RR2106 AUV *Sentry* side-scan sonar mapping and sonar data processing report

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Overview

AUV Sentry mapping surveys were conducted within 4 study areas, south of the GOFAR fracture zone and the other 3 chosen to roughly correspond to 3rd order segments of the SEPR 16.5°-18°S. Side-scan was collected with an Edgetech Trifreqency, using 540 khz for high-frequency on all dives and either 230 Khz or 120 Khz low-frequency as specified below.

Sentry mapping operations were conducted on 4 ridge axis segments, and the organization of the sonar data from all the dives has been structured by segment as follows:

1. SEPR segment south of GOFAR fracture zone: 5°S (first known surveys conducted here)
2. SEPR Segment 01: 16.5-17°S
3. SEPR Segment 02: 17-17.5°S (previously designated as Spike segment; cf. Wright et al. 2002)
4. SEPR Segment 03: 17.5-18°S (previously designated as the Stealth segment; cf. Wright et al. 2002)

Summary maps are presented to connect the regional ridge axis structure to the detailed Sentry sonar mapping. Following these summary maps, explanations of the data collection and processing from each dive are given as well as maps of each dataset.

The following 6 figures (SM1-6) are the overview maps of the 4 detailed study segments. The 5°S segment and the 16.5-17°S segment are each shown using one map as there were no Sentry operations in the segments outside the map extents. 17°S and 17.5°S are shown using 2 overlapping maps each to capture the full extent of operations. Black text with arrows indicates the latitudes of on-axis water sampling "Super Stations" during RR2106 or sites of multiple hydrocasts including a hydrothermal rosette, trace-metal clean rosette and radium pumps. Further information about the water sampling can be found in the RR2106 Plume Raiders cruise report by request (resing@uw.edu).

Figure SM1 - Overview map of the 5°S study area and associated Sentry dive 597.

