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学 位 論 文 内 容 の 要 旨

博士の専攻分野の名称 博士（理 学） 氏 名 劉 昭君

学 位 論 文 題 名

Dynamical downscaling of future sea-level change in the western North Pacific using
ROMS

(ROMS を用いた力学的ダウンスケーリングによる北西太平洋の将来海面高度変化の予測)

The future regional sea level (RSL) rise in the western North Pacific is investigated. Dynamical downscaling with the Regional Ocean Modeling System (ROMS) with an eddy-permitting 0.25° resolution is performed based on three Coupled Model Intercomparison Project Phase 5 (CMIP5) models—MIROC-ESM, CSIRO-Mk3.6.0, and GFDL-CM3—under the Representative Concentration Pathway (RCP) 8.5 scenario. The historical run (ROMS-Hist) is forced by the air-sea fluxes calculated by using Coordinated Ocean Reference Experiment version 2 (COREv2) reanalysis. Three future runs, namely, ROMS-MIROC, ROMS-CSIRO, and ROMS-GFDL, are forced with an atmospheric field constructed by adding the difference between the CMIP5 parameters for the 21st and 20th century to the forcing fields in ROMS-Hist.

The downscaled RSLs commonly exhibit strong, bullseye-like RSL rise maxima centered on 41°N , 142°E to the east of the Tsugaru Strait, and three zonally aligned maxima along 37°N between 140°E and 160°E . In all ROMS downscaling, the RSL rise along the eastern coast of Japan is generally one-third or less of the RSL rise maxima off the eastern coast of Japan along 37°N . The projected RSL rises along the Honshu coast during 2081–2100 relative to 1981–2000 are 22–29, 8–15, and 8–18 cm in ROMS-MIROC, ROMS-CSIRO, and ROMS-GFDL, respectively. The largest downscaled RSL rise along the Japan coast occurs at the Sanriku coast in all models. Although the

CMIP5 models substantially underestimate the maxima of the offshore RSL rise compared with the ROMS downscaling, the discrepancies of the RSL rise along the Honshu coast between the climate models and ROMS downscaling are less than 10 cm. The maxima of the RSL rise to the east of the Tsugaru Strait and those along 37°N are probably related to the enhanced northward intrusion of the Kuroshio Current along the eastern coast of Japan and to the northward shift of the Kuroshio Extension, respectively. ROMS-MIROC and ROMS-GFDL simulations suggest that the RSL changes are probably induced by wind stress changes rather than heat or freshwater fluxes at the surface, whereas ROMS-CSIRO suggests that heat and freshwater fluxes play a larger role than the other two models. All ROMS simulations show that the thermosteric components produce the major features of the regional dynamic height, and thus the major RSL changes, whereas halosteric components contribute to the overall meridional gradients in RSL changes.