

GMD 2022 Feb 08 15:14:53

Figure 1: (Left) Larger-scale bird's eyes perspective of 250 MHz GPR, 50 MHz GPR, static & polarimetric (SPM) and continuous ApRES (cApRES) locations at Ekström Ice Shelf, East Antarctica. (Right) Close-up of the survey grid close to the grounding-zone.

1 Summary of ReMeltRadar 2021/22

RD

ReMeltRadar's scientific focus (1) to understand & quantify processes that govern ocean-induced melting at the base of ice shelves, and (2) to provide observational constraints on the spatial variability of ice rheology impacting ice-shelf buttressing strength. The area of interest is the Ekström Ice Shelf, East Antarctica, using the Neuyamer III station as a logistical hub for field surveys on the ice shelf and in the grounding zone. The first field season took place from November 2021 to January 2022. This report details the data collected and will serve as a baseline for envisaged repeat measurements in 2022/23.

Name	Project	Deployment	Responsibility
Inka Koch (UT)	ReMeltRadar	27.12.21-13.12.22	PulseEkko GPR
Jonathan Hawkins (UCL)	ReMeltRadar	27.12.21-13.12.22	HF ApRES
Reinhard Drews (UT)	ReMeltRadar	27.12.21-13.12.22	Science Coordination
Reza Ershadi (UT)	ReMeltRadar	05.11.21-13.12.22	Rover, SPM
Olaf Eisen (AWI)	ReMeltRadar	05.11.21-13.12.22	Traverse Leader

Table 1: Team composition of ReMeltRadar with members of University of Tübingen (UT), University College London (UCL), and Alfred Wegener Institute (AWI).

1.1 Team composition and chronology of data collection

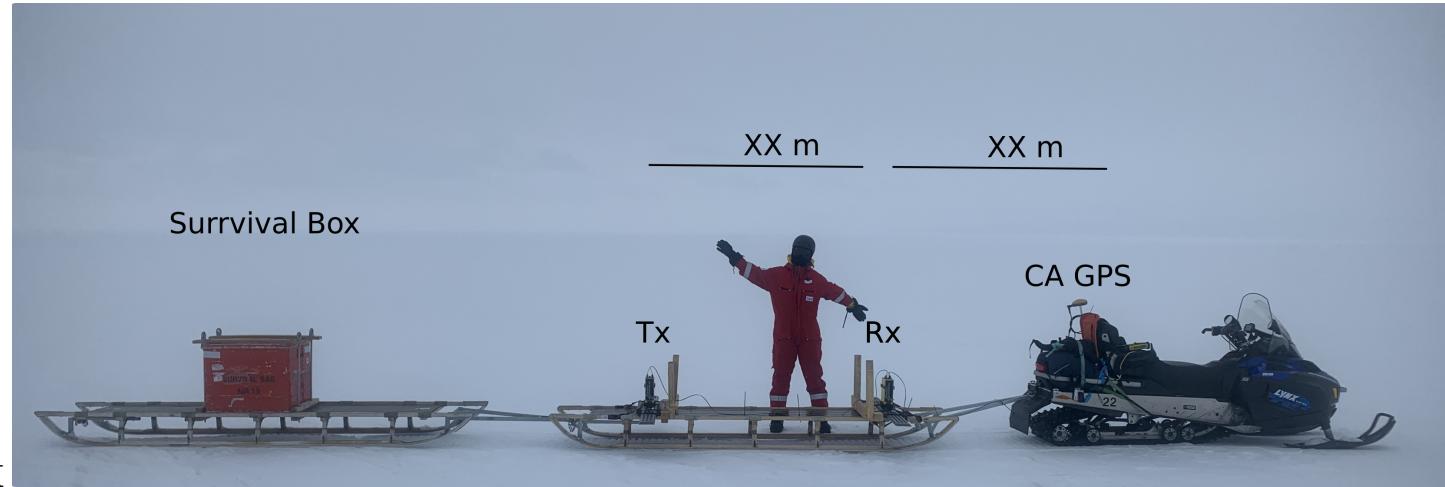
Date	Frequency	Profile	File-ID
28.12.21	50, 100 MHz	Test profiles near NM	<i>PE files</i>
29.12.21	100 MHz	MPA01-MPA03, SPX4-SPX2 near NM	<i>PE files</i>
01.01.22	250 MHz	NM-SPMA25 during traverse	<i>PE files</i>
02.01.22	50 MHz	GZ profiling along flow (SPMA25-SPMA21-GLPE3n-GLPE4s)	<i>PE files</i>
03.01.22	50 MHz	GZ profiling along flow (GLPE4s-GLPE1s-GLPE2n transfer to SPMA25)	<i>PE files</i>
04.01.22	50 MHz	GZ profiling along flow (GLPE7n-GLPE8s-GLPE5s)	<i>PE files</i>
05.01.22	50 MHz	GZ profiling across flow (XX points XX)	<i>PE files</i>
06.01.22	50 MHz	Finegrid along flow (XX points XX)	<i>PE files</i>
09.01.22	50 MHz	Finegrid across flow (XX points XX)	<i>PE files</i>
10.01.22	50 MHz	Along-flow Camp-NM (SPMA21-SPMA10)	<i>PE files</i>
12.01.22	50 MHz	Camp-NM continuation (SPMA10 - XX)	<i>PE files</i>

Table 2: Overview of GPR measurements taken with the PulseEkko radar from Sensors&Software. Details for the system setup and individual profiles are found in Section 3. Operator: I. Koch.
Here we need a table such as table for each sensor.

