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Team MIROC: Decadal prediction using recent series of MIROC global climate model

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In a near-term climate prediction, we require knowledge of the future state of internal variations in the climate system together with the global warming signal. Recently, we performed ensemble decadal hindcast experiments with initialization and explored predictability of internal variations such as the Pacific Decadal Oscillation (PDO). Here, we build on our earlier experiences by employing ensemble hindcast experiments using recent two versions of MIROC global climate model; MIROC4h (T213L56 AGCM and 1/6-1/4deg. 48levs. OGCM) has a higher-resolution and MIROC5 (T85L40 AGCM and 0.56-1.4deg. 50levs OGCM) contains new calculation schemes to improve representation of several physical processes in atmosphere, ocean and land. Using MIROC4h and MIROC5, we perform 10-sets of 10-year-long 9-ensemble hindcasts (3-members by MIROC4h and 6-members by MIROC5) with initialization every five years after 1961 toward the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC-AR5). Results of these hindcast experiments validate our ability to enhance decadal predictability particularly of the PDO for a few years and of the Atlantic Multidecadal Oscillation (AMO) for almost a decade, while the most predictable component in decadal climate variations is the global warming signal. Overall quality of the initialized hindcasts represents higher levels of performance than the so-called global warming simulations without initialization. The initialized hindcasts enable us to define the PDO and the AMO as predictable components in addition to the global warming signal, and large impacts of initialization are found over the mid- and high-latitudes of the North Pacific and the high-latitude of the North Atlantic, where the PDO and AMO signals are observed strongest. It should be worthwhile to further analyze our hindcast data using MIROC4h and MIROC5 toward IPCC-AR5, while it may not be easy to hold fully significant discussions due to the small number of ensembles with limited computational resource.