

Summary of missions Ran AUV during NB Palmer cruise NBP2202

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1. Summary

- 14 Hugin missions in total
 - 1 short test mission (mission 01)
 - 11 missions in Dotson Ice Shelf:
 - 3 missions (missions 02-04) with downward looking multibeam (DL MBES)
 - 8 missions (missions 05-11 and 14) with upward looking multibeam (UL MBES)
 - 2 missions at Getz B Ice Shelf:
 - 1 mission (mission 12) with UL MBES at Getz B east
 - 1 mission (mission 13) with DL MBES at Getz B west
 - For both of the ice shelves, the inflow is to the east and outflow to the west
 - collected water samples for biogeochemists during 9 missions (missions 06-14)
- Note that all time stamps are given in UTC
- Per ITGC and US policy, all data will be publicly available after 2 years.

Mission number	Location	Altitude range	MBES	MBES quality	Side scan quality
02	outside Dotson East	100 m	DL	OK	OK
03	Dotson West (outflow)	90 m	DL	OK	SSH 0004-0109
04	outside Dotson Mid + east to mid transect	90 m	DL	OK	No data
05	Dotson West (outflow)	100 m (300 m during MBES collection)	UL	1 survey line with UL MBES	SSH 0006-0056, 0061-0064 are OK
06	Dotson West (outflow)	160 m; ~500 m	UL	first lawnmower is OK (No UL DVL!)	SSH 0004-0018, 0075-0077 are OK

Mission number	Location	Altitude range	MBES	MBES quality	Side scan quality
07	Dotson West (outflow)	100 m during transit (first 5 h), ~500 m during lawnmower	UL	a bit noisy (No UL DVL!)	SSH 0004-0019, 0061-0067
08	Dotson East to mid transect	90 m during transit, constant depth at 450m and 390m during ice draft collection	UL	east to mid transect might be OK (No UL DVL!)	SSH 0004-0025, 0038-0041 are OK
09	Dotson West (outflow) + transect to east	90 m first 5h, constant depth at 210m at Dotson West, constant depth at 400m during west to east transect	UL	OK	SSH 0004-0021, 0110 are OK
10	Dotson Mid + west to east transect	90m first 5h, constant depth at 400m rest of the mission	UL	OK	SSH 0004-0017, 0119-0122 are OK
11	Dotson East + transect to drilling site	90m first 5h, constant depth at 450m rest of the mission	UL	OK	SSH 0004-0014, 0109-0112
12	Getz B East (inflow)	60m first 2h, constant depth at 350m rest of the mission	UL	OK	SSH 0004-0010, 0037-0038 (very featureful seafloor)
13	Getz B West (vent)	30m	DL	interference with SSH (some parts MIGHT be usable)	SSH 0006-0057
14	Dotson West (outflow)	70m; depth 180-240m	UL	OK	SSH0005-0017, 0100-0106 are OK

2. Missions at Dotson Ice Shelf

2.1 Three Missions at Dotson with DL MBES

The three missions at Dotson Ice Shelf (from west to east: 03, 04, 02) with DL MBES, overlaid on top of NBP's vessel MBES:

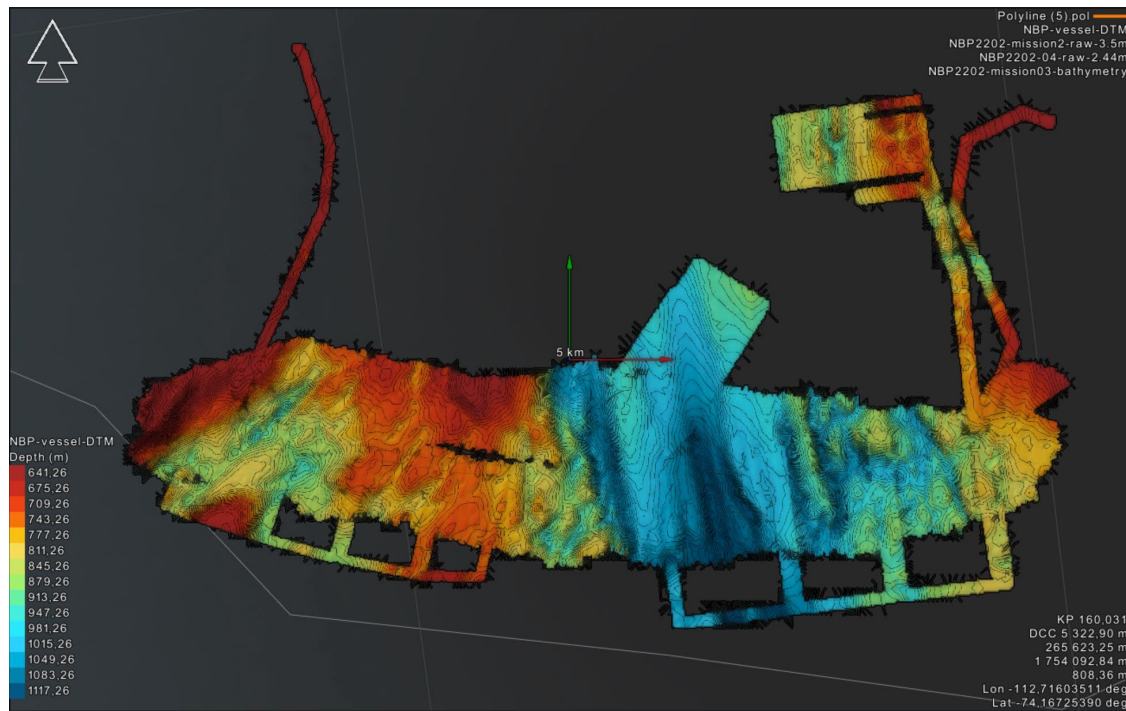


Figure 1: missions02-04-Dotson-in-relation-to-vessel-MBES

2.1.1 Mission 2 - Dotson East (DL MBES)

- lawnmower pattern at a geologically interesting location, then a long transect to under the Dotson Ice Shelf (4 km into the ice shelf)
- Altitude: 100 m
- Mission duration: ~20 h
- Mission start time: 2022.01.19 15:35:37
- Mission end time: 2022.01.20 11:36:32
- Useful SSH: ?

