

Updates on SnowEx'17 Data



C.K. Gatebe

**NASA Workshop on SnowEx Results & Campaign Planning
Baltimore, MD, September 17, 2019**

SnowEx'17 Data Highlights:

- SnowEx official data archive is National Snow and Ice Data Center (NSIDC) DAAC.
- Official data includes
 - rigorous quality control/user support
 - extensive metadata (machine-searchable)
 - consistent format w/other campaigns
 - documentation
- snow.nasa.gov -> Campaigns-> SnowEx -> Campaign data.
- Products released (17/46):
 - Airborne, 6/13
 - GBRS, 6/21
 - Field, 5/12

SnowEx'17 Data at NSIDC (46 data products)

SnowEx Data Inventory Process Tracking	2/22/2018 EK						
Instrument name (Airborne)	Primary data product(s)	in digital	pre/sub	Data QA	metadata	final	Product Name at NSIDC
1 Cloud Absorption Radiometer (CAR)	BRDF, albedo						Cloud Absorption Radiometer BRDF (SNEX17_CAR)
2 CASI-1500 Hyperspectral VNIR Imager	irradiance, radiative forcing, snow albedo,						
3 Riegl LMS-Q1560	surface elevation, snow depth, change in						
4 PhaseOne iXU 180-R50	visible imagery						
5 QWIP camera	Surface temperature maps						QWIP Data (SNEX17_QWIP_ST)
6 IR radiometer	land/snow surface temperature brightness						
7 P-3 video camera	visible imagery						P-3 Video Data (SNEX17_P3V)
8 UAVSAR	Quad Pol Backscatter and Single Look						UAVSAR (Brokered from JPL)
9 GLISTIN-A	Backscatter and Topographic Height						GLISTIN-A (Brokered from JPL)
10 SnowSAR	backscatter						SnowEx17 SnowSAR FMCW Waveforms
11 WISM radiometer (passive microwave)	brightness temperature						Wideband Instrument for Snow Measurements (WISM) Radiometer Passive
12 WISM SAR (active microwave)	backscatter						
13 KT-15	surface temperature						KT-15 Data (SNEX17_KT15_ST)
Instrument name (GBRS)	Variables observed and/or derived						
1 Parsivel2 Disdrometer and Pluvio 400 Weighing Precipitation	Precipitation Drop Size Distribution						
2 Cimel sunphotometer #599	spectral aerosol optical depth						
3 Trimble NetR9 and Zephyr antenna	Snow depth and SWE						
4 UW-Scat	Normalised Radar Cross Section						Ground-Based UW-Scat Ku- and X-Band Frequency Modulated Continuous Wave Radar (SNEX17_UWScat)
5 Truck Mounted Radiometer System-3	V and H pol brightness temperature at 1.4,						
6 Ground Based Broadband Radar	Frequency Modulated Continuous Wave						
7 Mala							
8 PulseEkko							
9 6-18Ghz FMCW							Ground-Based Broadband Frequency Modulated Continuous Wave Radar (SNEX17_GBB_FMCW)
10 25Ghz FMCW							Ground-Based Broadband Frequency Modulated Continuous Wave Radar (SNEX17_GBB_FMCW)
11 FlatEarth							
12 Snow Sensor	snow pack temperature, density, wet or dry,						
13 ASD FieldSpec	irradiance, radiance, spectral reflectance,						
14 Ground Penetrating Radar	Ground Penetrating Radar						Ground Penetrating Radar (SNEX17_GPR)
15 Radiometrics	Brightness temperatures						Radiometrics Surface-Based Radiometer Brightness Temperatures (SNEX17_SBR)
16 Precipitation Imaging Package (PIP)	falling precipitation size distributions and fall						
17 Wingscapes TimelapseCam	RGB image						
18 Riegl VZ-4000; Riegl VZ-6000; Riegl VZ-400	surface elevation, vegetation elevation,						
19 Riegl VZ-1000	surface elevation, vegetation elevation,						Boise State TLS (Terrestrial Laser Scanning) Data (SNEX17_TLS_PC_BSU)
20 Leica ScanStation C10	surface elevation, vegetation elevation,						CRREL TLS (SNEX_TLS_PC_CRREL)
21 Gulf Coast Data Concepts X16-1D	Two-axis tree acceleration at 12 Hz						
22 OTT Hydromet Pluvio-2	Snow Depth						
23 OTT Pluvio P2	snow depth						
24 Judd snow depth sensor (2 arrays, 10x each)	15 min snow depth						Time Series Sonic Snow Depth Measurement Array (SNEX17_SSD)
Instrument (Field)	Variables						
1 IceCube, IRIS	Specific Surface Area						Laser Snow Microstructure Specific Surface Area Data (SNEX17_SSA)
2 DGNSS	Differential GNSS Survey						CRREL Differential GNSS Survey (SNEX17_DGNSS1)
3 Magnaprobe	Snow Depth, Latitude, Longitude, time,						
4 Snow MicroPenetrator (SMP)	The SMP acquires very high vertical						SnowMicroPen (SMP) Raw Penetration Force Profiles (SNEX17_SMP)
5 Senator Beck SnowMicroPen (SMP) Raw Penetration Force	snow microstructure						Senator Beck SnowMicroPen (SMP) Raw Penetration Force Profiles (SNEX17_SMP2)
6 Manual snow depth probe	Snow depth						Community Snow Depth Probe Measurements (SNEX17_SD)
7 Snow Pit Measurements							Community Snow Pit Measurements (SNEX17_SnowPits)
8 Density sampler	Snow density						
9 Thermometer	Snow temperature						
10 Macroscopic	grain size						
11 Digital camera	Snow grains, study site, local landscape, data						
12 NIR digital camera	Snow pit stratigraphy						
13 ABS 1 m hinged board	Snow surface roughness						
14 Manual process - soil moisture	Gravimetric soil moisture						
Instrument name (Satellite)	Primary data product(s)						
1 High-resolution DEMs from commercial satellite imagery	High-resolution digital elevation models						