2 Data structure and initial source codes

RD, JH

3 GPR: Data example, field picture, system setup and profile specifics



4 SPM: Data example, field picture, system setup and site specifics

This section is written by Reza Ershadi ([Email Me](#))

The SPM points were measured in two different ways.

- We drove to the point by Hilux. We set up the system (ApRES and antenna) every time at each point. In this method, the antennas were directly on the snow surface (fig. 2). The coordinates and date of the measurements are written in table (3).
- We fixed the system (ApRES and antenna) inside the sleds and drove to the points by a snowmachine (fig. 5). The coordinates and date of the measurements are written in table (4).

More information on these points is in the following path:

..\\Tex\\Info\\RE_SPM_Points_Info.csv
..\\Tex\\Info\\RE_BulletPointReport.txt

4.1 SPM: Antenna directly on snow surface

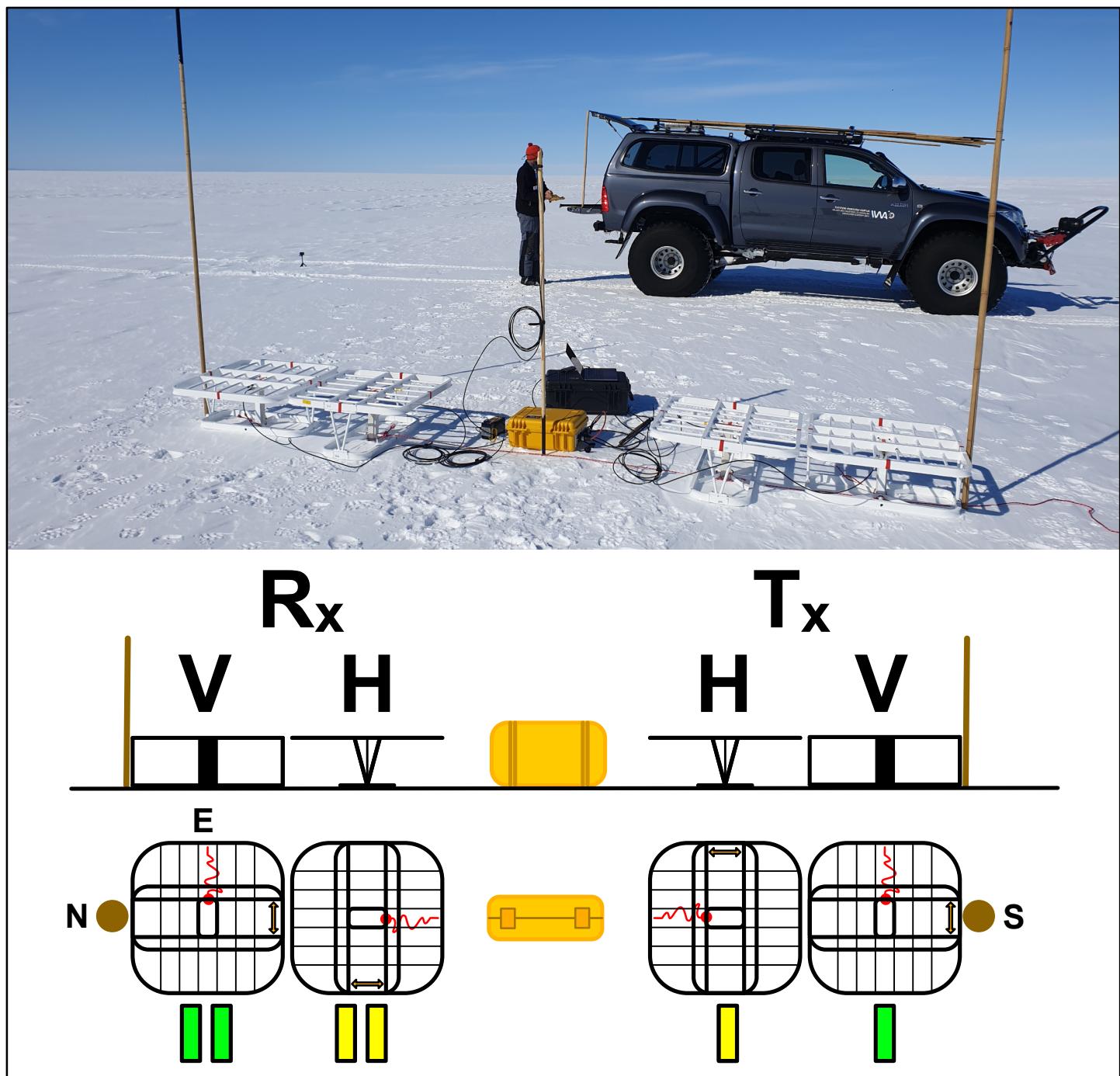


Figure 2: SPM four antenna (mimo) measurements. Antenna directly on the snow surface. The yellow and green rectangles are the tape sign an each antenna. The brown sticks and circles are the bamboo poles. The system was positioned in a way that T was always in the South direction.

