



***“Advancing Ocean Knowledge,
Fostering Sustainable Development:
from the Indo-Pacific to the Globe”***

Dynamics of Western Pacific Subtropical High that shapes predictability of summer monsoon and tropical storms

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Monsoon rainfall and tropical storms (TSs) impose great impacts on society, yet their seasonal predictions are far from successful. Here we show climate variation of western Pacific Subtropical High (WPSH) faithfully represents the dominant mode of the western North Pacific (WNP) wind stress variation, the intensity fluctuations of East Asian summer monsoon (EASM), the total TS days over the subtropical WNP, and the total number of TSs impacting East Asian coastal zones during 1979–2015. The climate variability of WPSH plays a critical role in linking Asian monsoon and ENSO. However, the sources of WPSH variability and predictability remain controversial and elusive.

With numerical experiments using coupled global climate models, we show that the WPSH variation is primarily controlled by (a) a positive atmosphere-ocean feedback between the WPSH and the Indo-Pacific warm pool and (b) the central Pacific SST anomalies. With a physically based empirical model and the state-of-the-art dynamical models, we demonstrate that the WPSH is approvingly predictable; and this predictability paves a promising way to improve predictions of the EASM rainfall and to enable skillful prediction of the TS activities that the current dynamical models fail.

Our findings reveal that WPSH–ocean interaction provides an important source of climate predictability and highlight the importance of subtropical high dynamics in understanding monsoon and TS predictability as well as turnabout of El Niño-Southern Oscillation.