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Title: The 2010/2011 Snow Season in the Sierra Nevada: Role of Atmospheric Rivers and Large-scale Modes
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Abstract:
The anomalously snowy winter season of 2010/11 in the Sierra Nevada is analyzed in terms of snow water equivalent (SWE) anomalies and the role of atmospheric rivers (ARs)―narrow channels of enhanced meridional water vapor transport between the tropics and extratropics. Mean April 1 SWE was 0.44 m (56%) above normal averaged over 100 snow sensors. AR occurrence was anomalously high during the period, with 20 AR dates during the season and 14 in the month of December 2010, compared to the mean occurrence of 9 dates per season. Fifteen out of the 20 AR dates were associated with the negative phases of the Arctic Oscillation (AO) and the Pacific-North American (PNA) teleconnection pattern. Analysis of all winter ARs in California during water years 1998-2011 indicates more ARs occur during the negative phase of AO and PNA, with the increase between positive and negative phases being ˜90% for AO, and ˜50% for PNA. The circulation pattern associated with concurrent negative phases of AO and PNA, characterized by cyclonic anomalies centered northwest of California, provides a favorable dynamical condition for ARs. The analysis suggests that the massive Sierra Nevada snowpack during the 2010/11 winter season is primarily related to anomalously high frequency of ARs favored by the joint phasing of −AO and −PNA, and that a secondary contribution is from increased snow accumulation during these ARs favored by colder air temperatures associated with −AO, −PNA and La Niña.
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