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Influence of Pacific Decadal Oscillation on global precipitation extremes on decadal time scales

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On the decadal time scales, while the influence of Pacific Decadal Oscillation (PDO) on total or average precipitation had been extensively studied, works about its influence on precipitation extremes were limited, especially lack of a global picture. Using two independent methods, nonstationary generalized extreme value (GEV) model which directly incorporates PDO index into its location parameter and moving GEV model which fits the annual extremes with a sliding window of 30 years and regresses the resulted changing location parameter onto the PDO index, we show that precipitation extremes over a large portion of stations are significantly affected by the PDO with stations in the Pacific Rim demonstrating distinct regional patterns. Over eastern China, the famous 'southern flood and norther drought' pattern corresponding to a positive PDO phase extends to extreme rainfalls; over Australia, a tri-polar pattern was revealed, in which the extremes over central Australia positively correlate with the PDO index and those over eastern and western Australia show a negative correlation; and the North America also demonstrates a dipole pattern, by which the northwest (southeast) experiences less (more) intense extreme rainfall in a PDO positive phase. Moreover, the western Europe and the large area between the Ural mountain and eastern Europe were discovered to hold a positive correlation with the PDO in their precipitation extremes. A comparative analysis to the local circulation controlling the precipitation extremes under different PDO phases further confirms the discovered relationships above. These findings have important implication for the future projection of extreme precipitation over related regions because the internal climate variability should be appropriately accounted for beyond the effects induced by global warming.