

Global temperature fluctuations due to tropical Pacific decadal variability and their uncertainty

Yu KOSAKA¹, Shang-Ping XIE^{2,3}, Chuan-Yang WANG^{3,2}, and Yukiko IMADA⁴

¹ *Research Center for Advanced Science and Technology, University of Tokyo, Tokyo, Japan*

² *Scripps Institution of Oceanography, University of California San Diego, La Jolla, USA*

³ *Physical Oceanography Laboratory/Qingdao Collaborative Innovation Center of Marine Science and Technology, Ocean University of China and Qingdao National Laboratory for Marine Science and Technology, Qingdao, China*

⁴ *Meteorological Research Institute, Japan Meteorological Agency, Tsukuba, Japan*

Global-mean surface temperature (GMST) is widely used to monitor climate change. It has risen since the late 19th century due to anthropogenic forcing, but with notable decadal slowdowns and accelerations. Tropical Pacific variability has been suggested as a major pacemaker of this global warming modulations (Kosaka and Xie 2016). We evaluate GMST change associated with the tropical Pacific sea surface temperature (SST) anomalies with the Pacific Ocean-Global Atmosphere (POGA) pacemaker experiments with three coupled models where the tropical Pacific SST anomalies are forced to follow observations, together with pre-industrial control (piControl) experiments by CMIP5 models. The tropical Pacific effect on GMST is systematically larger in decadal than interannual variability in all models (Wang et al. 2017). The extratropical oceans and sea ice accumulate influence from the tropical Pacific, amplifying decadal than interannual response. Meridionally broader tropical SST variability in decadal than interannual time scales also contributes to the time-scale dependence. However, this decadal tropical Pacific influence on GMST shows large intermodel diversity, in contrast to interannual impact which is well constrained among models and consistent with observations. The diversity in decadal GMST sensitivity arises from extratropical ocean responses to the tropical Pacific variability and, in piControl simulations, biases in dominant time scale of decadal tropical Pacific variability.

Key words: Global warming slowdown, ENSO, IPO, coupled model

References

Kosaka, Y., and S.-P. Xie, 2016: *Nature Geosci.*, **9**, 669-673.

Wang, C.-Y., and Coauthors, 2017: *J. Climate*, **30**, 2679-2695.