Name	Date	Latitude	Longitude	pRES	Note
SPM X 04	06.12.2021			127	Unattened mimo test with RTK GPS running
SPM A 01	06.12.2021			127	Note
SPM A 04	06.12.2021			127	Note
SPM A 06	07.12.2021	S70 54.6083	W8 35.0011	127	Note
SPM A 08	07.12.2021	S70 59.6685	W8 29.5190	127	Note
SPM A 10	07.12.2021	S71 04.8188	W8 24.1606	127	Note
SPM A 12	07.12.2021	S71 09.9336	W8 19.5682	127	Note
SPM A 11	07.12.2021	S71 07.3516	W8 21.8561	127	Note
SPM A 09	07.12.2021	S71 02.2326	W8 26.9498	127	Note
SPM A 07	07.12.2021	S70 57.1200	W8 32.0608	127	Note
SPM A 05	07.12.2021	S70 52.1103	W8 38.0142	127	Note
SPM X 12	07.12.2021	S70 48.5407	W8 37.3807	127	Note
SPM X 05	08.12.2021	S70 42.1876	W8 36.2362	127	Note
SPM X 06	08.12.2021	S70 42.9845	W8 42.2801	127	Note
SPM A 02	08.12.2021	S70 44.6456	W8 47.2300	127	Note
SPM A 03	08.12.2021	S70 47.0996	W8 43.9270	127	Note
SPM X2 13	08.12.2021	S70 49.5042	W8 44.3598	127	Note
SPM X2 12	08.12.2021	S70 48.6233	W8 38.4010	127	Note
SPM X3 01	01.01.2022	S71 0.1622	W7 37.8862	127	Note
SPM X3 02	01.01.2022	S71 0.8448	W7 44.6390	127	Note
SPM X3 03	01.01.2022	S71 1.0425	W7 46.5675	127	Note
SPM X3 04	01.01.2022	S71 1.4077	W7 50.0373	127	Note
SPM X3 05	01.01.2022	S71 1.5366	W7 52.3067	127	Note
SPM X3 06	01.01.2022	S71 1.6515	W7 52.5199	127	Note
SPM X3 07	01.01.2022	S71 2.0236	W7 56.2648	127	Note
SPM X3 08	01.01.2022	S71 2.4512	W8 0.4169	127	Note
SPM X3 09	01.01.2022	S71 8.2488	W8 8.3205	127	Note
SPM X3 10	01.01.2022	S71 4.0086	W8 16.2397	127	Note
SPM A 13	01.01.2022	S71 12.5541	W8 17.6910	127	Note
SPM A 14	01.01.2022	S71 15.2070	W8 16.5035	127	Note
SPM A 15	01.01.2022	S71 17.8907	W8 16.5801	127	Note
SPM A 16	01.01.2022	S71 20.5795	W8 16.6960	127	Note
SPM A 17	01.01.2022	S71 23.2723	W8 16.9177	127	Note
SPM A 18	01.01.2022	S71 25.9609	W8 17.1657	127	Note
SPM A 25	04.01.2022	S71 43.5428	W8 35.8674	128	Note

Table 3: SPM on surface info

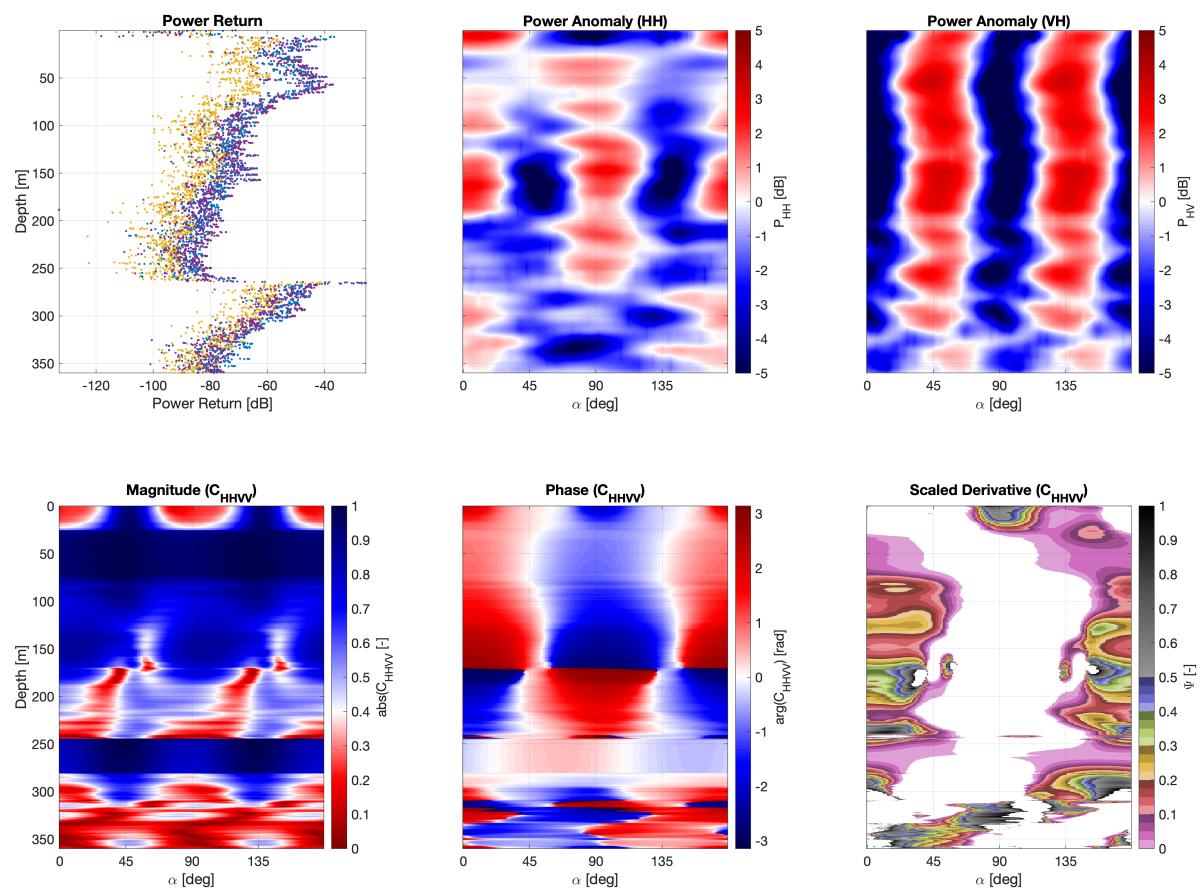


Figure 3: Data example from SPM_X_05 (floating ice - far from the GZ)

