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A SUBARCTIC OCEAN CURRENT DRIVEN BY SEA SURFACE COOLING (ABSTRACT)

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The coastal Oyashio, flowing southward along the coast of northern Japan, is an integral part of the subpolar circulation in the North Pacific. It shows a clear seasonal variation in current speed with the maximum in spring and minimum in fall. The coastal Oyashio has extended abnormally southward in years when the northwesterly monsoon was extraordinary strong, causing heavy snowfall in northern Japan. Y. SEKINE (J. Oceanogr. Soc. Jpn., **44**, 60, 1988) suggested that the abnormally southward extension of the Oyashio could be caused by southward shift of the latitude of null wind stress curl. His numerical experiments showed that the entire subpolar circulation extended southward by the wind effect. Actually, however, southward extension of the Oyashio is observed only in the coastal area.

Dataset of the Oyashio water area (T. YOSHIDA; Umi to Sora (Sea and Sky), **68**, 79, 1992) has been analyzed together with time series of sea level, air temperature, and sea surface temperature at coastal stations. It has been found that the variation in the Oyashio area is highly correlated with the downstream sea level difference in terms of both the monthly mean and anomaly values, and that the variation in the sea level difference is also highly correlated with the sea surface temperature and air temperature at coastal stations.

The sea levels along Japanese coasts are known to be primarily governed by the air pressure and the sea water temperature. Since the air pressure shows very poor correlation with the sea level differences, however, it seems likely that variation in the latter is responsible for the downstream sea level difference. It is well known that the sea water density is poorly dependent on temperature at lower temperatures (especially near the freezing point). This means that in wintertime the height of the sea water column does not drop significantly in the northern ocean while greater falls are observed in the southern ocean. Obviously, this may cause sea surface inclination in the north-south direction. Therefore, we conclude that the north-south sea level difference observed in wintertime is caused by the cold sea surface temperature or by the cold air temperature. This conclusion implies in turn that the coastal Oyashio is driven thermally or driven by the sea surface cooling in wintertime.

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