocean and ice properties give rise to connections between surface fluxes and longer term climate change.

1. 1993 Fall Meeting

2. 001308682 (AGU Member Number)

3. F. D. Carsey
JPL ms 300-323
Pasadena CA 91109
ph:818 3548163
fax: 8183936720

4. 0

5(a) 001 or 002.
Advances in Microwave Remote Sensing of Sea Ice: W. J. Campbell Memorial I or II
(b) 4275 Remote Sensing
4540 Sea Ice Exchanges
(c) Remote Sensing

6. Oral

7. 25% at Nansen Symp. Bergen, 6/1993

8, \$50 FirstBanks Visa
4798264000038034
exp. 07/95

9. c

10. Willing to chair; knew Bill Campbell since 1974 and had numerous fine disagreements with him