

Interaction between teleconnection patterns and associated impact on U.S. winter climate

Associated circulation patterns of the Pacific Decadal Oscillation (PDO) significantly impact relationships between surface air temperature (SAT) and the Arctic Oscillation (AO) across the United States in winter. Using historical data (1900 to 2002) and composite analyses, this study demonstrates that without the influence of the PDO, winter SATs are most significantly altered during various phases of the AO throughout the Ohio Valley region and in the South. More specifically, extreme phases of the PDO significantly alter SAT responses to positive phases of the AO west of the Cascades, in the Ohio Valley region, and along the northeast coast of the US. SAT regimes related to negative phases of the AO are significantly modified by the different phases of the PDO across the northern Great Plains, and throughout the West. When the AO and PDO are both negative, winters are typically significantly cooler throughout the upper Midwest, the Great Plains and in the Northwest, in comparison to winters when PDO has been neutral. When the 2 indices are out of phase, winters are cooler (warmer) than during neutral PDO years west of the Cascades and warmer (cooler) east of the mountain range during the AO+/PDO- (AO-/PDO+) conditions. Extreme phases of the PDO modify the north/south structure of the mean sea level pressure (SLP) field over the Northern Hemisphere, these changes being consistent with the modifications observed in the SAT patterns across the study area.