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MEASUREMENT OF THE BEAUFORT CIRCULATION USING AN IOEB (ICE OCEAN ENVIRONMENTAL BUOY) (ABSTRACT)

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An Ice Ocean Environmental Buoy (IOEB-1) was deployed by cooperation between JAMSTEC and WHOI at 73°03'N-148°48'W in 1992 to measure the Beaufort circulation. The ADCP data discussed here was obtained via the ALGOS Satellite System during 1992-1994. It was found that the features of the circulation were different between the Canada Basin and the Chukchi Plateau/Northwind Ridge. In the Canada Basin, the velocity field at all depths, 58 m, 106 m, 154 m, 202 m, and 250 m, had no correlation with bottom topography and the circulation was governed by meso-scale eddies. Activity of the most of meso-scale eddies found in the Canada Basin had a maximum at 106 m or 154 m depth within the cold halocline layer where dissolved Si takes maximum (ANDERSON and DYRSEEN, 1989). A hypothesis that shelf water having rich Si was advected by the meso-scale eddies from the shelf region into the basin in the cold halocline layer was proposed by AAGAARD and CARMACK (1994). The results of the present study support their hypothesis. On the other hand, near the Chukchi Plateau and the Northwind Ridge, velocity field had good correlation with bottom topography at all depths. At the depth below the cold halocline (250 m), 30-days running mean data showed that currents with speed about 5 cm/s flowed in the direction with shallow region on the right on the eastern slope of the Northwind Ridge and northern slope of the Chukchi Plateau. Along the margin between the Chukchi Sea and the Chukchi Plateau, it was also found that currents with speed about 2 cm/s flowed in the direction with the Chukchi Sea on the right. The core of the currents on shelf slopes was not located at a specific contour of bottom topography, but was located where the gradient of the bottom topography had maximum values. This implies that a convergence of the currents can occur where the gradient of bottom topography is large, on the other hand, a divergence can occur where the gradient of bottom topography is small. Since the Atlantic Water is found below the cold halocline in the Beaufort Circulation, the present result indicates that there are two routes of the Atlantic Water from west of the Chukchi Plateau to the Canada Basin. At the depth above the cold halocline layer, strong current was also found on the eastern slope of the Northwind Ridge and northern slope of the Chukchi Plateau. The current found on the northern slope of Chukchi Plateau was in the same direction as that found at 250 m depth, however, on the eastern slope of the Northwind Ridge, the direction was opposite. This implies that there was a dynamical difference between the upper and lower levels.

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