

SnowEx 17 UWScat site & system notes

Notes

1. Scan geometry shown in Figure 1.
2. UWScat filenames contain a number that represents the scan start date/time in UTC.
3. Near-field reflectivity correction from Sekelsky (2002).
4. Far-field distances: Ku-narrow: 5.44 m, Ku-flood: 3.03 m, X-narrow: 17.10 m.
5. Maximum range of UWScat is about 34 m. This is why the maximum range in the range profile data is always around 34 m.
6. All scans performed in narrow-beam mode which uses a single antenna for send/receive, except for Feb 25 Ku-band which recorded in both narrow- and flood-beam mode (uses a separate send and receive antenna achieving greater sensitivity at longer distances due to improved send/receive isolation). Scans performed in flood beam have filenames ending with -F whereas filenames of narrow beam scans end with -N
7. Both frequencies were scanned from exactly the same position. We use one tripod and scan one frequency at a time, and then switch the RF head to the alternate frequency, leaving the tripod in position. This also explains why there is a time offset between Ku- and X-band scans at each site. Note: a single scan takes about 10 minutes to complete.
8. Since the scan filenames include the start time in UTC and not local time, there are instances when late afternoon scans are dated the following day, but with a time showing just after midnight. This happened on Feb 21, and the Feb 24 Skyjack sites
 - For example, on Feb 21, the X-band scan is dated Feb 22, but time is just after midnight :
 - Start time – Ku (UTC): 2017/02/21 23:22:31
 - Start time – X (UTC): 2017/02/22 00:07:22

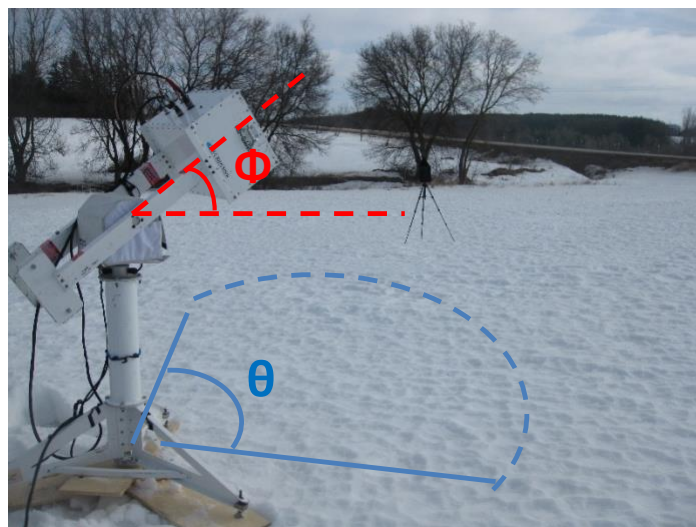


Figure 1. Azimuth angle is blue (θ), elevation angle is red (ϕ). Antenna height provided for when $\phi = 90^\circ$ and is measured from air-snow interface to antenna boresight.

Feb 21, 2017 pm LSOS

Start time – Ku (UTC): 2017/02/21 23:22:31

Start time – X (UTC): 2017/02/22 00:07:22

Location: 39.054360°N 108.094573°W

Direction facing: East

Antenna height: 2.2 m

Azimuth sweep: 40° (20° to -20°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: UWScat was set up adjacent to Michigan radiometer truck. Snowpack was visibly melting according to Ludo who was working in a snowpit beside us. Somewhat complex scene: trees at right, rocks buried in snow (not visible, positions not exactly known) in FOV. Different materials beneath snow (asphalt, gravel, and grass).

Feb 22, 2017 am

Start time - Ku (UTC): 2017/02/22 18:29:45

Start time – X (UTC): 2017/02/22 19:17:53

Location: 39.008521°N 108.136823°W

Direction facing: south

Antenna height: 2.2 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: no vegetation visible, snow surface appeared smooth

Feb 22, 2017 pm

Start time - Ku (UTC): 2017/02/22 22:18:07

Start time – X (UTC): 2017/02/22 23:13:21

Location: 39.034365°N 108.053959°W

Direction facing: south

Antenna height: 2.2 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: no vegetation visible, snow surface appeared smooth

Feb 23, 2017 am

Start time – Ku (UTC): 2017/02/23 17:36:55

Start time – X (UTC): 2017/02/23 17:57:09

Location: 39.017733°N 108.067244°W

Direction facing: north

Antenna height: 2.2 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: high winds, some buffeting of UWScat. No vegetation visible in FOV. Ku-band scan stopped at 55° incidence angle

Feb 23, 2017 pm

Start time - Ku (UTC): 2017/02/23 20:48:47

Start time – X (UTC): 2017/02/23 22:27:15

Location: 39.020033°N 108.066969°W

Direction facing: south

Antenna height: 2.2 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: No vegetation visible in FOV. Wind had died down during this scan. X-band scan stopped at 49° incidence angle.

Feb 24, 2017 am Megapit

Start time – Ku (UTC): 2017/02/24 19:51:41

Start time – X (UTC): 2017/02/24 22:16:07

Location: 39.029939°N 108.033248°W

Direction facing: south-west

Antenna height: 2.2 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: no vegetation visible in FOV.

Feb 24, 2017 pm Skyjack

Start time - Ku (UTC): 2017/02/24 23:58:32

Start time - X (UTC): 2017/02/25 00:18:50

Location: 39.028050°N 108.032715°W

Direction facing: south

Antenna height: 9.9 m

Azimuth sweep: 60° (30° to -30°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: Stand of mature evergreen on right side of FOV (eg ~0° - 30° azimuth), open meadow on the left side (eg ~0° - (-30°) azimuth). Forest at back of meadow may be visible at high incidence angles. At low incidence angles only snow was visible – there was a gap of about 10 m between the base of the skyjack and where the trees began. Backscatter values for skyjack scenes are lower than scans done on the ground – we are approaching the maximum range for this equipment and I think this has caused a weak return.

Feb 25, 2017 Skyjack

Start time - Ku (UTC): 2017/02/25 17:27:26

Start time - Ku Flood Beam (UTC): 2017/02/25 17:40:35

Start time - X (UTC): 2017/02/25 20:17:19

Location: 39.028050°N 108.032715°W

Direction facing: south

Antenna height: 9.5 m

Azimuth sweep: 60° (20° to -40°)

Elevation angle range, step: 25° - 61°, by 3° increments

Notes: X-band temperature indicator malfunctioned – I don't know what temperature the system maintained during the scan. Comparing output from this scan with that of Feb 24 (same scene, slightly different azimuth angles), the data is very close so I suspect the system maintained the proper

temperature, however I don't know for certain. Backscatter values for skyjack scenes are lower than scans done on the ground – we are approaching the maximum range for this equipment and I think this has caused a weak return. The scans on Feb 25 were done at the same position as those on Feb 24, but the azimuth angles were slightly different. Ku-band recorded in flood-beam and narrow-beam modes. X-band only recorded in narrow-beam mode. I have provided both Ku narrow and flood, and X narrow.