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Relationship of predictability between the Pacific and Atlantic climate change

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A linkage between the Atlantic and the Pacific climate predictability is investigated using coupled climate models. From the early 1990s to the early 2000s, the observed sea surface temperature (SST) shows warming in the North Atlantic and La Nina-like pattern in the Pacific. Associated with the SST pattern, the observed precipitation indicates the strengthened Walker circulation in the tropical Pacific and the enhancement in the tropical Atlantic. At first, we conducted the decadal climate prediction experiment using three versions of coupled climate model MIROC. Those observational patterns in SST and precipitation during the 1990s are simulated well in hindcast experiments initialized oceanic anomaly state with prescribing the external forcing, but poor by uninitiated simulation with prescribing the external forcing only. In particularly, the observed La Nina-like SST pattern becomes prominent in ensemble members with large amplitude of the Atlantic Multidecadal Oscillation (AMO) index during the 1996-1998 period. The similar relationship also appears in the decadal prediction experiment conducted by Coupled Model Intercomparison Project Phase 5 (CMIP5) models. Our results suggest that the ocean initialization not only in the Pacific but also in the Atlantic plays an important role to predict the Pacific stepwise climate change during the 1990s. Second, we conducted a 100-year-long model control simulation in the pre-industrial condition using a coupled climate model CESM. In this control simulation, SST variability in the tropical Pacific is affected by the Atlantic climate variability associated with AMO on decadal timescales. Contribution from internally generated variability to decadal climate predictability is discussed.