J11B.5 - ENSO and MJO Effects on North Pacific AR Speed and Propagation

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350 (The Baltimore Convention Center)

Abstract

Atmospheric rivers (ARs), narrow bands of high integrated water vapor transport, are responsible for most of the tropical-extratropical water vapor transport. AR propagation characteristics may be modulated by tropical natural climate variations such as the El Niño-Southern Oscillation (ENSO) and the Madden-Julian Oscillation (MJO). The goal of this study is to investigate if ENSO states (El Niño (EN), La Niña (LN), and neutral), active MJO phases, and the combination of them, may modulate cool-season (November-March) North Pacific ARs characteristics such as propagation speed, distance and lifetime. Results show that AR propagation speed is lower than the climatological average in MJO phases 4-7 and higher in phases 8-3. During EN conditions, the AR propagation speed increases in all MJO phases except phase 2. The background EN-related anomalies increase the frequency of phases 8-1, as both modes in these phases support suppressed convection over the Maritime Continent, while enhanced convection dominates over the central Pacific. Thus, the highest AR speeds happen in phases 8-1 under EN, associated with AR events propagating through longer distances and when both modes show similar patterns of circulation/convection anomalies. In LN and neutral, AR propagation speed is predominantly lower than EN through all MJO phases, except for phase 5 in LN, when both modes show similar patterns of circulation/convection anomalies, opposite to those in EN and phases 8-1. Notwithstanding, AR events with the highest propagation speeds in EN and phases 8-1 also show the enhancement of intraseasonal IVT flux, circulation, and precipitation anomalies over western North America. These results improve understanding of MJO-AR lifecycle characteristics over the North Pacific under different ENSO backgrounds and add knowledge about the AR characteristics on subseasonal timescales affecting precipitation over western North America.

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