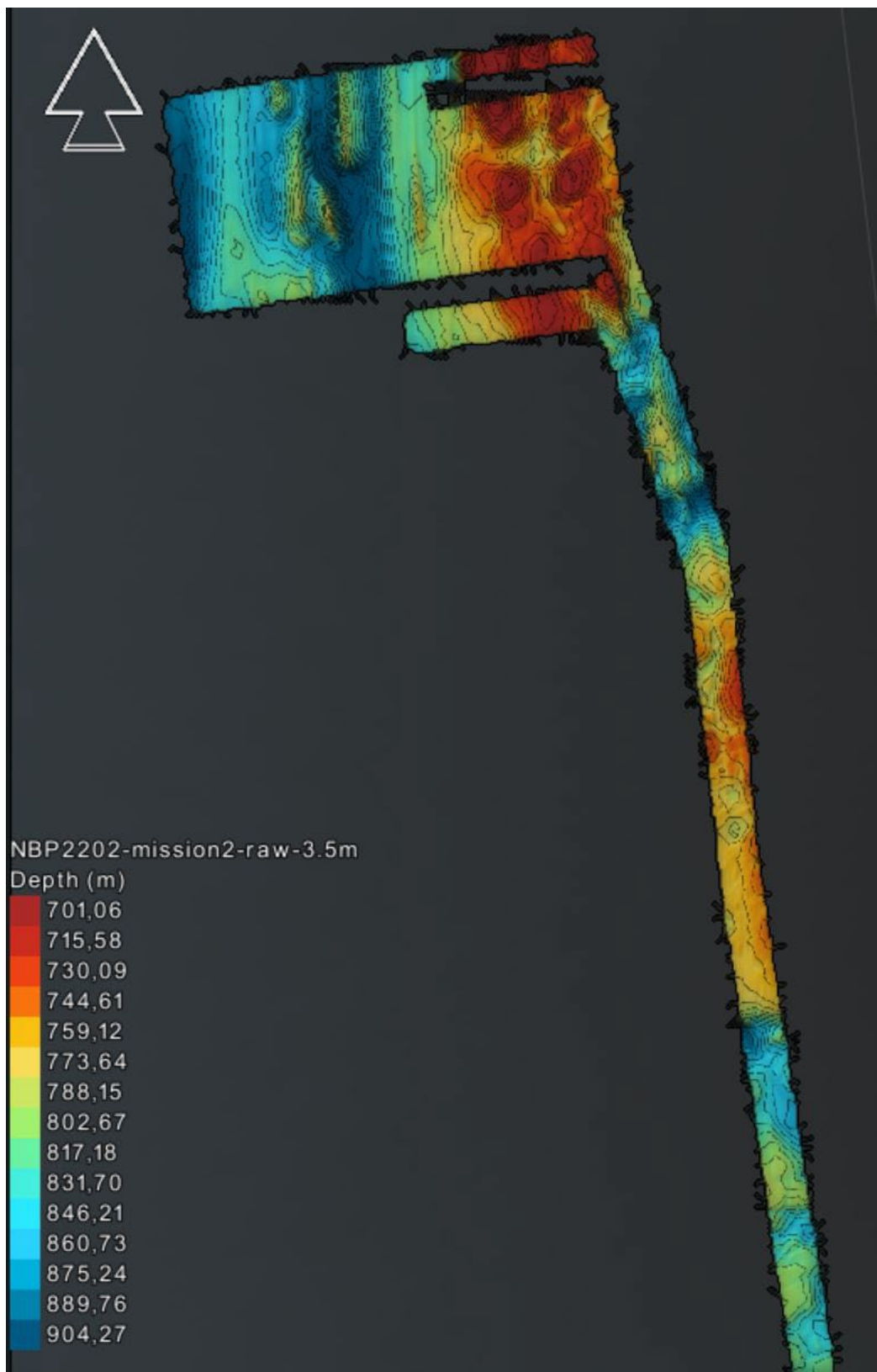


Figure 2: mission02-DotsonEast-transect-4km-under-ice-DL-MBES

2.1.2 Mission 03 - Dotson West with under ice map (DL MBES)

- Long transect from the launch site (shallow water) to the front of Dotson west (outflow). Lawnmower pattern at Dotson west, then three box patterns to Dotson Mid. Approx half of the map lawnmower pattern is under the ice shelf.
- Altitude: 90 m
- Mission duration: ~26 h
- Mission start time: 2022.01.22 12:17:21
- Mission end time: 2022.01.23 13:57:05
- Useful SSH: 0004-0109

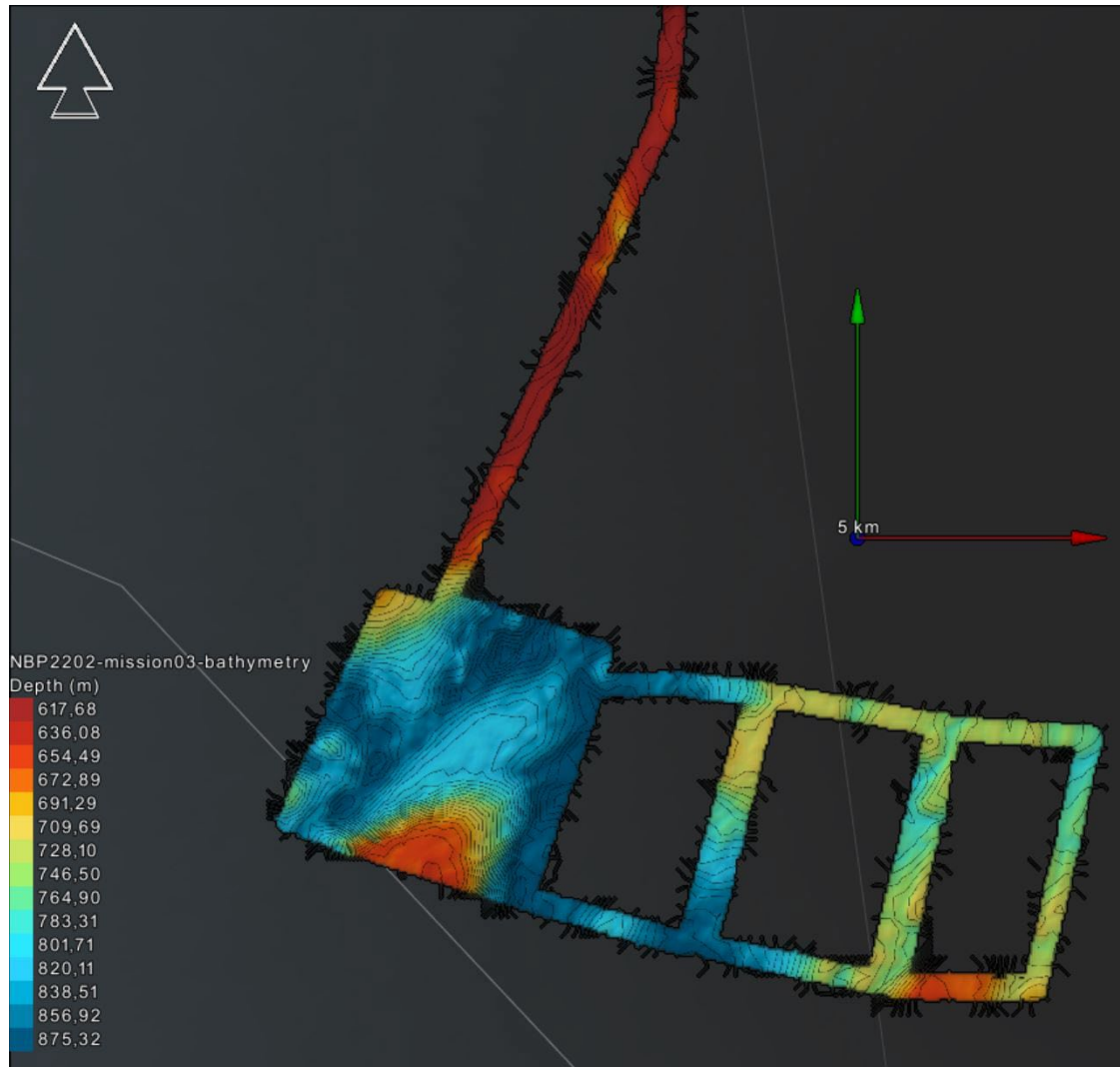


Figure 3: Mission03-DotsonWest-under-ice-map-DL-MBES

2.1.3 Mission 04 - Dotson Mid with transect from east to mid (DL MBES)

- Long transect from the launch site (shallow water) to the front of Dotson east (inflow). Three box patterns from Dotson east the mid Dotson (approx half of the box patterns is under the ice shelf), then transect out to do a lawnmower pattern at mid Dotson.

