Title: **Snow pattern evolution in the East River SFA simulated with a distributed snow model and Airborne Snow Observatory data**

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Project Abstract:

Spatial and temporal patterns of snow accumulation and melt dominate hydrologic and biogeochemical flows in temperate mountain catchments. Mountain snowpack states, fluxes, and properties exhibit extreme and scale-dependent variability, complicating efficient sampling and modeling. Evaluating system perturbation impacts on water availability and nutrient cycling depend on robust observations and simulations of seasonal snow dynamics at appropriate scales.

To explore snow accumulation and melt process dynamics over meter to watershed scales, we implemented a physically-based snow cover evolution model (Liston et al., 2006) at multiple grid resolutions, using combinations of accumulation process sub-models.

Model wind transport parameters were optimized in Senator Beck Basin, a well-instrumented nearby study site, and transferred to the East River SFA where instrumentation is less reliable.

To improve model results and system disturbances impacts analysis, we:

(i) implement and validate the albedo decay parametrization from Deems et al., 2013.
(ii) define a new forest type to allow wind sheltering of adjacent areas
(iii) explore precipitation assimilation and validation methods via in-situ and Airborne Snow Observatory measurements of snow depth and water equivalent (SWE), using both HRRR and WRF model forcings

These results help characterize the snow hydrologic system in the East River and assess the importance of snow distribution due to wind and gravitational transport at the watershed scale, providing the foundation for our ongoing long term system perturbation work and for integration with simulations of connected systems within the SFA.

References:

Liston, G.E., Elder, K., 2006. A Distributed Snow-Evolution Modeling System (SnowModel). *J. Hydromet*. 7, 1259–1276.

Deems, J. S., et al. 2013. Combined impacts of current and future dust deposition and regional warming on Colorado River Basin snow dynamics and hydrology. *Hydrol. Earth. Sys. Sci.* 17(11): 4,401-4,413.