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Understanding the warm water volume precursor of ENSO events and its interdecadal variation

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Our study uses a wind forced ocean model to decompose the equatorial Pacific warm water volume (WWV) between 1980-2016 into two components, the (i) adjusted wind response, which is found by letting the model evolve unforced for three months; and (ii) instantaneous wind response, which are the instantaneous WWV changes due to Ekman transports. Our results suggest roughly half of WWV variability is only as predictable as the winds that drive the instantaneous change. Separate examinations of pre- and post-2000 periods reveal: (i) nearly equal importance of instantaneous and adjusted responses for the pre-2000 period; and (ii) dominance of the instantaneous response during the post-2000 period, which is most apparent during the recharged phase. This increasing instantaneous contribution prominence explains the post-2000 reduction in WWV/ENSO sea surface temperature lead times (from 6-9 months pre-2000 down to 3-months post-2000) and is consistent with the reduction in post-2000 ENSO prediction skill.