- Altitude: 90 m
- Mission duration: ~ 26 h
- Mission start time: 2022.01.28 00:23:58
- Mission end time: 2022.01.29 02:30:45
- Note: Side scan failed to record any data during this mission (turned itself off for unknown reason)

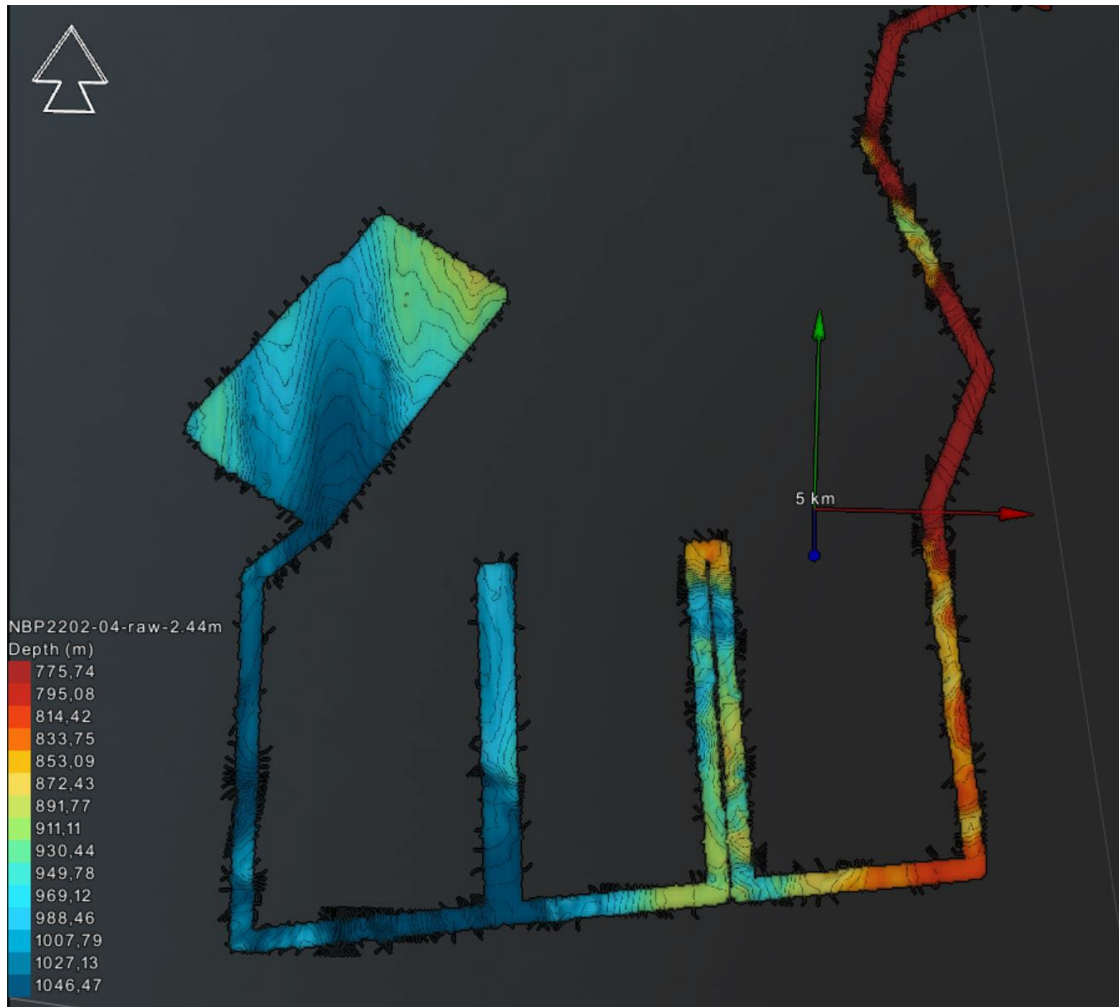


Figure 4: mission04-Outside-DotsonMid-and-box-lines-DotsonEasttoMid-DL-MBES

2.2 Eight Missions at Dotson with UL MBES

- 8 missions (missions 05-11 and 14) with UL MBES
- Missions 05 only has one line survey line with ice track (close enough for UL DVL to detect the ice)
- Missions 06-08 lack UL DVL data (the sensor failed to activate, and no UL DVL data was collected)
- Missions 09-11 have proper UL DVL data and look sensible

- Due to the lack of beacons in the seabed, the navigation of the vehicle in general was quite bad. After some hand alignments, we can see that the UL MBES data aligns well to the satellite image of the ice (SAR image)

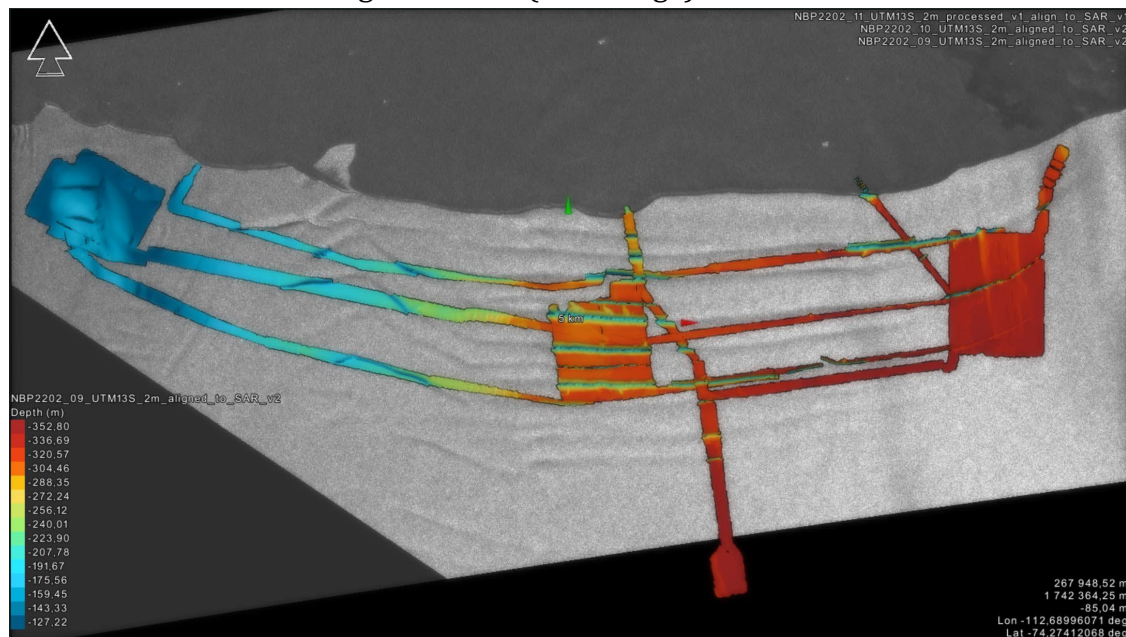


Figure 5: missions09-11-Dotson-icedraft-hand-aligned-to-SAR-image

2.2.1 Mission 05 - Dotson West with one survey line of ice track (UL MBES)

- AUV closed to the seabed (100 m) during most of the mission. Attempt to get closed to ice for one survey line at 300 m altitude.
- Altitude: 100 m during most of the mission, 300 m during MBES collection
- Mission duration: ~15 h
- Mission start time: 2022.01.30 22:34:35
- Mission end time: 2022.01.31 14:04:24
- Useful SSH: 0006-0056, 0061-0064