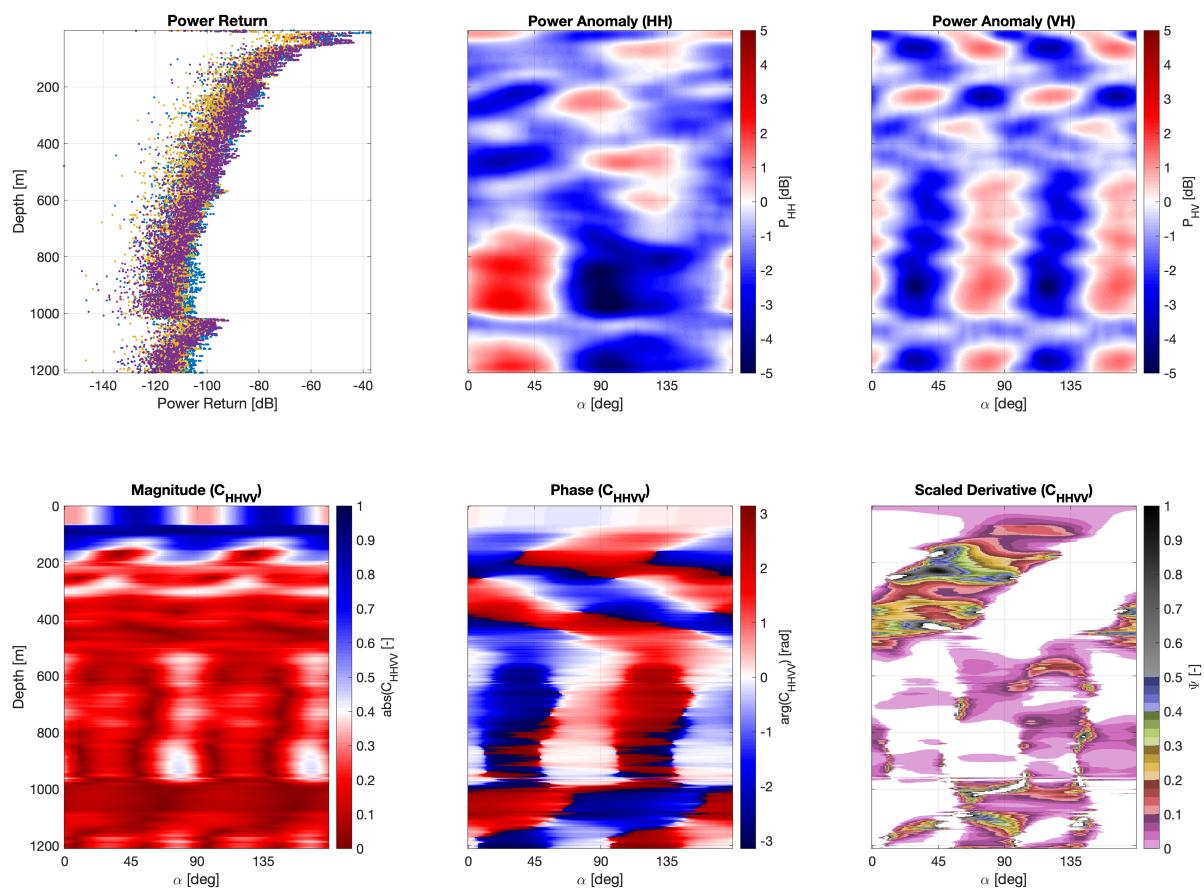


Figure 4: Data example from SPM_A_25 (grounded ice - very close to the GZ)

