



RAL SEMINAR SERIES

Extreme Moisture Transport Changes, Variability, & Feedbacks

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1-2 PM (MT) VIRTUAL MEETING | [Watch Live](#)



Atmospheric rivers (ARs) are narrow, intense filaments of water vapor transport in the extratropics, responsible for most poleward moisture transport in midlatitudes and serving as a key precipitation source for coastal regions. Using a novel series of coupled model experiments, I address how ARs—and moisture transport more broadly—have responded to climate change, variability, and feedbacks. First, I show that from 1920 to 2005, mean AR characteristics remained largely unchanged due to opposing but roughly balanced effects of industrial aerosols, which weaken ARs, and greenhouse gases, which strengthen them. Despite this historical stability, projections indicate a pronounced intensification of ARs in coming decades, with mean AR-driven precipitation increases reaching up to ~20 mm/month. Second, I demonstrate that this anthropogenic intensification rivals the magnitude of the largest natural variations in AR activity over the past millennium, which have been driven by annular modes—the dominant patterns of extratropical climate variability in both hemispheres. Third, I explore the role of moisture transport, including ARs, in accelerating Atlantic Meridional Overturning Circulation (AMOC) collapses during past Heinrich events. Through North Atlantic “hosing” simulations, I attribute AMOC weakening to both the direct effects of added meltwater and the subsequent hydrologic cycle response, showing that hydrologic feedbacks to North Atlantic freshening account for roughly half of simulated AMOC collapse. Finally, I conclude by outlining future directions for translating physical climate insights into effective adaptation strategies, with an emphasis on meaningful stakeholder engagement at local-to-regional scales. [Event Website](#)