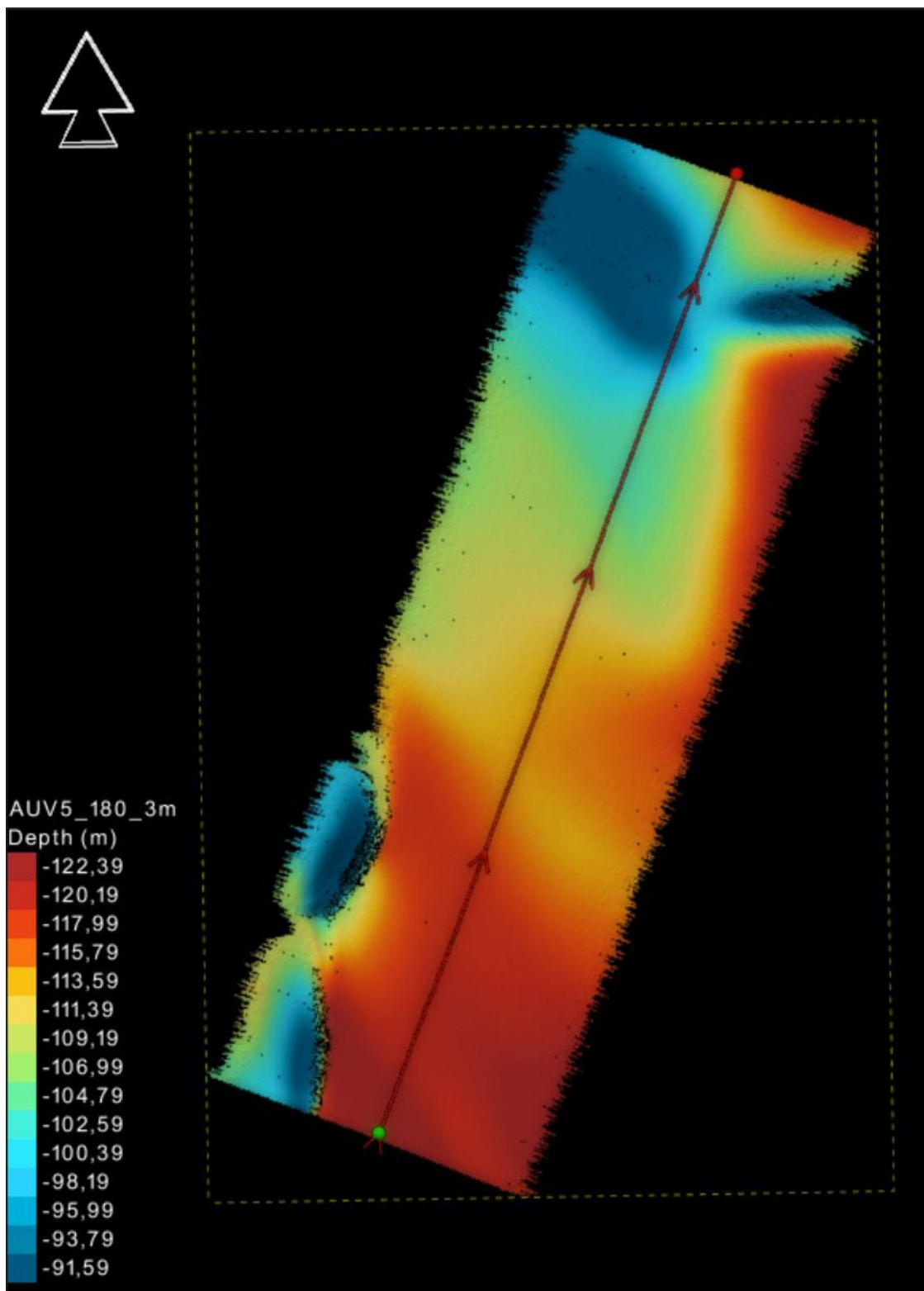


Figure 6: mission05-DotsonWest-one-survey-line-UL-MBES

2.2.2 Mission 06 - Dotson West ice draft map attempt 1 (UL MBES)

- **N.B. No UL DVL data!!!**
- First attempt to create an ice draft map under Dotson West (outflow). No UL DVL data due to the overriding setting in `override.ini`, which set the UL DVL range to 120 m instead of 180 m...
- Two lawnmower pattern surveys:
 - The first lawnmower pattern has horizontal survey lines going east-west at altitude 160 m. The ice draft turns out to be quite thick so the UL MBES quality is ok. The side scan data is likely ok as well.
 - The second lawnmower pattern has ~vertical survey lines going north-south at depth 260 m. The ice draft turns out to be very thin, so the UL MBES quality is very poor (the dark blue part of the ice draft is likely completely unusable.). The bathymetry of this section is ~800 m to 850 m, i.e. the altitude of the vehicle is ~ 500 m to 600 m, and the side scan data is likely not usable.
- Altitude: 160 m during the first lawnmower pattern, ~500-600 m during the second lawnmower pattern
- Mission duration: ~16 h
- Mission start time: 2022.02.01 18:47:53
- Mission end time: 2022.02.02 10:43:02
- Useful SSH: 0004-0018, 0075-0077

