

# Airmass modification and sea surface cooling over the Japan Sea and Okhotsk Sea under winter monsoon situations

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Under winter monsoon situations, a cold and dry airmass from Siberian continent associated with a developed low passes over the Sea of Japan and Sea of Okhotsk. In such case, a large amount of heat and moisture is transported from the ocean to atmosphere (i.e., air-mass modification). The ocean is also modified by a strong sea surface cooling, and sea ice is formed in the Sea of Okhotsk and continental shelf region in the Sea of Japan. Consequently, a deep convection occurs and promotes the renewal of Japan Sea Proper Water (JSPW) and North Pacific Intermediate Water (NPIW). Thus, cold-air outbreaks over the relatively warm ocean significantly affect both of atmosphere and ocean, which is an universal process among the past, present and future. Therefore, the investigations of the current air-sea interaction under monsoon situations is useful for the understanding of the paleoceanographic studies. In this presentation, the properties of turbulent heat flux during cold-air outbreaks over the Sea of Japan and Sea of Okhotsk are shown based on aircraft observations.

Observations by a Russian research aircraft were conducted on 29 January, and 2 and 3 February 2001 over the Sea of Japan, and on 14 and 18 February 2000 over the ice-covered Sea of Okhotsk. Each flight was made during a typical winter monsoon situation. From results of the flights over the Sea of Japan, it was found that the amount of turbulent heat flux depends on the intensity of cold airmass from the continent. In particular, the sea surface cooling and resultant sea-ice formation near the continental shelf on 2 and 3 February was remarkable, suggesting that the massive renewal of JSPW took place since the mid-1980s. Over the ice-covered Okhotsk Sea, on the other hand, the air-sea heat transfer was significantly suppressed due to the ice cover. However, the airmass modification / sea surface cooling still dominates over the open water areas among ice floes and over the marginal ice zone.

For the better understanding of the paleoceanographic environment in these regions, the places to interact between the atmosphere and ocean should be detected more accurately (e.g., coast lines, and marginal ice zones).