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Poster
Altimeter data have significantly improved our understanding of regional sea level variability and trends, but their relatively short records do not allow either evaluation of the ocean state prior to 1993 or multi-decadal low-frequency signals in the ocean. Here, we characterize and quantify the multi-decadal regional sea level rise (rSLR) and related ocean heat content in the Pacific from a non-Boussinesq ocean circulation model in comparison with datasets from altimeters, two sea level reconstructions, and in situ ocean profiles from 1958 to 2008. We show that the rSLR trends have undergone two shifts, during the mid-1970s and in the early 1990s, with an east-west dipole pattern in the tropical Pacific. In each of these phases, rSLR accelerated on one side of the Pacific, but decelerated on the other side. The multi-decadal sea level shifts can be explained by the dynamical (steric) upper-ocean responses to the surface wind forcing associated with the Pacific Decadal Oscillation (PDO), with negligible contributions from internal (depth-integrated) ocean mass changes. Additional model experimentation further confirms that the Pacific wind stress trend over the recent two decades has played an important role in strengthening the rSLR in the western Pacific while suppressing the rSLR in the eastern Pacific. The climate-forced large-scale rSLR variability imposes a long-term impact on coastal communities.
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