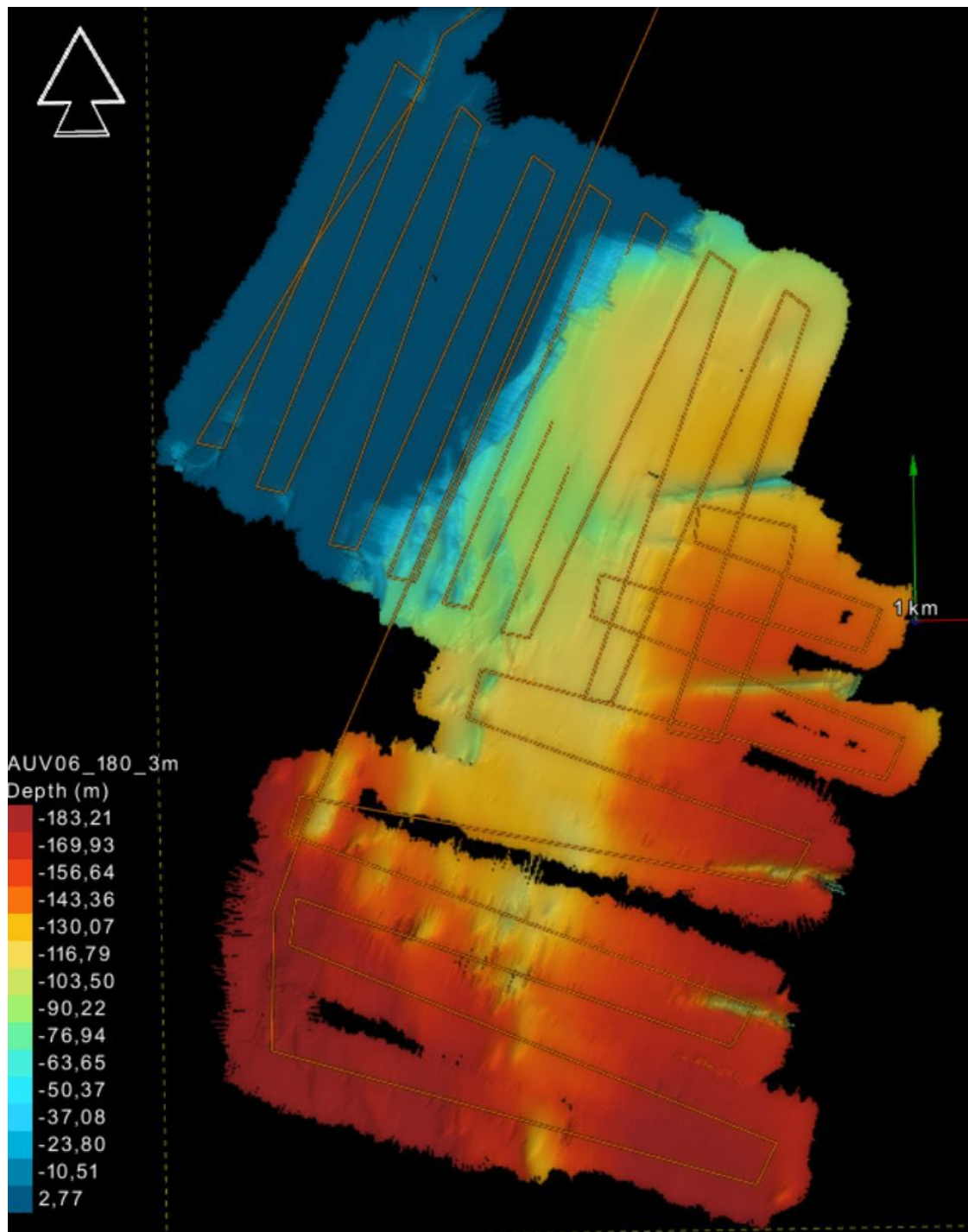


Figure 7: mission06-DotsonWest-icedraft-noULDVL!-UL-MBES

2.2.2 Mission 07 - Dotson West ice draft map attempt 2 (UL MBES)

- **N.B. No UL DVL data!!!**
- Second attempt to create an ice draft map under Dotson West (outflow). No UL DVL data due to defects (DVL did not turn on).
- Altitude:

- 100 m during the transit from shallow water launch position to under ice (~ first 5 h).
 - Constant depth at 240 m during the lawnmower pattern. The bathymetry at this region is between 700 m to 850 m, i.e. the altitude is ~ 450 m to 600 m, the side scan is likely unusable during this part (~ last 9 hours).
- Mission duration: ~14 h
- Mission start time: 2022.02.04 09:34:45
- Mission end time: 2022.02.04 23:39:36
- Useful SSH: 0004-0019, 0061-0067

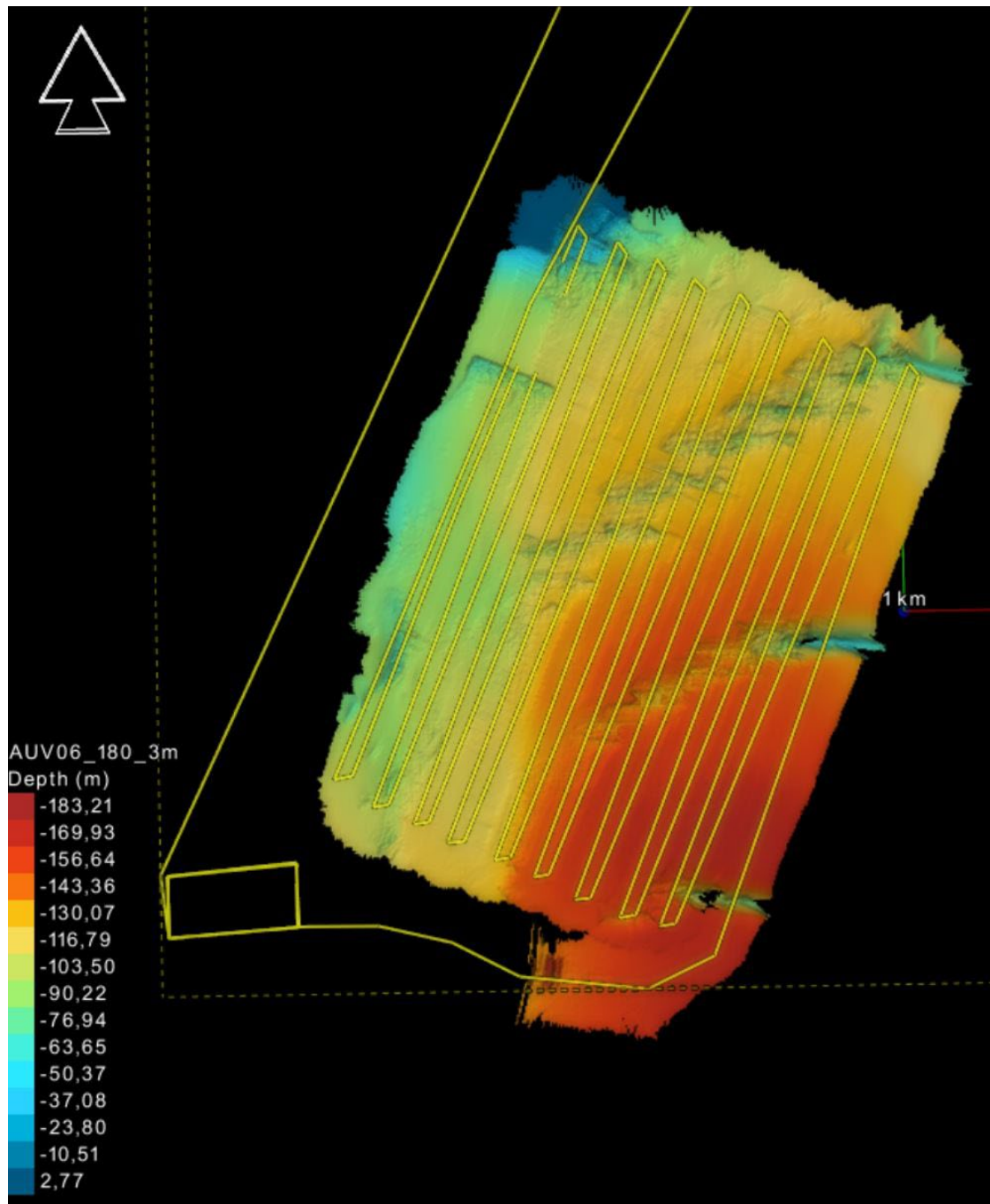


Figure 8: mission07-DotsonWest-icedraft-noULDVL!-UL-MBES

2.2.3 Mission 08 - Dotson east to mid transect (UL MBES)

- **N.B. No UL DVL data (DVL was off due to defect)!!!**
- Altitude:
 - 90 m during the lawnmower pattern at Dotson East (inflow). The ice draft was thinner than expected, so the UL MBES data here is of very poor quality. Though the side scan data might be ok.

- Two constant depths during east to mid transect (450 m and 390 m). The UL MBES data appears to be OK during the transect. The bathymetry is likely very deep (~1000 m), i.e. the altitude is likely > 500 m and the side scan is most likely unusable.
- Mission duration: ~ 9 h
- Mission start time: 2022.02.05 14:04:43
- Mission end time: 2022.02.05 23:40:23
- Useful SSH: 0004-0025, 0038-0041

