

Near-inertial waves advected by the Kuroshio from observation and simulation

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Advection of near-inertial waves (NIWs) by background currents has been predicted using numerical simulations, while supporting in-situ observations were rare. A pair of tall current moorings, deployed around 26°N and 125°E in Okinawa Trough from June 2015 to June 2016, provides a clear evidence exhibiting NIWs advected by the Kuroshio. Energetic NIWs are observed after two-typhoon passages in early August and late September 2015. Both typhoon passages occurred across the Kuroshio east of Taiwan upstream of the observation sites about 250-km southwest with a difference of about 2-degree in latitude. One site (KCM1), relatively close to the center of the Kuroshio axis, exhibits more energetic NIWs than near the edge of the Kuroshio (KCM2), ~32 km away from KCM1. The frequency of NIWs shifts to the lower band from the local inertial frequency ($0.91 f$), inferring propagation from the south. The data-assimilative three-dimensional numerical model forced by 6-hourly atmospheric forcings including tides and oceanic circulation demonstrates local NIW generation is weak at observation sites during and after typhoon passages, while its generation upstream of observation sites is quite energetic. Current patterns and frequency shifts of NIWs between observation and simulation agree well at observation sites. Analyses of simulation provide that negative relative vorticity region works like a waveguide for NIW propagation, and the strong Kuroshio current advects the waves poleward with a speed ~85% of the local current.

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