# Internal structures along the Kuroshio large meander area obtained from dissolved inorganic radiocarbon

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The Kuroshio is the strong western boundary current of the North Pacific subtropical gyre that transports large amounts of heat, salt, and dissolved materials northward. It is well known that the Kuroshio south of Japan shows remarkable bimodal path fluctuations between the large meander (LM) path and the nonlarge meander (NLM) path. When the Kuroshio takes the LM path, turbulent water mixing associated with the Kuroshio variabilities can pose significant effects on fisheries, marine navigation, and regional climate along the southern coast of Japan. Previous studies about the impact of the Kuroshio variabilities were mainly conducted and observed by satellite observations. However, satellite observations are limited to the ocean surface and are sometimes limited by inadequate spatial resolution. Therefore, high-resolution field observations throughout the water column need to be conducted to gain better knowledge about the direct impact of the Kuroshio LM.

The radiocarbon ($\Delta^{14}C$) in dissolved inorganic carbon (DIC) of seawater is used as a reliable tracer of water circulation and mixing processes. In this study, high-resolution dissolved inorganic radiocarbon ($\Delta^{14}C$-DIC) results in the Kuroshio LM are reported. The seawater samples were collected in March 2022 by R/V Hakuho-maru (KH-22-5) along the Kuroshio LM path and measured by accelerator mass spectrometry at Atmosphere and Ocean Research Institute, The University of Tokyo. As a result, significantly large horizontal variations in $\Delta^{14}C$-DIC values were observed between 300 m and 1000 m in the Kuroshio LM. The main causes of these large variations are the upwelling and downwelling of water masses associated with the presence of cyclonic and anticyclonic eddies, and the turbulent water mixing found at the Kuroshio front. Meanwhile, the high chlorophyll a concentration observed at the upper euphotic zone on the south side of the Kuroshio axis suggests that nutrients were supplied from the subsurface water through these turbulent water mixing processes. We also compared our results with values previously reported for similar stations during the WOCE and GO-SHIP projects decades ago. The result of comparison shows that variations in bomb $^{14}C$ penetration depths over the past 30 years might be mainly caused by the intensive mixing that occurs in the Kuroshio region.

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