

Atmospheric River Modeling: Forecasts, Climate Simulations and Climate Projections

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Abstract

Research in recent years has highlighted the significant importance of ARs to the development and occurrence of weather and hydrology extremes as well as the critical role they play in helping establish the climate of the Earth, namely its water and energy budgets, through their decisive impact on the poleward transport of water vapor. With this in mind, it is imperative that ARs, and their associated dynamics, thermodynamics and hydrodynamics, are accurately represented in our weather and climate models. Our presentation will review and assess present-day modeling capabilities of ARs, including for both weather forecast and climate simulation/projection settings. Specifically, we will discuss and summarize research performed to date on prediction and predictability aspects of ARs in relation to short to extended-range (i.e. 1-15 days) weather forecasts. In addition, we will review of research and model evaluation studies that examine and quantify climate model performance with respect to their AR representation. By extension, the more we can understand the fidelity and systematic biases in climate models, the more we can characterize and understand the uncertainty in climate model projection attributes that are characterized by ARs. Thus, we will also review the research that has examined contemporary sets of climate projections to quantify how ARs and related fields are expected to change. We will summarize with an articulation of the gaps in AR simulation, multi-time scale forecasting and climate projections.