



WESTERN SNOW CONFERENCE



88th Annual Meeting of the Western Snow Conference
April 12-15, 2021
Virtual Meeting
"Bridging the Gap between Research and Operations"

All times are MDT

Monday April 12 –

10:00- 2:00 Short Course: "A Round Table to Bridge the Research-Operations Divide"
Sean Fleming (USDA-NRCS NWCC)

Tuesday April 13 –

10:00 General Chair's Welcome: **Noah Molotch**, University of Colorado
Conference Chair's Welcome: **Lucas Zukiewicz**, NRCS
Keynote Address: **Seth Makepeace**, Hydrologist with the Confederated Salish and Kootenai Tribes

Snowmelt Modeling and Snow Variability in the Forest, Keith Musselman, Session Chair

11:00 SnowClim: High Resolution Snow Model and Data for the Western United States. **Abby Lute**, U of Idaho

11:15 Lessons Learned from Eight Years of Near Real-Time Snowpack Modeling in the Sierra Nevada.
Andrew Hedrick, USDA-ARS Northwest Watershed Research Center

11:30 Potential Improvements to CO Basin River Forecast Center Water Supply Forecasts Using External Snow Products. **Patrick Kormos**, Colorado Basin River Forecast Center

11:45 Spatially Distributed Process-Based Snowmelt Modeling in the Upper Gunnison, CO: Assessment against Remote Sensing Observations. **Joachim Meyer**, U of Utah

12:00 A Snow Data Assimilation System for the National Water Model: Plans and Progress. **Andy Fox**, UCAR/Joint Center for Satellite Data Assimilation

12:15 Improving Operational Streamflow Forecasts in the NOAA National Water Model Using Observational Constraints on Snowpack Albedo and Snow-Covered Area from STC-MODSCAG.
Thomas Enzinger, National Center for Atmospheric Research

12:30 Deep Learning-Based Snowpack Mapping and Forecasting with Ground Observations: A Case Study Using a Wireless Sensor Network in the American River Basin. **Guotao Cui**, Sierra Nevada Research Institute, U of California

12:45 Identifying Major Sources of Uncertainty in Snow Water Equivalent Estimates from Land Surface Modeling. **Eunsang Cho**, NASA Goddard Space Flight Center / U of Maryland

- 1:00 High Resolution Computer Modeling to Predict the Effects of Forest Thinning in the Lake Tahoe Basin, California. **Gabriel Lewis**, U of Nevada
- 1:15 Measuring Variability of a Moderate Snowpack across a Forest Stand Boundary in New Mexico. **Adrian Marziliano**, U of New Mexico

Poster Presentation Breakouts

- 1:30 Room 1: A New Instrumental Way to Measure Accumulating Snow Water Equivalent in Mountain and Polar Catchments Directly, on the Kilometre-Scale and in Near Real-Time. **Hamish Pritchard**, British Antarctic Survey
- Room 2: Observed Changes to the Hydrologic Cycle in Multiple Subwatersheds: A Regional Study for the Upper Rio Grande. **Khandaker Islam**, New Mexico State U, USDA Southwest Climate Hub
- Room 3: Spruce Beetle Outbreak Increases Streamflow Efficiency and Predicted Streamflow from Snow-Dominated Basins in Southwest Colorado, USA. **Aidan Manning**, U of Nevada
- Room 4: Snow as a Driver of Soil Biogeochemical Cycling in the Semiarid Dryland Cereal Production Systems in the Northern Great Plains. **Caitlin Mitchell**, Montana State U
- Room 5: Using In Situ Snow Energy Balance to Assess the Performance of a Spatially Distributed Snow Energy Balance Model Forced with an Atmospheric Model in the Upper Gunnison, CO. **Dillon Ragar**, U of Utah

Wednesday April 14 – Remote Sensing of Snow & Rain on Snow, McKenzie Skiles, Session Chair

- 10:00 Announcements: **Lucas Zukiewicz**, Conference Chair
- 10:15 Vendor Presentations
- 11:00 Impact of the Spatial and Temporal Variability of the Snowpack Conditions on Internal Liquid Water Fluxes. **Eole Valence**, École de Technologie Supérieure
- 11:15 Basic Science of Rain on Snow. **Bruce McGurk**, McGurk Hydrologic
- 11:30 Mapping Snow Grain Size Using Lidar Intensity. **Chelsea Ackroyd**, U of Utah
- 11:45 What Have We Learned About Snow Distribution in Western Canada from Airborne LiDAR Surveys? **Brian Menounos**, U of Northern British Columbia
- 12:00 Snow Depth and Density Mapping in Mountainous Environments of Coastal British Columbia Using Remotely Piloted Aircraft Systems. **Trevor Dickinson**, Coastal Hydrology Research Lab (Vancouver Island U)/ICE Lab (U of Victoria)
- 12:15 Topographic Corrections of Broadband Snow Albedo Measured from an Uninhabited Aerial Vehicle (UAV). **Andrew Mullen**, Montana State U
- 12:30 Runoff Detection from Sentinel-1 SAR in the Lajoie Basin, British Columbia. **Sara Darychuk**, U of Northern British Columbia