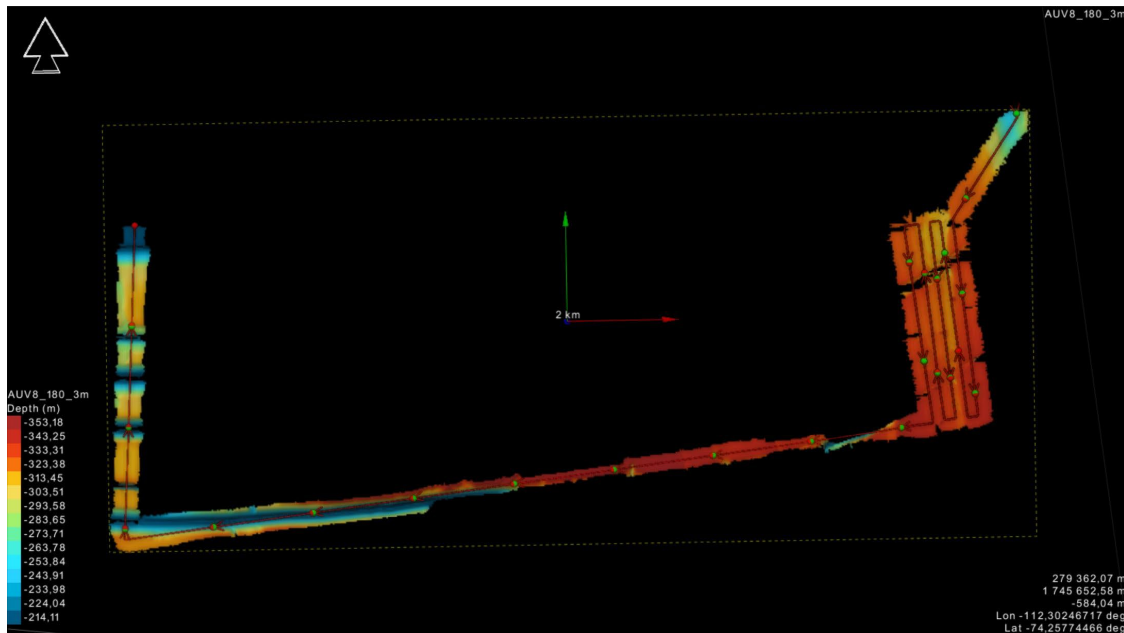


Figure 9: mission08-DotsonEast-transect-to-Mid-icedraft-noULDVL!-UL-MBES

2.2.4 Mission 09 - Dotson West ice draft map attempt 3 (UL MBES)

- Sensible MBES ice draft data for Dotson West!
- Altitude:
 - 90 m during the first 5 h (transit from shallow water launch point to under Dotson West), the side scan during this section might be OK
 - constant depth at 210 m during the lawnmower pattern (MBES is good, side scan likely unusable)
 - constant depth at 400 m during the transect from west to east (MBES is ok, side scan likely unusable)
- Mission duration: ~ 24 h
- Mission start time: 2022.02.06 13:39:41
- Mission end time: 2022.02.07 14:18:13
- Useful SSH: 0004-0021, 0110

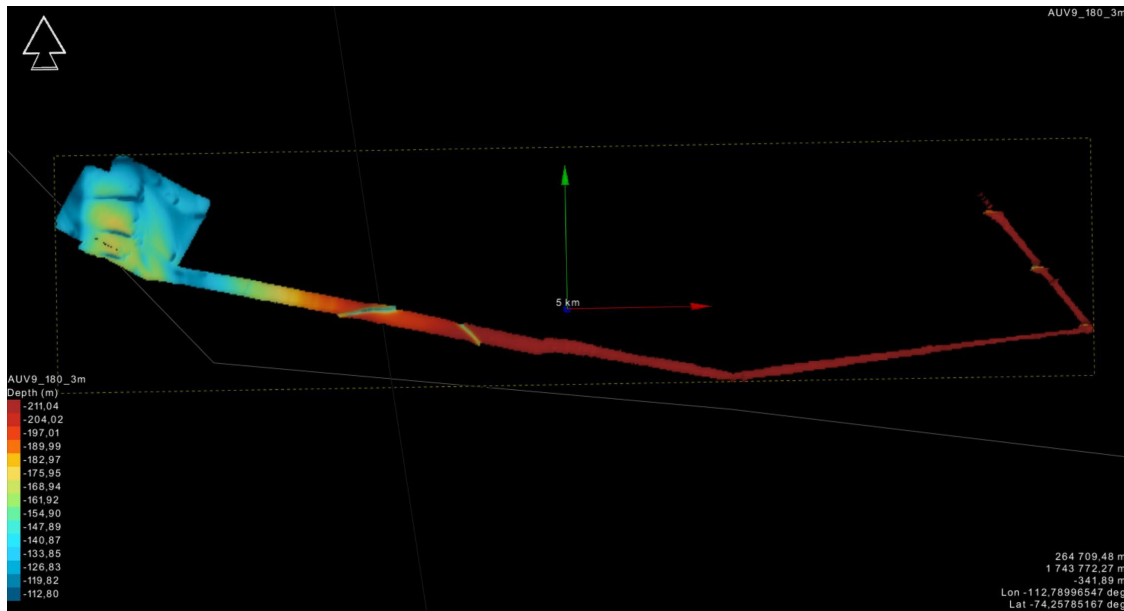


Figure 10: mission09-DotsonWest-transect-to-East-icedraft-UL-MBES

2.2.5 Mission 10 - Dotson mid ice draft map (UL MBES)

- Sensible MBES ice draft map at mid Dotson. Lost navigation almost as soon as the lawnmower pattern at mid Dotson finished (since the AUV ended up following an ice crack thinner than the range of UL DVL).
- Altitude:
 - 90 m during the first 5 h (transit from shallow water launch point to under Dotson West), the side scan during this section might be OK
 - Constant depth at 400 m during the lawnmower pattern at Dotson mid, the side scan is likely unusable during the ice survey.
- Mission duration: ~ 25 h
- Mission start time: 2022.02.09 10:16:44
- Mission end time: 2022.02.10 12:11:10
- Useful SSH: 0004-0017, 0119-0122

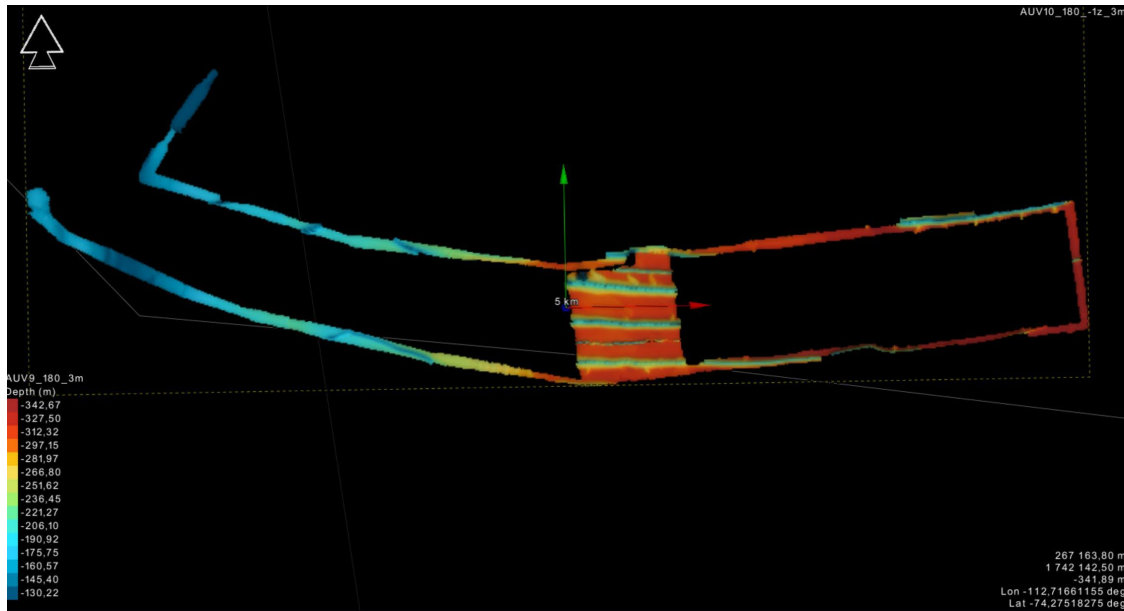


Figure 11: mission10-DotsonMid-transect-West-to-East-icedraft-UL-MBES

2.2.6 Mission 11 - Dotson East ice draft map (UL MBES)

- Lawnmower pattern at Dotson east (inflow), then transect to a previous geological drilling site 15 km into the middle of Dotson ice shelf, do a short lawnmower pattern at the drilling site and transect out at mid Dotson.
- Altitude:
 - 90 m during the first 5 h (transit from shallow water launch point to under Dotson East), the side scan during this section might be OK
 - constant depth at 450 m during the entire ice survey, until the very last part where the depth is changed to 400 m as the ice thins
- Mission duration: ~ 24 h
- Mission start time: 2022.02.11 03:42:42
- Mission end time: 2022.02.12 04:31:11
- Useful SSH: 0004-0014, 0109-0112