4.2 SPM: Antenna inside the sleds

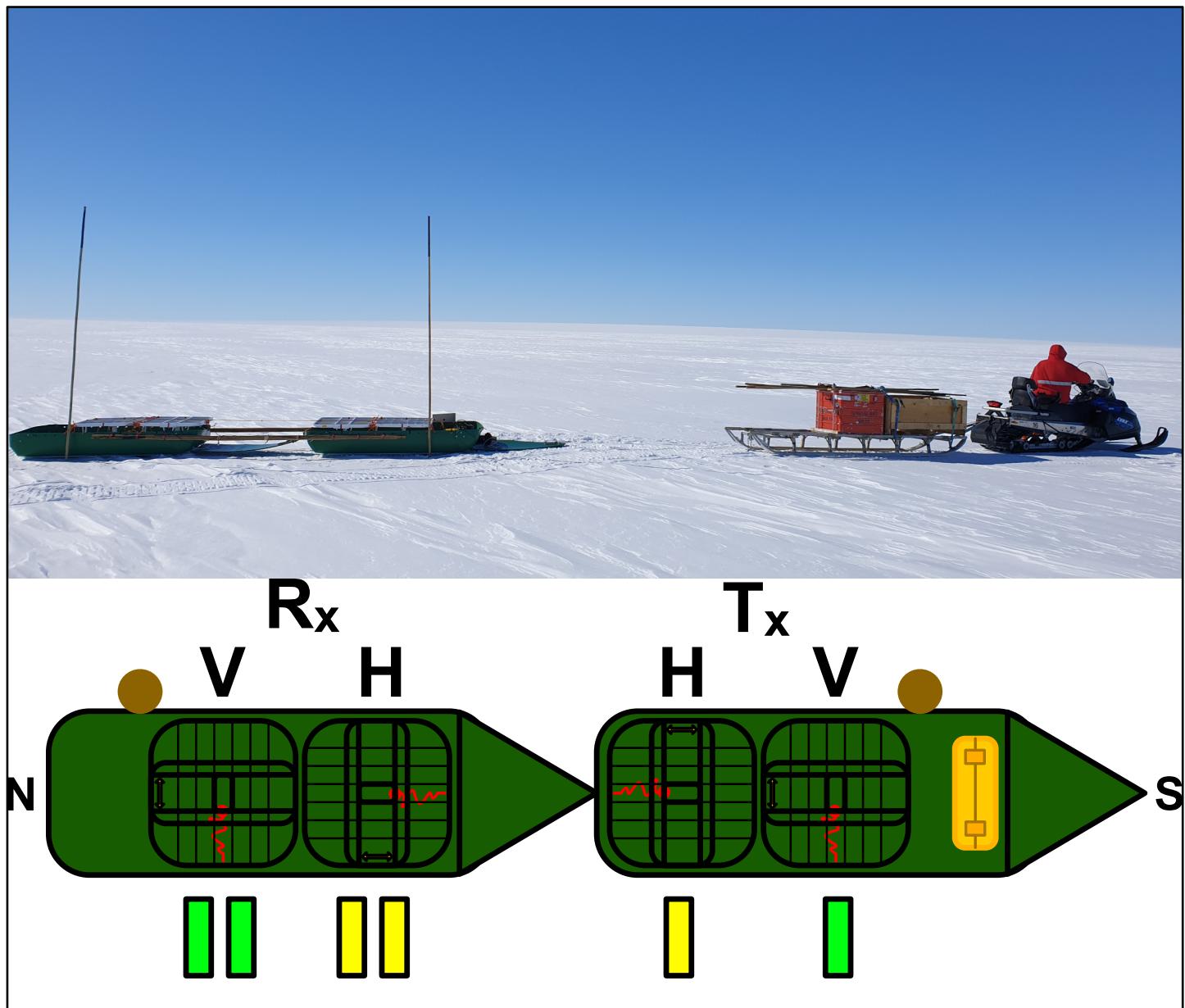


Figure 5: SPM four antenna (mimo) measurements. Antenna inside sleds. The yellow and green rectangles are the tape sign an each antenna. The brown sticks and circles are the bamboo poles. The system was positioned in a way that T was always in the South direction.

Name	Date	Latitude	Longitude	pRES	Note
SPM X 01	10.12.2021	S70 38.9781	W8 12.1931	127	
SPM X2 11	11.12.2021	S70 47.7299	W8 32.4452	127	
SPM X2 10	11.12.2021	S70 46.8444	W8 26.5088	127	
SPM X2 09	11.12.2021	S70 45.9602	W8 20.4776	127	
SPM X 03	12.12.2021	S70 40.5602	W8 24.2193	127	
SPM X 02	12.12.2021	S70 39.7987	W8 17.4478	127	
SPM X2 01	13.12.2021	S70 43.2433	W8 2.8528	?	
SPM X2 02	13.12.2021	S70 43.5002	W8 4.3377	?	
SPM X2 03	13.12.2021	?	?	?	double check needed
SPM X2 04	13.12.2021	?	?	?	double check needed
SPM X2 05	13.12.2021	S70 44.145	W8 8.7386	?	
SPM X2 06	13.12.2021	S70 44.4317	W8 10.4649	?	
SPM X2 07	13.12.2021	S70 44.7319	W8 12.5599	?	
SPM X2 08	13.12.2021	S70 45.0474	W8 14.6026	?	
SPM A 22	7.01.2022	S71 36.3400	W8 24.1557	127	Same setup as rover in traverse
SPM A 19	7.01.2022	S71 28.6556	W8 17.4667	127	Same setup as rover in traverse
SPM A 20	7.01.2022	S71 31.3291	W8 18.3103	127	Same setup as rover in traverse
SPM A 21	7.01.2022	S71 33.8910	W8 20.5898	127	Same setup as rover in traverse
SPM A 23	7.01.2022	S71 38.7621	W8 27.8876	127	Same setup as rover in traverse
SPM A 24	7.01.2022	S71 41.1405	W8 31.9045	127	Same setup as rover in traverse
SPM X4 01	08.01.2022	S71 25.0643	W8 45.4317	127	Same setup as rover in traverse
SPM X4 02	08.01.2022	S71 54.3048	W8 43.9249	127	Same setup as rover in traverse
SPM X4 03	08.01.2022	S71 45.5403	W8 42.3649	127	Same setup as rover in traverse
SPM X4 04	08.01.2022	S71 45.7?64	W8 40.8149	127	Same setup as rover in traverse
SPM X4 05	08.01.2022	S71 46.0135	W8 39.2839	127	Same setup as rover in traverse
SPM X4 06	08.01.2022	S71 46.2455	W8 37.7977	127	Same setup as rover in traverse
SPM X4 07	08.01.2022	S71 46.4827	W8 36.1669	127	Same setup as rover in traverse
SPM X4 08	08.01.2022	S71 46.7199	W8 34.6045	127	Same setup as rover in traverse

Table 4: SPM on sled info

5 MP_A (profiling)

This section is written by Reza Ershadi ([Email Me](#))

The purpose here was to measure a 1000 m profile with 1.5 m spacing with all the antennas positioned in the H direction. The system was directly connected to an RTK GPS for precise positioning. We had many problems with this profile, including the RTK signal, constant ApRES disconnection and typical rover problems. Therefore, we could not finish the 1000 m profile with 1.5 m spacing. The position of the profile and measured points are stored in our log files.

