Air-sea interaction between Typhoon Nari and Kuroshio

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Abstract

The air-sea interaction between Tropical Cyclone Nari and Kuroshio was studied using satellite observations and a three-dimensional primitive equation ocean model. With energy and heat supplement from the Kuroshio, Nari was circling around a restricted water and sustained over an extraordinarily long period. The features that Nari strengthened as it passed over the warm Kuroshio, weakening as it met a cold dome were well revealed by TMI/SST. At certain locations along typhoon track, surface cooling of up to 5°C was observed after Nari's departure. Model simulation indicated significant positive vorticities and cyclonic current vectors did not occur throughout the trail of Nari. Only regions north of Kuroshio provided a better condition for developing a cyclonic eddy. As a result, the cold SST patch was only visible to the north of the Kuroshio axis. The cyclonic circulation penetrated much deeper for a slowly-moving storm, regardless of the typhoon intensity. Near-inertial frequency oscillations after typhoon departure were simulated by the model in terms of the vertical displacement of isotherms. The SST cooling caused by upwelling and vertical mixing is effective in cooling the upper ocean several days after the storm had passed. At certain locations, surface chlorophyll-a concentration increased significantly after Nari's departure. The combined action of upwelling and mixing in turn brings cold deep-layer, nutrient-rich water to the sea surface, which significantly increases the surface chlorophyll-a concentration.