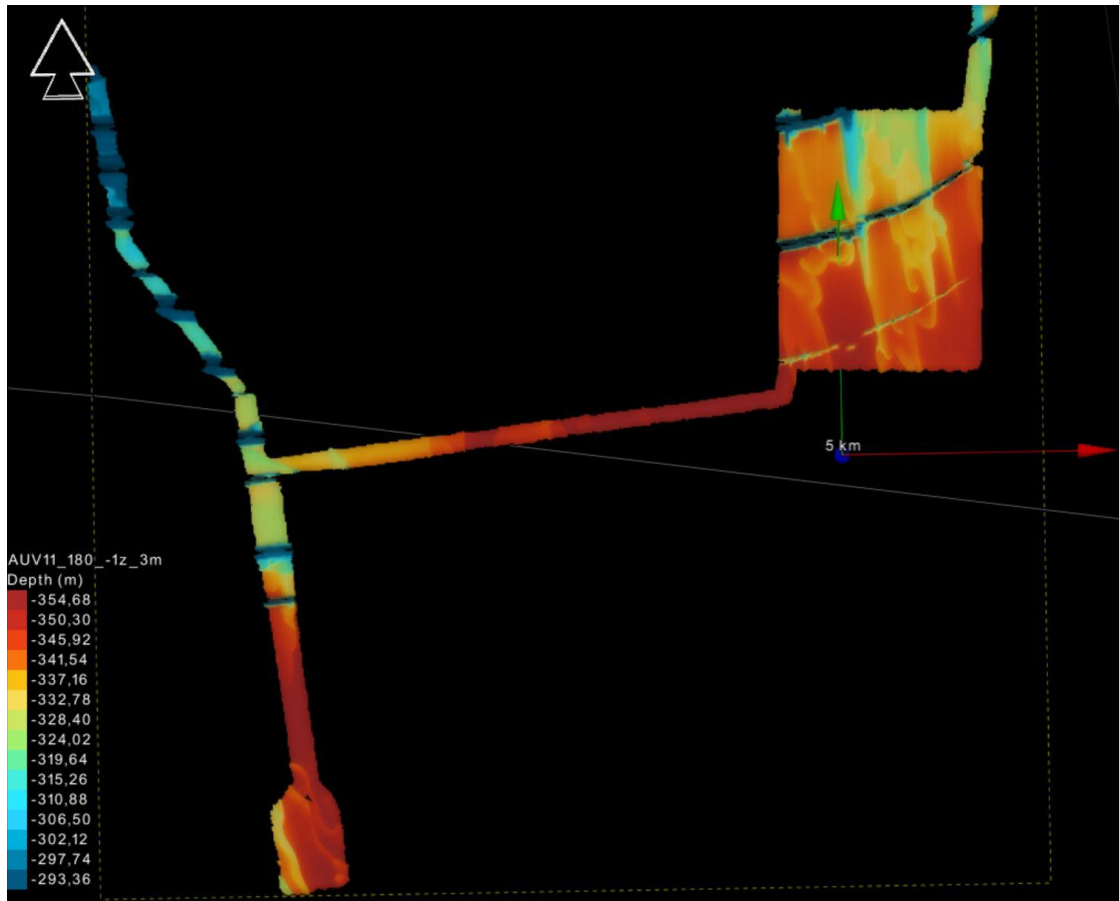


Figure 12: mission11-DotsonEast-icedraft-transect-to-drilling-site-15km-into-ice-UL-MBES

2.2.7 Mission 14 - Dotson West ice draft map (UL MBES)

- Complementing the ice draft map created in mission 09
- Altitude:
 - 70 m during the transit into the ice shelf
 - 180 m depth during the first part of the survey
 - 240 m depth during the second part of the survey
 - 230 m depth during the third part of the survey
- Mission duration: ~ 23 h
- Mission start time: 2022.02.23 03:30:29
- Mission end time: 2022.02.24 03:00:58

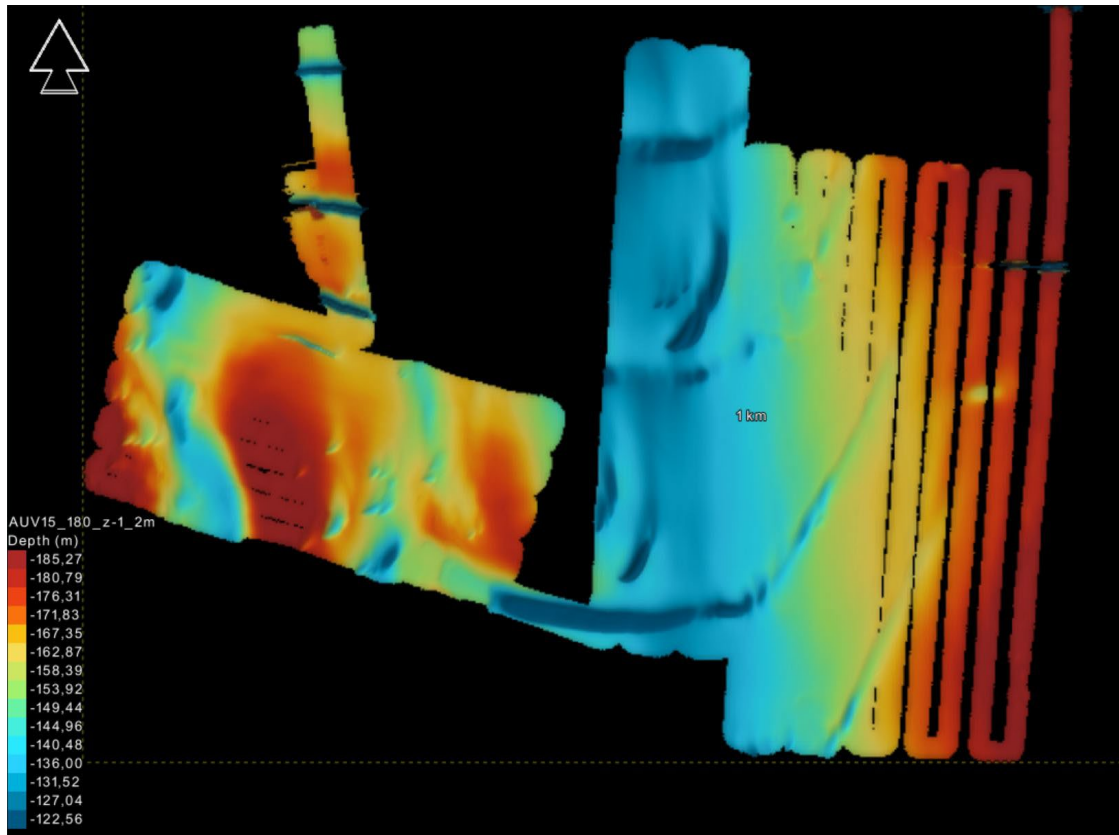


Figure 13: mission14-DotsonWest-icedraft-UL-MBES

3. Missions at Getz B Ice Shelf

3.2 Mission 12 - Getz B East (UL MBES)

- Short under ice mission with UL MBES at Getz B East (inflow)
- Altitude:
 - 60 m during the first 2 h
 - constant depth at 350 m during the rest of the mission, side scan likely unusable
- Mission duration: ~ 9 h
- Mission start time: 2022.02.15 14:00:46
- Mission end time: 2022.02.15 23:12:39
- Useful SSH: 0004-0010, 0037-0038