Add detailed information about the 3 metal pieces. (?)

The MP_A profile has been done with two different methods.

- We pulled the whole sled system manually for 100 m with 1.5 m spacing (fig. 6).
- We connected the sled system to the rover for a 1000 m profiling with 1.5 m spacing (fig. 7)

5.1 Manually pulling the sleds

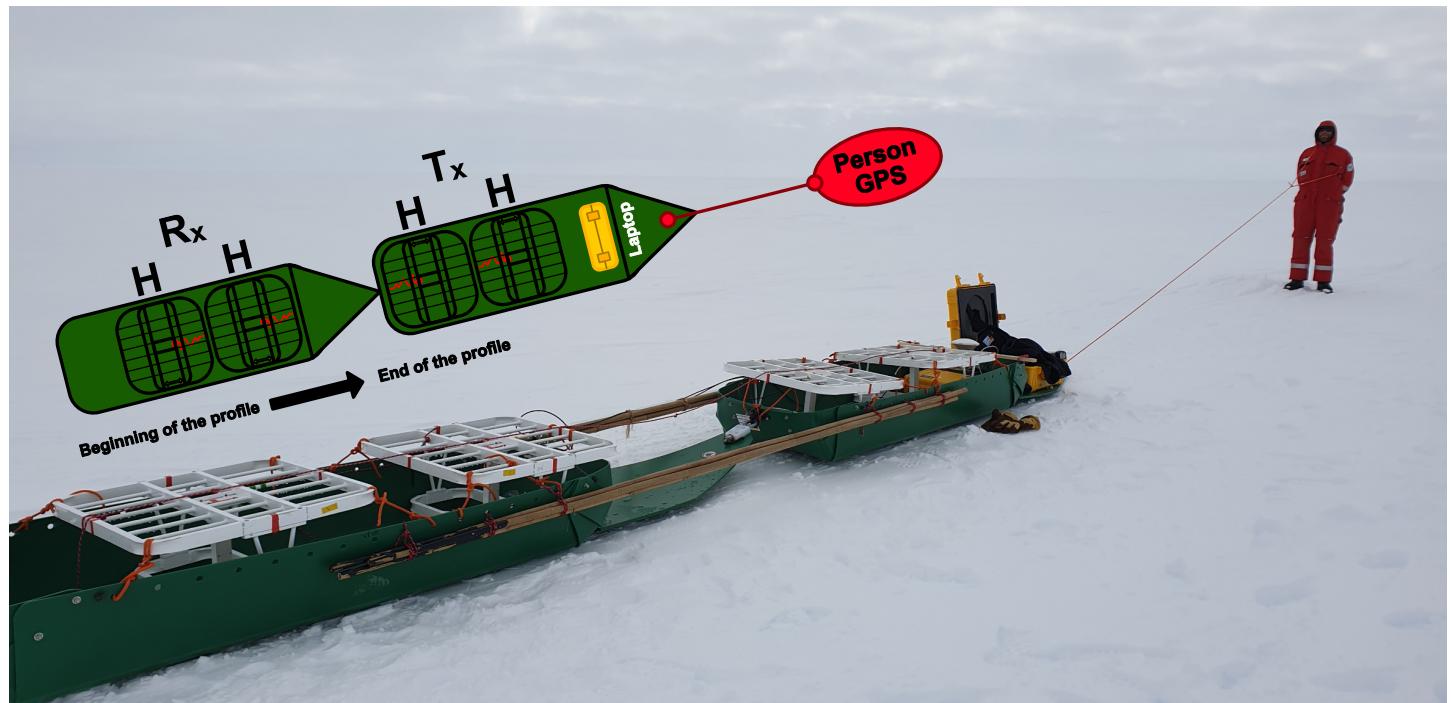


Figure 6: Manually pulling the ApRES and sleds

5.2 Using the rover



Figure 7: Pulling the ApRES and sleds using the rover

6 HF ApRES: Data example, field picture, system setup and profile specifics

JH

7 cApRES: Data example, field picture, system setup and site specifics

RE,JH

The cables are not clarified yet. (lengths and colors)

