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Abstract

Mutsu Bay is semi-enclosed coastal water body composed of two bays. The west bay connected to Tsugaru Strait is strongly influenced by Tsugaru Warm Current and high-saline, warm, whereas the east bay is low-saline, cold. The abrupt rises of the bottom water temperature and its vertical reversal was observed at the automatic marine monitoring buoys under a condition of the atmospheric disturbance approaching in the bay during March 6-8th, 2003. This study reproduced the abrupt vertical reversal of the water temperature and examined the oceanic response to the atmospheric disturbance using the three-dimensional multi level model. The typical northwestern wind in winter drove the surface eastward currents along the northern and southern coasts, which transported the high-saline, warm water from the west bay to the east bay. The westward bottom current flowed into the west bay, compensating the surface current. When the atmospheric disturbance approached the bay, the northeastern wind drove the westward currents transporting the surface water from the east bay to the west bay along the northern and southern coasts. The westward currents were compensated by the downwelling in the southern coast of the east bay and the bottom eastward current transporting the high-saline, warm water from the west bay to the east bay. Thus, the flow pattern during the atmospheric disturbance was contrast to the typical pattern in winter. The surface high-saline, warm water was advected by the downwelling to the bottom layer. The bottom temperature increases higher than the surface, which causes the vertical reversal. Since the salinity of the transported bottom warm water is relatively high, the density of the warm water is hardly different from that of the low-saline, cold water distributed at the bottom in the east bay before the atmospheric disturbance approaching. After the atmospheric disturbance, the structures of the flow and temperature required approximately four days and

more than a week, respectively, to returns to the typical patterns in winter.