

Aircraft observations over the Sea of Japan and the Sea of Okhotsk in winter

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It is well known that the Sea of Okhotsk is one of the southernmost seasonal sea ice zones in the Northern Hemisphere. The importance of the relationship between the Sea of Okhotsk ice cover and regional/global climate has long been recognized. Indeed, recent research work has tied the extreme maximum and minimum wintertime extents of sea ice cover to large scale changes in atmospheric circulation patterns. Recent studies suggest that a possible origin of the North Pacific Intermediate Water (NPIW) is produced in the Sea of Okhotsk. Thus, there are important climate issues that are associated with the Sea of Okhotsk. It is also known that Japan, especially along the coast of the Sea of Japan, is one of the heaviest snowfall regions in the world. Snowfall is brought by banded snow clouds formed when winter monsoon air from Siberia is supplied latent and sensible heat from the Sea of Japan. These banded snow clouds are also frequently formed in the lee side of the sea ice over the Sea of Okhotsk, and play an important role in the growth of the sea ice.

Despite of the scientific importance of these areas in regional/global climate system, in-situ observations there are extremely few, especially in winter. This is due to the fact that the wintertime environment is generally harsh and is not conducive to making high quality measurements. However, in recent years instrumentation and technology have improved to the point where it is now possible to make the requisite wintertime measurements. In this regard, we conducted aircraft observations over the Sea of Okhotsk and the Sea of Japan.

We had deployed an X-band Doppler radar at Monbetsu on November of 2005, and started observation on 16 January of 2006. The height of sea-ice is different from place to place. Air-born laser altimeter is only the tool that can make horizontal distribution of the height of sea-ice. However, this method is very expensive and severely affected by weather condition. We tried to make a three dimensional display of sea-ice and suggested that our radar system could be used to study the irregularity of the height of sea-ice. Therefore, we measured horizontal distribution of height of sea-ice by using aerial cameras and compared it with 3Dimages of our X-band radar.

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