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Characterization of Heat Wave Events during the Warming Phase in Taiwan

Taiwan, located in East Asia, is typically influenced by the Western North Pacific Subtropical High (WNPSH) system during the summer. In recent years, global warming has intensified the strength of WNPSH, frequently leading to prolonged high temperatures and heat waves. Understanding the variability of the WNPSH system is crucial for studying heat waves in Taiwan. This study aims to examine the impact of the WNPSH system on heat waves and its subsequent influence on Taiwan.

The EOF method was employed to identify mechanisms affecting the WNPSH system. EOF1 represents a global warming mode, which strengthens the WNPSH and increases heat waves in Taiwan. EOF2 and EOF3 correspond to the negative phase of the Pacific-Japan (P-J) pattern and the negative Pacific Meridional Mode (PMM), respectively. These modes weaken the WNPSH, thereby reducing heat waves.

Meteorological data analysis across Taiwan show a decrease in wind speeds with the strengthening WNPSH. Regressing analysis of daily maximum temperatures reveals contrasting results over Taiwan and Japan. Under the positive phase of the P-J pattern, an increase in geopotential height strengthens the WNPSH over East Asia leading to higher temperatures. Similar contrasting results are observed for precipitation with the negative P-J pattern showing reduced precipitation in Taiwan due to the increased strength of the WNPSH.

In summary, global warming significantly strengthens the WNPSH, evident in the increase of geopotential height, reduction of wind speed and precipitation, and increase of maximum temperatures. However, other factors, such as the positive P-J pattern, can also intensify the WNPSH system, contributing to higher temperatures.

Keyword

Heat Wave