Introduction: 
- The ongoing Surface Atmosphere Integrated Field Laboratory (SAIL) and Study of Precipitation, the Lower Atmosphere and Surface for Hydrometeorology (SPLASH) field studies in the East River watershed aim to investigate key physical processes in the watershed hydrology.
- Three months of data (10/21-1/28) are used to study the spatial variability and temporal evolution of the atmospheric boundary layer during the transition from fall to winter.

Used Data: 
Several sites are deployed along the valley axis with similar instrumentation (including the ARM mobile facility): 
- Surface meteorology, radiation fluxes, and heat fluxes 
- ceilometers for cloud base height 
- Infrared spectrometers (AERI and ASSIST) and microwave radiometers are used to retrieve thermodynamic profiles with an optimal estimation physical retrieval (TROPoe, Turner and Löhnert 2014, Turner and Blumberg, 2019, Turner and Löhnert 2021)

Main points: 
- Snow cover changes from intermittent to more homogeneous after first strong snowfall event of the season between 12/7-12/10 
- Major changes in surface energy balance, valley wind, near-surface temperature, and stratification after this event 
- Lower stations experience colder nighttime temperatures -> cold air pooling in the valley

2-m temperature, precipitation, radiation and heat fluxes: 
- 3-month period can be split in two main regimes separated by a major precipitation event on 12/7-12/10 

Regime 1: 
- Relatively warm and dry 
- Small albedo (shortwave down much larger than shortwave upward radiation) 
- High sensible heat flux 
- Intermittent now cover

Regime 2: 
- Maximum temperature near freezing 
- Significant snowfall at the end of December followed by a dry January 
- Very high albedo (≈1) 
- Very low sensible heat flux 
- Continuous snow cover 

Top: 2 m temperature, 24-h precipitation rate, mean diurnal shortwave downward and upward radiation, and mean diurnal sensible heat flux at Gothic 
Bottom: Camera images looking west from gothic at 21 UTC on 3 days.

Variability along the valley axis 
- Cloud-base fraction higher further up the valley, but clear-sky days generally occur at both sites 
- Maximum temperature similar at all sites, but minimum temperature lower further down the valley -> cold air pooling and stronger diurnal cycle at lower stations 
- Downvalley wind dominates at all sites during both regimes, even more frequent during Regime 2 
- Downvalley wind direction most variable at Gothic, very clear at Kettle Ponds, Brush Creek and Roaring Judy 
- Upvalley wind forms during Regime 1 only, mostly absent during Regime 2

Stratification in the boundary layer 
- Strong surface inversion during nighttime forms regularly during both regimes 
- Surface inversion gets mixed out during daytime during Regime 1, while a stable layer of more than 500 m depth persists during daytime during Regime 2 with a shallow CBL embedded 
- Nocturnal inversion stronger at Roaring Judy than Gothic

References: 
SAIL: https://psl.noaa.gov/splash/ 
SPLASH: http://psl.noaa.gov/splash/ 