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Research Article

Remote Linkages to Anomalous Winter Atmospheric Ridging Over the Northeastern Pacific

Daniel L. Swain , Deepti Singh, Daniel E. Horton, Justin S. Mankin, Tristan C. Ballard, Noah S. Diffenbaugh

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Abstract

Severe drought in California between 2013 and 2016 has been linked to the multiyear persistence of anomalously high atmospheric pressure over the northeastern Pacific Ocean, which deflected the Pacific storm track northward and suppressed regional precipitation during California's winter "rainy season." Multiple hypotheses have emerged regarding why this high pressure ridge near the west coast of North America was so resilient—including unusual sea surface temperature patterns in the Pacific Ocean, reductions in Arctic sea ice, random atmospheric variability, or some combination thereof. Here we explore relationships between previously documented atmospheric conditions over the North Pacific and several potential remote oceanic and cryospheric influences using both observational data and a large ensemble of climate model simulations. Our results suggest that persistent wintertime atmospheric ridging similar to that implicated in California's 2013–2016 drought can at least partially be linked to unusual Pacific sea surface temperatures and that Pacific Ocean conditions may offer some degree of cool-season foresight in this region despite the presence of substantial internal variability.

Plain Language Summary

Severe drought in California between 2013 and 2016 has previously been linked to the persistence of atmospheric high atmospheric pressure over the Pacific Ocean (nicknamed the "Ridiculously Resilient Ridge"), which prevented winter storms from reaching the coast over several consecutive years. There has been much discussion regarding why this high-pressure system has been so persistent—and some scientists have previously suggested that unusual ocean temperature patterns in the Pacific, reductions in Arctic sea ice, or random weather variations may have played a role. In this study, we investigate relationships between atmospheric high pressure over the North Pacific and possible links to ocean conditions using both real-world observations and climate model simulations. Our results suggest that persistent atmospheric high pressure similar to that which occurred during California's 2013–2016 drought can be partially linked to unusual Pacific Ocean temperatures and that knowledge of such ocean conditions may offer foresight regarding the potential for future droughts in this region.