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Title: Subtropical High predictability establishes a promising way for monsoon and tropical storm
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Abstract:

This talk reports a recent work on seasonal prediction and predictability of East Asian monsoon and western North Pacific tropical storm. Monsoon rainfall and tropical storm (TS) impose great impacts on society, yet the seasonal predictions are far from successful. Here we explore a new way of thinking by turning our attention to the predictability of the circulation system first. The western Pacific Subtropical High (WPSH) is a prime circulation system affecting East Asian summer monsoon (EASM) and western North Pacific (WNP) TS activities, we show that the WPSH variation faithfully represents fluctuations of EASM strength ($r=0.92$), the total TS days over the subtropical WNP ($r=0.81$), and the total number of TSs impacting East Asian coasts ($r=0.76$) during 1979-2009.

However, the sources of WPSH variability and predictability have not been firmly established. Using theoretical analysis and numerical experiments we establish that the WPSH variation is primarily controlled by (1) central Pacific cooling/warming and (2) a positive atmosphere-ocean feedback between the WPSH and the Indo-Pacific warm pool oceans.

With a physically-based empirical model and the state-of-the-art dynamical models we demonstrate that the WPSH is highly predictable; and this predictability creates a new promising way for prediction of monsoon and TS. The predictions using the WPSH predictability not only yields substantially improved skills in prediction of the EASM rainfall, but also enables skillful prediction of the TS activities that the current dynamical models fail.

Our findings reveal that positive WPSH-ocean interaction can provide a new source of climate predictability and highlight the importance of subtropical dynamics in understanding monsoon and TS predictability.

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