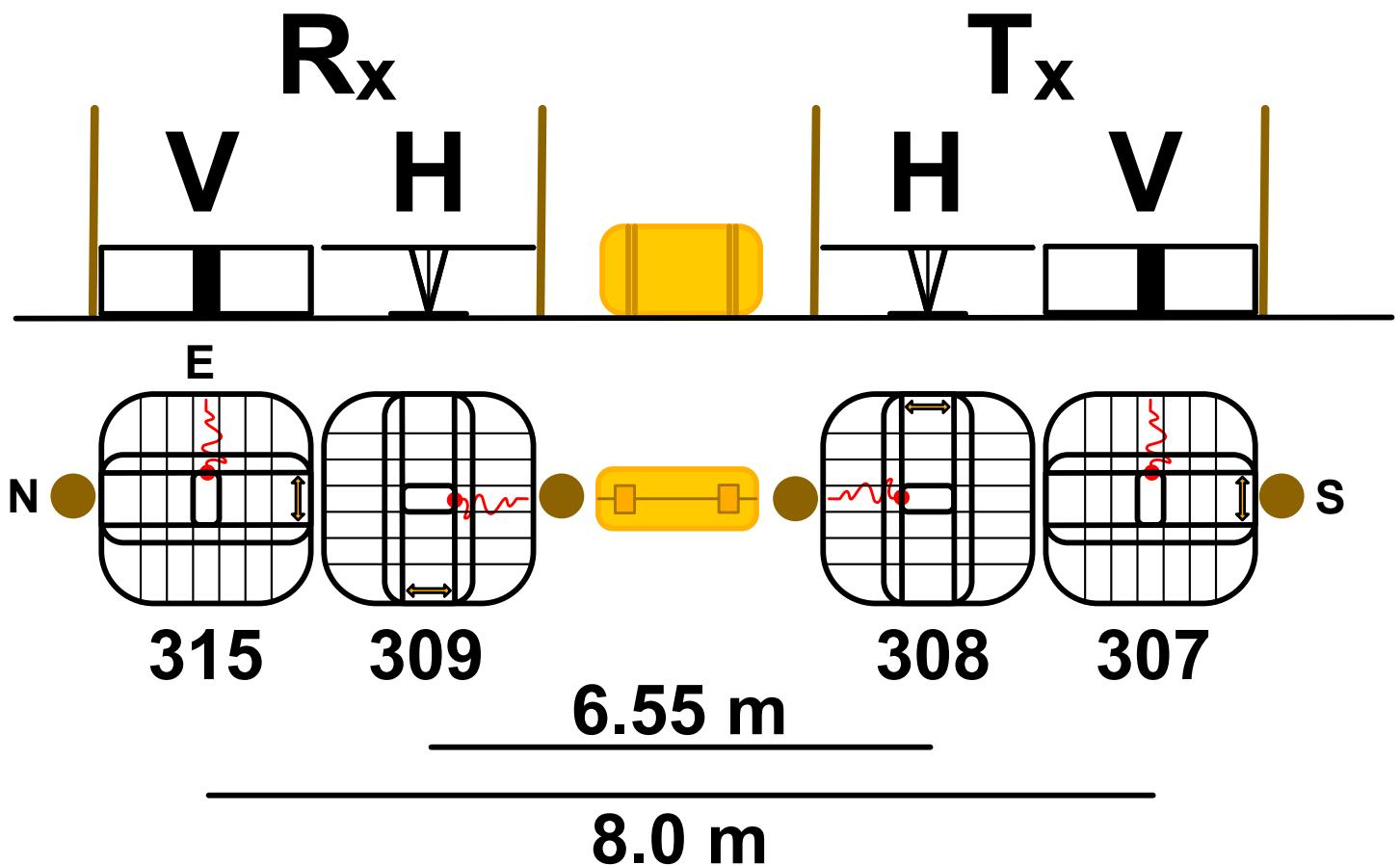


Figure 8: cApRES

Name	Date	Latitude	Longitude	pRES	Note
cApRES	8&9.01.2022	S71 36.9565	W8 25.9803	127	buried

Table 5: cApRES

8 Rover-ApRES: Data example, field picture, system setup and site specifics

This section is written by Reza Ershadi ([Email Me](#))

