Science and Technology Infusion Climate Bulletin
NOAA's National Weather Service
37th NOAA Annual Climate Diagnostics and Prediction Workshop
Fort Collins, CO, 22-25 October 2012

Weakened Interannual Variability in the Tropical Pacific Ocean Since 2000

Zeng-Zhen Hu[1], Arun Kumar[1], Hong-Li Ren[2,3], Hui Wang[1,4],
Michelle L'Heureux[1], and Fei-Fei Jin[2]

[1]*Climate Prediction Center, NCEP/NWS/NOAA, MD*
[2]*Department of Meteorology, the University of Hawaii, Honolulu, HI*
[3]*Laboratory for Climate Studies, National Climate Center, CMA, Beijing, China*
[4]*WYLE Science, Technology and Engineering Group, McLean, VA*

ABSTRACT

In this paper an interdecadal shift in the variability and mean state in the tropical Pacific Ocean is investigated in the context of changes in the El Niño–Southern Oscillation (ENSO). Compared with 1979-1999, the interannual variability in the tropical Pacific was significantly weaker in 2000-2011, and this shift can be seen as coherent changes in both the atmospheric and oceanic mean state and variability (Fig. 1). For example, the equatorial thermocline tilt became steeper during 2000-2011, which was consistent with positive (negative) sea surface temperature anomalies, increased (decreased) precipitation, and enhanced (suppressed) convection in the western (central and eastern) tropical Pacific, which reflected an intensification of the Walker circulation. We propose that the combination of a steeper thermocline slope with stronger surface trade winds has hampered the zonal migration of the warm water along the equatorial Pacific. As a consequence, the variability of the warm water volume was reduced and thus ENSO variability also decreased. Through Zebiak-Cane model experiments, it is preliminarily confirmed that both too large and too small thermocline slopes (and too strong and too weak wind stress) can potentially lead to the suppression in ENSO variability.

This work has been published in *Journal of Climate* in 2012.

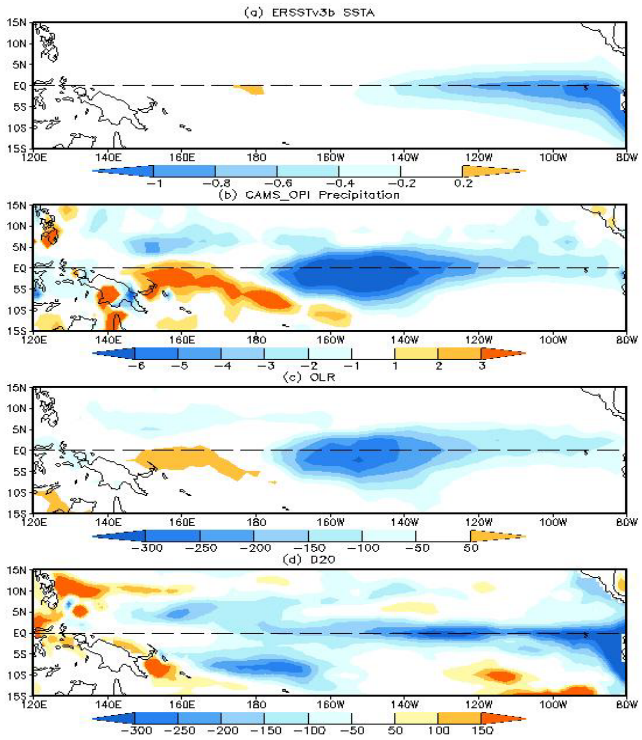

Fig. 1 Variance differences of (a) ERSSTv3b SST, (b) CAMS_OPI precipitation, (c) OLR, and (d) D20 between the means in Jan 2000-Dec 2011 and in Jan 1979-Dec 1999. The units are $(^{o}C)^2$ in (a), $(mm/day)^2$ in (b), $(W/m^2)^2$ in (c), and m^2 in (d).

Paper published

Hu, Z.-Z., A. Kumar, H.-L. Ren, H. Wang, M. L'Heureux, and F.-F. Jin, 2012: Weakened interannual variability in the tropical Pacific Ocean since 2000. *J. Climate* (online release; doi: http://dx.doi.org/10.1175/JCLI-D-12-00265.1).

Correspondence to: Zeng-Zhen Hu, Climate Prediction Center, NCEP/NWS/NOA, 5830 University Research Court, College Park, MD 20740-3818; E-mail: Zeng-Zhen.Hu@noaa.gov.