

Circulation and haline structure of a microtidal bay in the Sea of Japan influenced by the winter monsoon and the Tsushima Warm Current

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Mooring and hydrographic surveys were conducted in Tango Bay, a microtidal region of freshwater influence (ROFI) in the Sea of Japan, in order to clarify the circulation pattern in the bay and its driving forces. Monthly mean velocity records at four stations revealed an inflow and outflow at the eastern and northern openings of the bay, respectively, which indicates an anticyclonic circulation across the bay mouth. The circulation was significantly intensified in winter, in accordance with the prevailing NW wind component of the winter monsoon. The anticyclonic circulation at the bay mouth was connected to an estuarine circulation that was evident near the mouth of the Yura River at the bay head. Surface salinity just offshore of the river mouth was closely related to the Yura River discharge, whereas in lower layers the offshore water had a stronger influence on salinity. Prior to a seasonal increase in the Yura River discharge, summer salinity decreased markedly through the water column in Tango Bay, possibly reflecting intrusion of the Changjiang Diluted Water transported by the Tsushima Warm Current. In contrast with the traditional assumption that estuarine circulation is controlled mainly by river discharge and tidal forcing, the circulation in Tango Bay is strongly influenced by seasonal wind and the Tsushima Warm Current. The narrow shelf may be responsible for the strong influence of the Tsushima Warm Current on circulation and water exchange processes in Tango Bay.

Keywords: water exchange, ROFI, microtidal bay, estuarine circulation, Tsushima Warm Current, Changjiang Diluted Water