- 12:45 The Role of Triple Collocation Based Merging of Precipitation and Evapotranspiration Products to Investigate Uncertainty in Water Balances at the Catchment Scale. **Beatrice Gordon**, Department of Natural Resources and Env'tl Sciences, U of Nevada
- 1:00 Plane-Based LiDAR Derived Snow Depth and Snow Water Equivalent from Four Coastal Watersheds in British Columbia, Canada. **William Floyd**, BC Government and Vancouver Island U
- 1:15 Colorado Airborne Snow Observatory Expansion Plan. **Taylor Winchell**, Denver Water

Poster Presentation and Vendor Breakouts

- 1:30 Room 1: A Model-Based Approach to Quantify the Effects of Forest Thinning on Snow Water Resources. **Mikey Johnson**, U of Nevada
- Room 2: Improved Characterization of the Spectral Reflectance of Snow Organics. **Jana MacInnis**, Central Washington U
- Room 3: Review of the Past 20 Years of Hydroclimate Data in Yosemite National Park. **Rachel Hallnan**, Yosemite National Park
- Room 4: Validating L-Band InSAR SWE Retrievals in the Jemez River Basin, New Mexico. **JackTarricone**, U of Nevada
- Room 5: Drought Detection in the Central Sierra Derived from the Reconstruction of the Mt. Rose SWE Record for Water Years 1749- 2019 Using the Reversal of the Sun's Magnetic Field. **John Kleppe**, U of Nevada
- Room 6: An Improved Temperature-index Snowmelt Model Using an Hourly Time Step on a Watershed Scale for Real-time Flood Forecasting in British Columbia, CA. **Charles Luo**, BC River Forecast Center
- Room 7: Using Structure from Motion Photogrammetry to Map Avalanche Slide Paths and Analyze Crown Fractography. **Teddy Zerivitz**, U of Utah

Vendor Breakouts

- 1:30 Hydrologic Services America, Kisters, Sommer Messtechnik, Alpine Hydromet, Geonor, and Hydroinnova

Thursday April 15 – Snow Survey, Monitoring, & Economics; Climate Change, Abby Lute, Session Chair

- 10:00 Announcements: **Lucas Zukiewicz**, Conference Chair, and **Bruce McGurk**, WSC Editor
- 10:15 Our Winter Snows Are of the Utmost Importance: Development of Snow Surveys in British Columbia, 1920s-1950s. **Blake Butler**, Western U
- 10:30 Toponymy Based on Winter, Cold and Snow for Municipalities and Others in Western Canada and

Northern Canada. **Jerry Toupin**, U of Alberta

- 10:45 Water Towers of the West: Where are They and How Have They Changed? **Kate Hale**, U of Colorado-Boulder INSTAAR
- 11:00 Future Changes in Ephemeral Snow over North America in a Warming Climate. **Rachel McCrary**, National Center for Atmospheric Science
- 11:15 Evaluating the Snow-Wildfire Relationship Using an Ensemble of Snowpack Observations. **Alex Gottlieb**, Dartmouth College
- 11:30 Developing an In Situ Network for Net Solar Radiation, Snow Energy Balance, and Remote Sensing Validation across a Latitudinal Gradient in the Rocky Mountains. **McKenzie Skiles**, U of Utah
- 11:45 Benefit/Cost Ratios for Snow Management Techniques on Dryland Agricultural Lands. **Harold Steppuhn**, Retired Hydrologist
- 12:00 Perspectives on Improving R2O with NASA's Western Water Applications Office. **Catalina Oaida**, NASA Jet Propulsion Lab, NASA Western Water Applications Office Assimilation
- 12:15 Snow Today at the National Snow and Ice Data Center. **Karl Rittger**, U of Colorado, INSTAAR
- 12:30 Using Remotely Piloted Aircraft Systems to Model Snow Depth in Partially Treed Coastal Watersheds. **Alex Landry**, BC Government and Vancouver Island U
- 12:45 Tech Session Closeout: **Lucas Zukiewicz**, Conference Chair, and **Noah Molotch**, General Chair

Vendor Breakouts

- 1:00 Hydrologic Services America, Kisters, Sommer Messtechnik, Alpine Hydromet, Geonor, and Hydroinnova