The role of internal variability in North Pacific marine heatwave development and the connection to tropical surface temperature variability

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Marine heatwaves (MHWs) are discrete events characterized by periods of anomalously high sea surface temperature (SSTa) and can have complex temporal behavior and spatial connectivity. MHWs can be forced locally through processes affecting the mixed layer temperature budget and/or modulated by regional or remote sources and climate modes and atmospheric/oceanic teleconnections. Although MHWs occur throughout the global ocean, the Northeast Pacific has emerged as a hot spot for persistent and large-scale events that are forced by anomalous air-sea heat flux driven by remote forcing from the tropics as described by El Niño Southern Oscillation (ENSO) and the Pacific Decadal Oscillation. To examine these relationships, we identify, track, and characterize the spatio-temporal evolution of mid-latitude North Pacific MHWs present in the 100 historical simulation ensemble members of the CESM2 Large Ensemble Community Project, identifying over 30,000 MHWs across the ensemble spread. We examine the diversity of the North Pacific SST responses to ENSO, more specifically identifying MHWs that result from local stochastic atmospheric forcing and MHWs that evolve as part of a basin-scale dynamical mode linking the North Pacific to the Tropical Pacific. By examining the connection between the MHWs in the North Pacific Ocean and the Tropical Pacific SST and associated atmospheric teleconnections, we build on our understanding of the role that internal climate variability plays in the occurrence and development of MHWs and identify the projection of ENSO teleconnections in the midlatitudes.