Seasonal variation of near-inertial internal wave energy and associated water masses modification in the Okinawa Trough

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The Okinawa Trough, which is separated from the Philippine Sea by a submarine ridge associated with the Ryukyu Island chain, is a relatively shallow basin over the western boundary of the North Pacific subtropical gyre. This basin is characterized by the following aspects: the Kuroshio flows northeastward over complex bottom topography along the continental slope and across the straits, and baroclinic tidal energy is significantly stronger than that in the interior ocean. The observations, therefore, show the evidence that several types of topography-current and topography-wave interactions occur, and strong turbulent mixing is exited around the Okinawa Trough. Furthermore, the previous studies have revealed that the water masses, particularly the North Pacific Intermediate Water (NPIW) carried by the lower part of the Kuroshio, is strongly modified within the Okinawa Trough by strong turbulent mixing, which is estimated to be O (10^{-4}) m^2 s^{-1} in average.
In this study, we examine the seasonal salinity variation for the NPIW around the Okinawa Trough, and its relation to the seasonal variation of vertical mixing there. For this purpose, we perform two kinds of data analyses: one is to describe the seasonal salinity variation of NPIW using data from two repeat hydrographic sections across the Kuroshio in the Okinawa Trough, and the other is to describe seasonal and spatial variations of near-inertial internal kinetic energy in the Okinawa Trough using historical moored velocity records. Based on these analyses, we suggest that the seasonal variation of vertical mixing due to near-inertial internal wave breaking causes that of the NPIW in the Okinawa Trough. The discussion is devoted to inferring the mechanism for seasonal variation of near-inertial internal kinetic energy input, focusing on wind forced motion and Kuroshio meander motion.

Keywords: North Pacific Intermediate Water,, Vertical mixing, Repeat hydrographic sections, Moored current-meter records

