**Dynamical downscaling with High-Resolution MRI-AGCM**

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High-resolution downscaling is vital to project weather and climate extremes and their future changes. A direct dynamical downscaling with a regional climate model (RCM) embedded within an atmosphere-ocean coupled general circulation model (AOGCM) is commonly used but is subject to systematic biases in their present-day simulations of AOGCM, which may cause unexpected effects on future projections and lead to difficult interpretation of climate change. In a high-resolution atmospheric general circulation model (AGCM)–RCM system, the present-day climate in AGCM is forced by observed sea surface temperature (SST) and sea-ice distribution. Then, the future climate is calculated with the “future” boundary conditions (SST and sea-ice), which are created by adding their future changes projected by AOGCM to the observed present-day values, besides the future radiative forcing. This system is one of methods to minimize the effects of such biases. A Meteorological Research Institute AGCM with 20-km grids is successfully applied to project future changes in weather extremes such as tropical cyclones and rain systems that cause heavy rainfall and strong winds. Regional downscaling with 5-km mesh RCM is then performed over certain area to investigate local extreme rainfall events and their future changes. We review various downscaling methods and try to rationalize a use of high-resolution AGCM-RCM system.