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CAREER: The Mesoscale Climate Dynamics of Rocky Mountain Snowpack Depletion

The surface-albedo feedback (SAF) associated with snow cover over mountainous terrain is one of the dominant influences on the regional-scale response to large-scale climate variability and change in the mid-latitudes. At global scales, detailed analyses have illuminated the controls on the SAF and sources of spread in SAF magnitude between global climate models (GCM’s). While regional climate model (RCM) simulations over complex terrain suggest impressive regional effects of the SAF, no detailed quantitative analysis of the regional SAF has been undertaken.

This work will quantify and diagnose the SAF in high-resolution RCM simulations over the Rocky Mountains (and later the continental US) using the WRF model. They include 8-year reanalysis-forced control simulations and 8-year pseudo-global-warming (PGW) simulations, wherein reanalysis boundary conditions are perturbed by monthly mean changes predicted by a GCM under greenhouse forcing. This framework allows for clean diagnosis of thermodynamic, microphysical, and mesoscale mechanisms of climate change in isolation from changes in large-scale circulations and storminess.