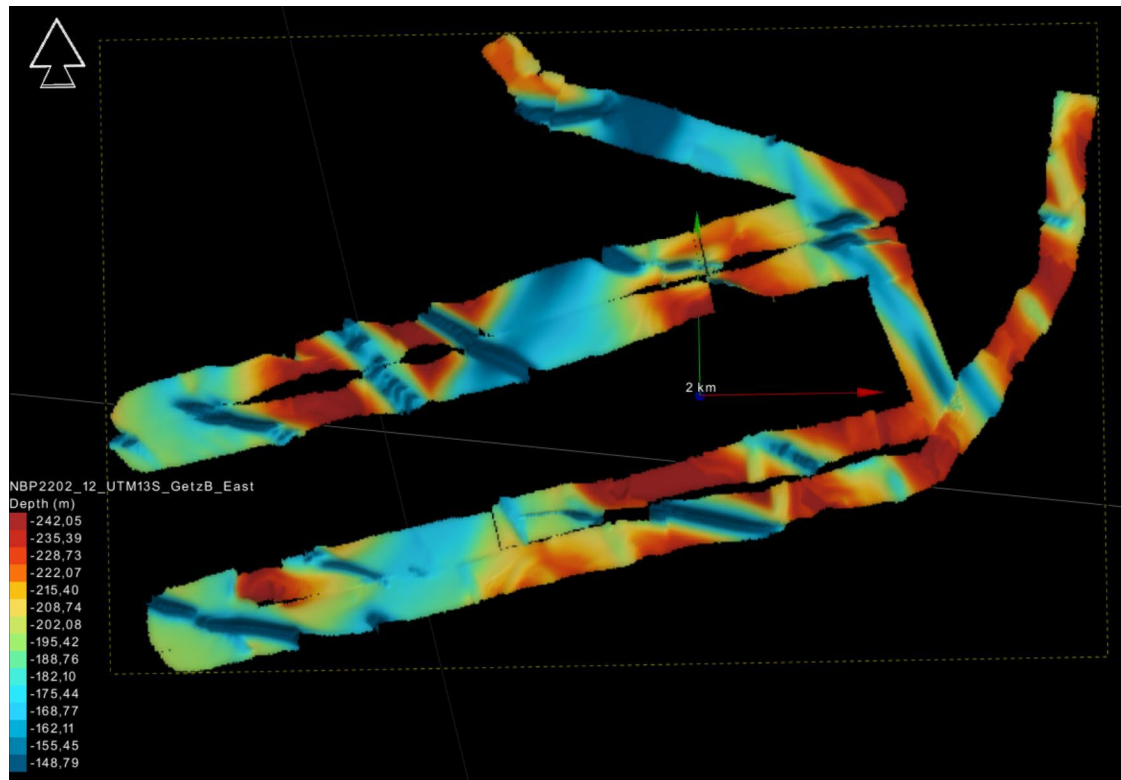


Figure 14: mission12-GetzB-East-icedraft-UL-MBES

3.2 Mission 13 - Getz B West (DL MBES)

- **N.B. Multibeam (set to 400 kHz) and SSH sidescan interfered with one another**
- Surveying a valley at Getz B west with a potential hydrothermal vent
- Altitude: 30 m
- Mission duration: ~ 8 h
- Mission start time: 2022.02.19 01:46:20
- Mission end time: 2022.02.19 09:55:52
- Useful SSH: 0006-0057 (confidential during 2022 due to geological findings)

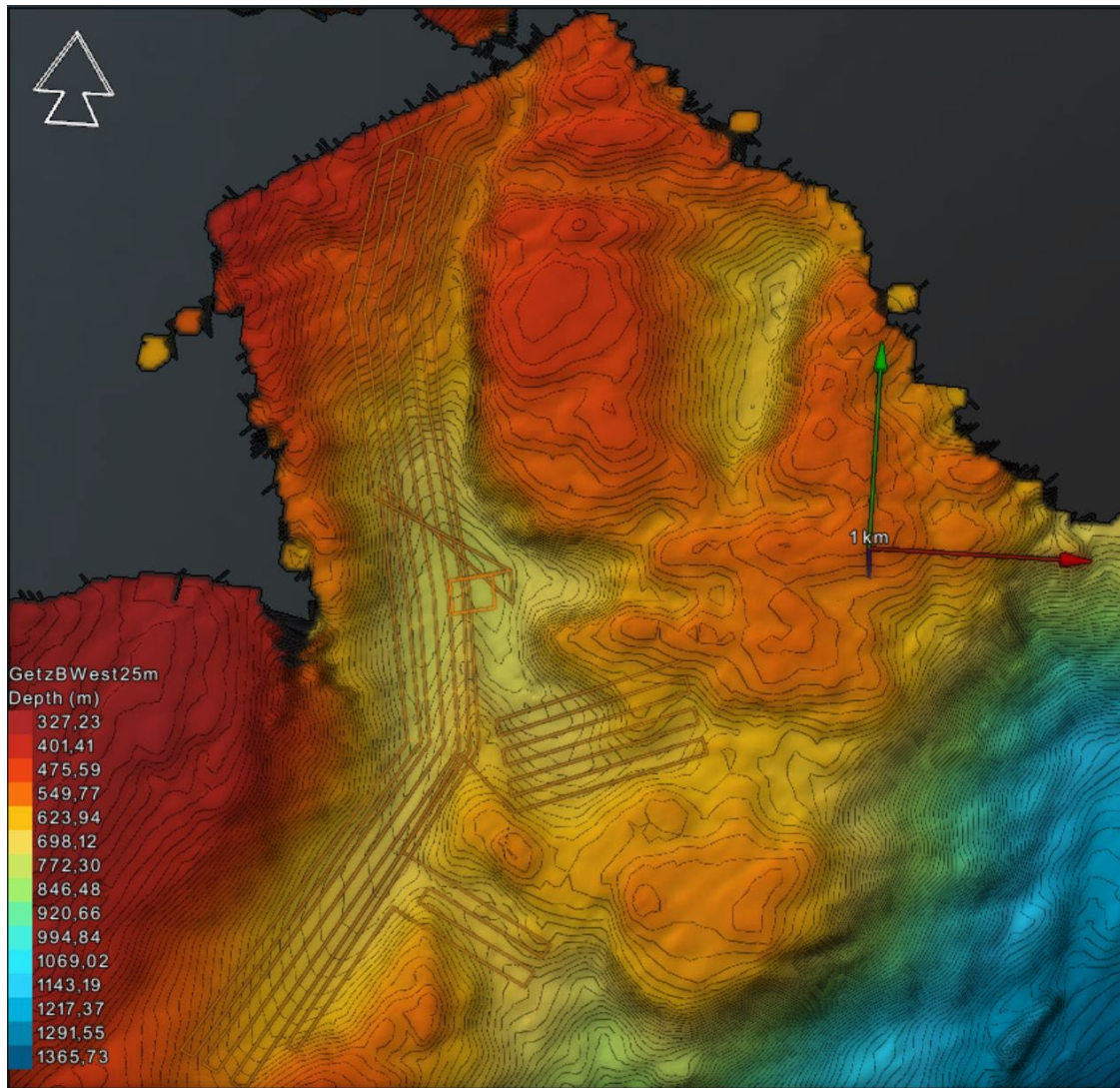


Figure 15: mission13-GetzBWest