

Development of projection system of large ensemble data for ocean change around Japan (d4PDFv_ocn)

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A downscaling process was performed to drive a 10 km North Pacific model, creating an ensemble dataset for future projections. Similar to the global model, historical (1960–2020), ssp245 (2021–2100), ssp125 (2021–2100), and hist-nat (1960–2020) have 36 members, while ssp585 (2021–2100) has 10 members. The Meteorological Research Institute Community Ocean Model (MRI.COM) was used as the ocean model. The downscaling was achieved by driving a 1x0.5 degrees global ocean model with the global model as an atmospheric forcing, using a nested approach. Among the 36 members, six members included simplified ecosystem and carbon cycle models. A limited members employed additional nesting to downscale to a 2 km ocean model and historical (1990–2020), ssp245 (2021–2100), and historical natural (1960–2020). A 10 km resolution in the ocean model is essential to realistically reproduce the Kuroshio and its separation. A 2 km resolution enables the representation of more realistic topography and submesoscale phenomena. Large ensembles at these resolutions are unprecedented in the world. Initial analyses of Kuroshio variations, marine heatwaves, and ocean acidification are presented.

Keywords: Large ensemble, Future projection, North Pacific, OGCM