NASA SnowEx, 2016 – 2023

NASA SnowEx is a multi-year field campaign, sponsored by NASA’s Terrestrial Hydrology Program (THP), to assess the ability of different remote sensing techniques across a range of snow climates and topographic and vegetation gradients. Research and validation have aimed to address unique environmental challenges needed for global snow satellite observations to be successful.

- Over 250 Participants
- 49 Institutions
- 20 Sites
- 8 Aircraft
- 18 Airborne Instruments
- 184 Datasets

Community-wide field campaign efforts

- 2017: Grand Mesa and Senator Beck, Colorado. Test wide range of instruments in different vegetation and topographic conditions
- 2019-2020: Grand Mesa, CO. Seven different airborne instruments on 5 different aircraft over a week in November & 3 weeks in February
- 2020-2021: Western U.S. Time Series. L-band InSAR time series over 14 sites across Western U.S., range of snow climates, local field teams deploy on each of 16 sorties
- 2022-2023: Fairbanks and North Slope, Alaska. Lidar/SIM and X/Ku-band SAR in boreal and tundra snow climates; Multispectral imagery during the snowmelt period in boreal forest

SWE/Snow Depth Airborne Sensors

Albedo, Temperature & Optical Airborne Sensors

SnowEx Data

Data collected during the SnowEx campaigns is archived and available at the National Snow and Ice Data Center (NSIDC, https://nsidc.org/data/snowex/).

SnowEx Findings to Date

The NASA SnowEx campaign has helped improve process-level understanding advance snow remote sensing and algorithm development and explore data integration and merging techniques.

Ground Measurements

- Snow grain size
- Snow density
- Snow temperature
- Snow depth
- SWE
- SWE
- Snow depth
- SWE

SnowEx Hackweek

Hackweek is a participant-driven workshop designed and implemented through a partnership with the University of Washington’s eScience Institute, Boise State University, and the SnowEx community to foster collaboration, provide education in the tools and methods of open science, and align community members around shared software and SnowEx datasets.

- Three Hackweeks: 2-week-long workshops (1 in-person, 1 virtual) + 1 virtual seminar series
- Team of tutorial developers and organizers
- Event @UW eScience, tutorials on SnowEx data, tools, access, modeling, and group projects
- Tutorials and database access available to community

Outreach & Snow Schools

Multiple snow-focused outreach efforts have promoted snow science and measurement in conjunction with SnowEx:

- Winter Wildlands Alliance Snow School: K-12 program that takes over 35,000 students into the snow environment to teach science
- NASA/CUAHSI Snow School: 4-day hands-on field school; prepare researchers at all career levels to make quality field observations using standard techniques
- NASA MAIAINSE: Undergraduate interns from American Indian and Alaska Native serving institutions exploring SnowEx data
- SnowEx-Ed, NASA STEAM Education with Snow: Snow science kits were designed, built and distributed to schools across the US to highlight snow science, along with fun outdoor snow activities to give students snow measurement experience

Community Building & Next Steps

Over the past 7 years, SnowEx has helped bring together the snow community through:

- Multiple field campaigns, working groups and community-wide meetings
- A 10-year roadmap was developed to steer snow research and goals into the future with upcoming satellite missions and snow mission opportunities in mind
- Two snow mission proposals were submitted to the recent NASA Earth System Explorer solicitation
- Stay Tuned! Plans for an in-person science meeting are underway to discuss remaining science gaps and next steps

SnowEx: outreach and education programs for kids and educators

SnowEx Science objectives can:

- Improve snow science, along with fun outdoor snow activities
- Snow science kits were designed, built and distributed to schools across the US to highlight snow science, along with fun outdoor snow activities to give students snow measurement experience

SnowEx is sponsored by NASA’s Terrestrial Hydrology Program, led by Dr. Jared Entin.

https://snowex.hackweek.io/