

Detecting the Kuroshio-induced island vortices observed from GCOM-C and Himawari-8 data

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When the Kuroshio passes Green Island, a small island located southeast of Taiwan, well-organized vortices were formed by the interaction between the current and the island. Previous researches have used high-resolution satellite imagery, acoustic Doppler current profiler data, cruise observations, and numerical models to analyze the Green Island wakes, however, there are still many bottlenecks and questions to be resolved. To more understand the spatial structure of island wake and vortex trajectory, the sea surface temperature (SST) and chlorophyll-a (Chl-a) concentration derived from Himawari-8 and the second generation global imager (SGLI) of global change observation mission (GCOM-C) were used in this study. Based on the GCOM-C data, the horizontal SST and Chl-a variations in observed lines, the fronts of SST and Chl-a between the wake and the Kuroshio, the distance between two consecutive vortices, and different structures of SST and Chl-a in the same vortex have been investigated. Based on the Himawari-8 data, totals of 101 vortex cases from July 2015 to December 2019 have been calculated. The average vortex propagation speed was 0.95 m/s, and more than half of the vortices have propagation speed between 0.8-1.2 m/s. The average incoming surface current speed of Green Island was 1.15 m/s which was calculated by the maximum cross-correlation (MCC) method. In total of 38 cases of two continuous vortices, the average vortex shedding period was 14.8 hours, and the results agreed to the ideal Strouhal-Reynolds number fitting curve relation. Our results suggested that the size of Green island and the horizontal eddy viscosity are suitable selected 5 to 6 km and the $100 \text{ m}^2\text{s}^{-1}$, respectively.

Keywords: Island vortex, Kuroshio, Himawari-8, GCOM-C