

Day 1, Session 2: Discuss the current capabilities and state of the art of numerous sensing/measurement techniques

09:50 AM-10:00 AM: Introduction of breakout session objectives/expectations

10:00 AM-11:00 AM: Breakout session by sensing techniques

11:00 AM-12:00 PM: Breakout session groups to summarize the state of the art for each sensing technique

12:00 PM-01:00 PM: Lunch catered



Day 1 Breakout Session I Objectives, Format, and Intended Outcome

- **Objective:** Identify advances in snow remote sensing and measurement that have taken place over the SnowEx mission time period. Brainstorm future advances and what is needed to realize them. Incorporate discussion to update “stoplight chart” from SnowEx Science Plan (last updated at Baltimore meeting).
- **Format:** Breakout session groups will be self-selected by sensing technique. Leadership for each breakout session has been identified, provided below. Each group will have access to a Google Drive folder with the breakout session guidelines, formatted summary slides (this file), and a blank Google document where group leaders can take notes.
- **Outcome:** By the end of the hour, the two group leaders will compile 1 presentation slide summarizing the state of the art for each technique. This slide will be presented immediately afterward to the larger group. Based on the full group discussion, recommendations can be made to update the “stoplight chart.”



Group Topics, Session Leaders, Room Assignments:

1. **Microwave Scattering:** Mike Durand, Ed Kim
1. **Signals of Opportunity:** Steve Margulis, Eli Deeb, Jessica Lundquist
1. **UAV applications (all sensors):** Dan McGrath, Jennifer Jacobs
1. **Snowpack and Hydrologic Modeling (including machine learning and data assimilation):** Mark Raleigh, Joachim Meyer
1. **Ground-based/observations:** Megan Mason, Ryan Webb, Sveta Stuefer
1. **Snowpack Albedo:** Kelly Gleason, Karl Rittger
1. **InSAR:** Jack Tarricone, HP Marshall
1. **Spaceborne lidar/stereo (including lidar snow depth retrieval):** Zach Fair, Yong Hu



Day 1 Breakout Session I Instructions:

- Breakout group specific documents for note-taking and summary slides: <https://tinyurl.com/Day1-SessionI>
- Breakout session leaders will facilitate a discussion around the following questions, notes can be taken at length in a Google Document specific to your breakout group topic (in “Day 1 Breakout Session I Notes” folder)
- “Day 1 Breakout Session I Summary Slides” has 1 labeled slide for each breakout session group to summarize discussion for full group discussion in the following hour



Day 1 Breakout Session I Questions:

Questions:

1. What do you feel are the biggest innovations and applications of this technique in the past decade?
 - a. What has enabled this to occur?
2. What are the biggest remaining challenges and development opportunities for this approach?
3. How do you think this approach fits into a global snow observing system or strategy?
 - a. How well does this approach perform in measuring snow depth, SWE, snowmelt, albedo?
 - b. How well does this approach work under different snow/environmental conditions
 - i. In forests versus open areas?
 - ii. In shallow snow?
 - iii. In complex terrain?
 - iv. Dry versus wet
 - v. Under clouds
 - c. Has the uncertainty been defined? If so, at what scale (basin, mountain range, hemispherical, global)?
 - i. How big is the impact?
4. Does this technique support a path to space?
 - a. If so, how mature is it?
 - b. If not, does it complement spaceborne observations and how?
5. What does this technique rely on or need to pair with to work? What other techniques are highly complementary to this approach? (synergies)



Group Topics, Session Leaders, Room Assignments:

1. **Microwave Scattering:** Mike Durand, Ed Kim
1. **Signals of Opportunity:** Steve Margulis, Eli Deeb, Jessica Lundquist
1. **UAV applications (all sensors):** Dan McGrath, Jennifer Jacobs
1. **Snowpack and Hydrologic Modeling (including machine learning and data assimilation):** Mark Raleigh, Joachim Meyer
1. **Ground-based/observations:** Megan Mason, Ryan Webb, Sveta Stuefer
1. **Snowpack Albedo:** Kelly Gleason, Karl Rittger
1. **InSAR:** Jack Tarricone, HP Marshall
1. **Spaceborne lidar/stereo (including lidar snow depth retrieval):** Zach Fair, Yong Hu

