

## Verification of SI-CAT ocean products around Japan

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We examined SI-CAT ocean products around Japan, such as sea surface temperature (SST) and sea level, Kuroshio, and sea-ice in the Sea of Okhotsk. We used the SICAT10 Version 2 data, in which the North Pacific Ocean model with a resolution of 10 km was driven by JRA-55 and CMIP5 (MIROC5, MRI-CGCM 3, GFDL-ESM2M, IPSL-CM5A-MR) atmospheric forcing under the present climate (1960-2005). Observation data used for verification are COBE-SST2 and CMEMS. We made a t-test for the mean difference between the observed and simulated fields, as well as a f-test for the ratio of the observed variance to the simulated. The p-value was taken as a measure of the reliability of the model. The simulated SSTs generally capture the dominant low-frequency modes in the North Pacific in each run. In the sea around Japan, the reliability of the variability is relatively high except for the regions where eddy activity is enhanced, such as off the east of Tohoku and off the south of Japan. The regional averaged SSTs show a long-term upward trend as in the observation. Compared to the reliability of the simulated SST, that of the simulated sea level is relatively low, but the average sea level around Japan shows low-frequency variability associated with PDO as well as long-term upward trends related to the global warming. The average Kuroshio flow path and the position of Kuroshio Extension are generally well captured by the 10 km model. The latitudes of the simulated Kuroshio Extension show no remarkable trend like observation. In the Sea of Okhotsk, the simulated sea ice area during the winter is captured in the IPSL run, but is underestimated (overestimated) in the MIROC run (the MRI and GFDL runs). The long-term trend in winter shows a statistically significant decrease in the GFDL run, which is similar to the observation.

Keywords: SI-CAT, climate change adaptation, high-resolution ocean general circulation model