NSIDC DAAC Metrics for ASO and SnowEx through August 2019

ASO

- 98 unique users
 - 3M_SD – 44
 - 50M_SD - 42
 - 50M_SWE - 30
- 963 science files downloaded
- Users from 15 countries
 - USA – 67 (68%)
 - China – 9 (9%)
 - Norway – 5 (5%)
 - Iran – 3 (3%)
 - Others – 14 (14%)

SnowEx'17

- 151 unique users
- 140,875 science files downloaded
- Users from 17 countries
 - USA – 102 (65%)
 - China – 13 (8%)
 - Canada – 12 (8%)
 - India – 9 (6%)
 - Others – 20 (13%)

Airborne Data (6)

Product Name	Primary data products	users
Cloud Absorption Radiometer BRDF (SNEX17_CAR)	Surface reflectance maps, Snow spectral BRDF, snow spectral albedo	11
QWIP Data (SNEX17_QWIP_ST)	Surface temperature maps	4
P-3 Video Data (SNEX17_P3V)	video	8
UAVSAR (from JPL)	Quad Pol Backscatter and Single Look Complex Stacks	?
GLSITIN-A (from JPL)	Backscatter and Topographic Height	?
KT-15 Data (SNEX17_KT15_ST)	surface temperature	9

GBRS (6)

Product Name	Primary data products	users
Ground-Based UWScat Ku- and X-Band Frequency Modulated Continuous Wave Radar (SNEX17_UWScat)	Normalised Radar Cross Section (backscatter) at Ku and X-band (VV, HH, VH, HV), Mueller Matrices.	18
Ground Penetrating Radar (SNEX17_GPR)	Surface temperature maps	21
Radiometrics Surface-Based Radiometer Brightness Temperatures (SNEX17_SBR)	Brightness temperatures	2
Boise State TLS (Terrestrial Laser Scanning) Data (SNEX17_TLS_PC_BSU)	surface elevation, vegetation elevation, vegetation structure, snow depth (Riegl VZ-1000)	10
CRREL TLS (SNEX_TLS_PC_CRREL)	surface elevation, vegetation elevation, vegetation structure, snow depth (Leica ScanStation C10)	6
Time Series Sonic Snow Depth Measurement Array (SNEX17_SSD)	15 min snow depth	22

Field Measurements (5)

Product Name	Primary data products	users
Laser Snow Microstructure Specific Surface Area Data (SNEX17_SSA)	Specific Surface Area (IceCube, IRIS)	18
CRREL Differential GNSS Survey (SNEX17_DGNSS1)	Differential GNSS Survey	6
SnowMicroPen (SMP) Raw Penetration Force Profiles (SNEX17_SMP)	The SMP acquires very high vertical resolution measurements of force (units=Newtons). From these force measurements, algorithms are applied to estimate snow microstructure parameters such as density, specific surface area, snow grain type, etc.	31
Community Snow Depth Probe Measurements (SNEX17_SD)	Snow depth	28
Community Snow Pit Measurements (SNEX17_SnowPits)	Snow density, Snow temperature, grain size, Snow grains (study site, local landscape, data collection), Snow pit stratigraphy	47

THANKS:

- Data providers
- NSIDC/Tanner, Heightley, et al,
- NASA/HQ/J. Entin