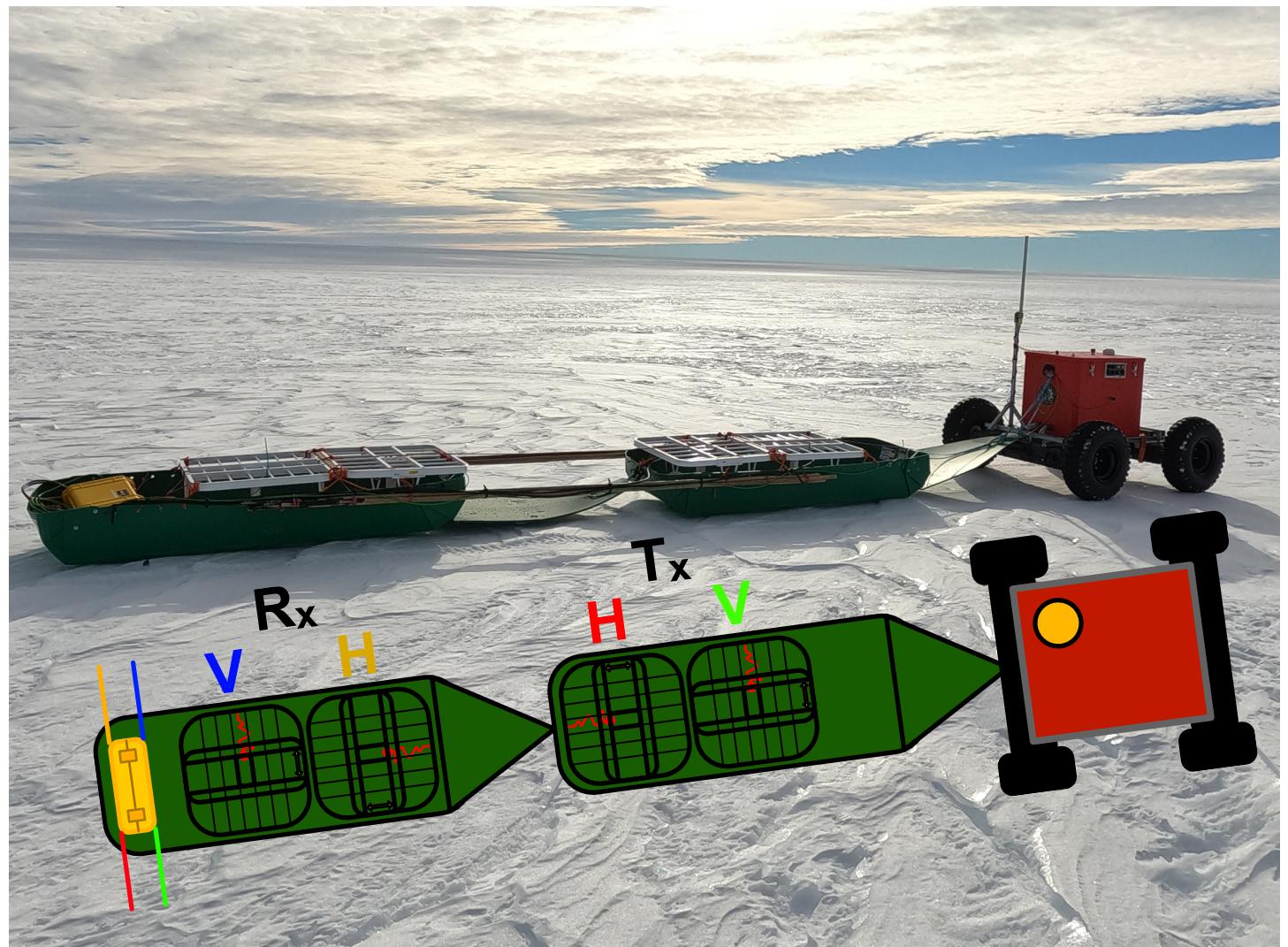


Figure 9: Antenna setup for ApRES profiling with the rover and sleds

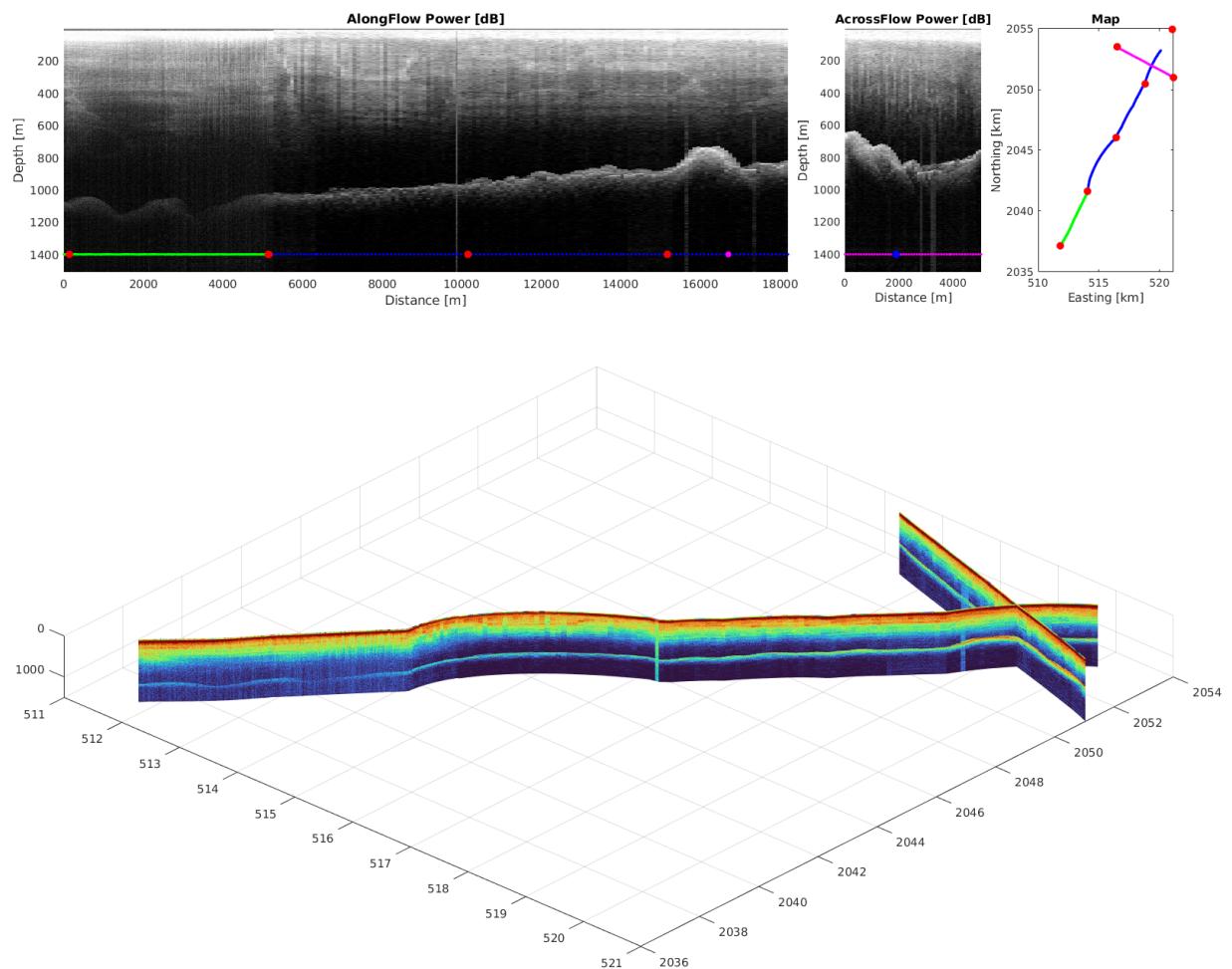


Figure 10: Radar power obtained by the rover-sled profiling system.