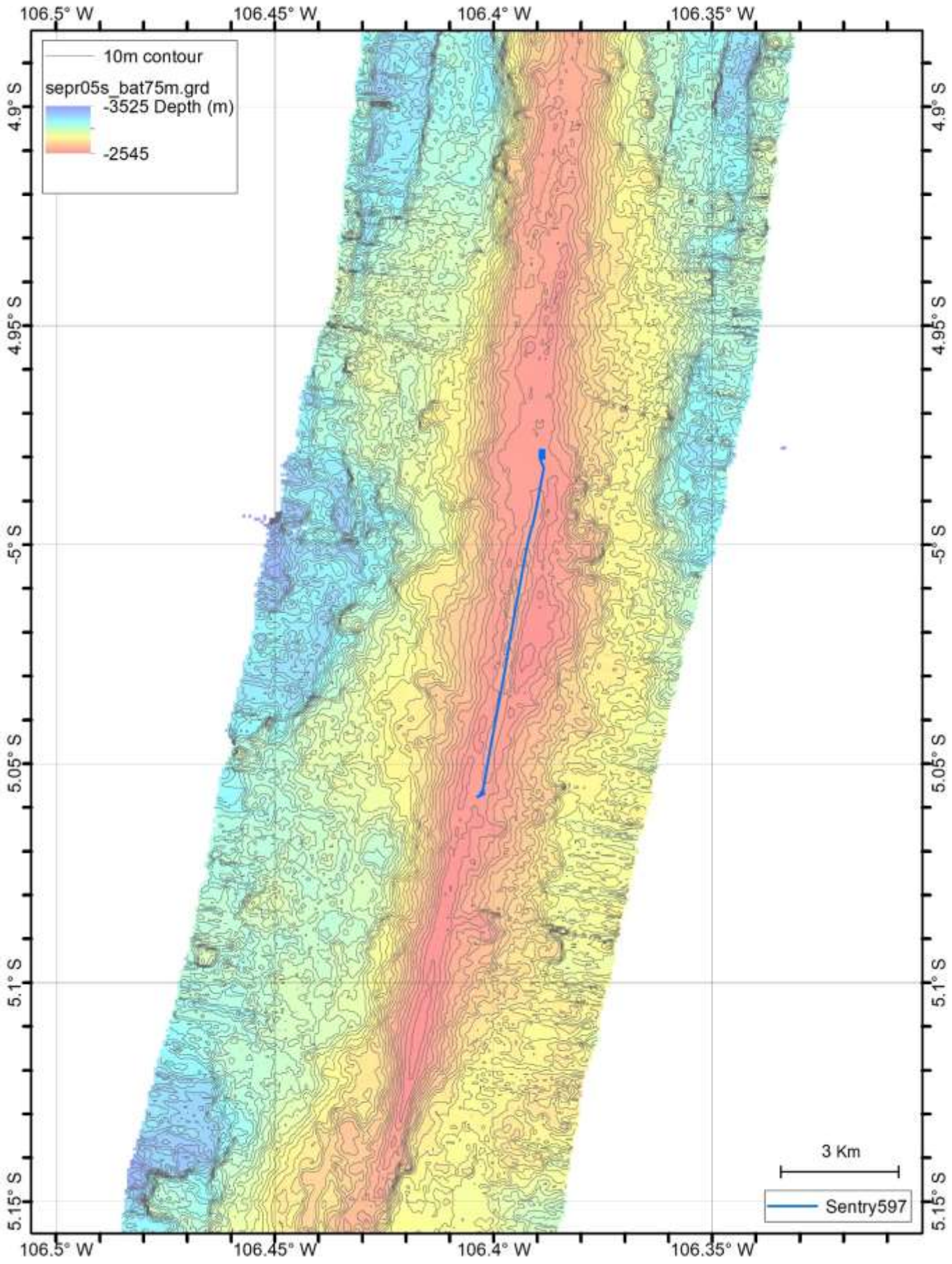


Figure SM2 – Overview map of the 16.5-17ºS segment of the SEPR and associated sentry dive 598. Black text and arrows indicate RR2106 water sampling Super Stations where hydrothermal flow was detected.

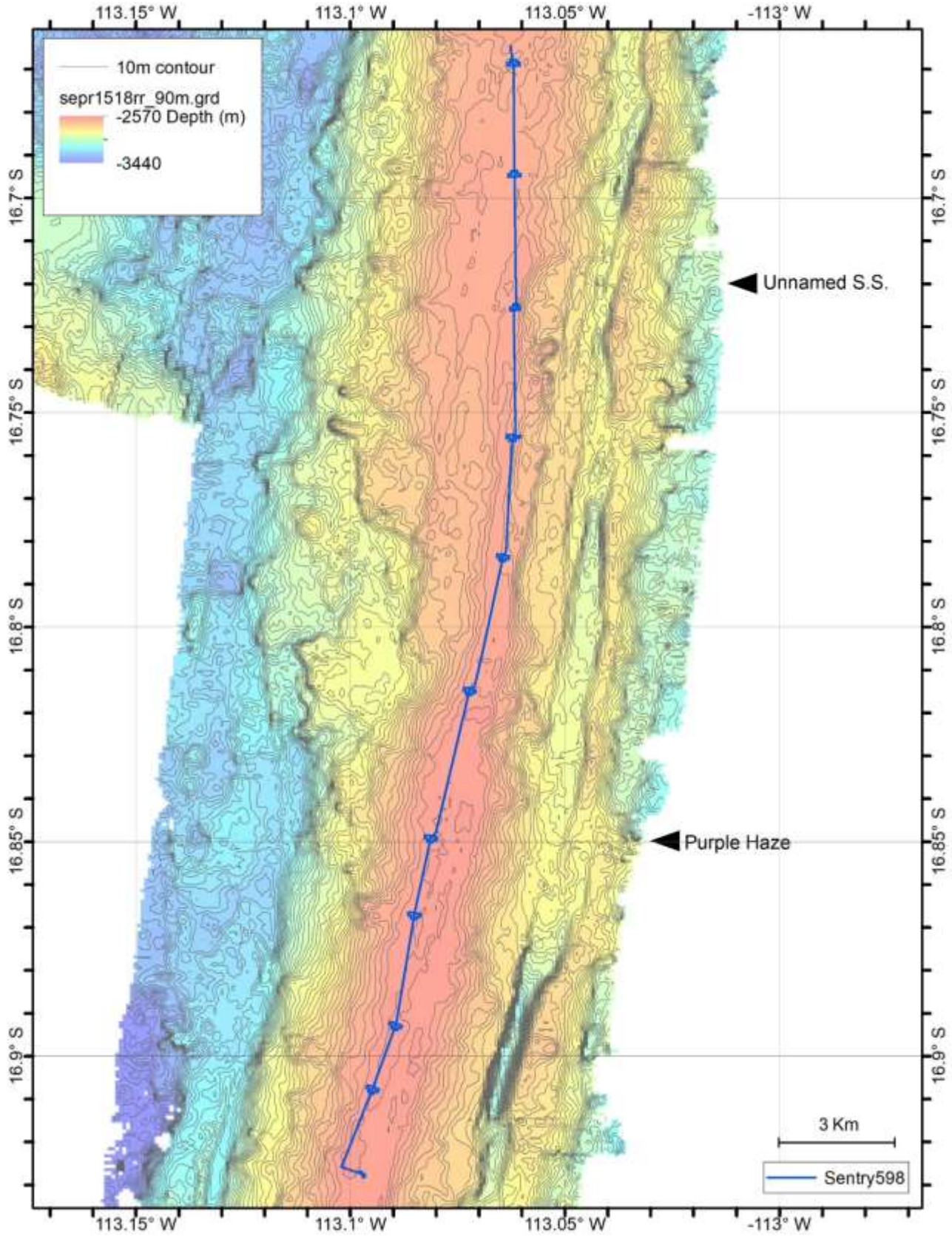


Figure SM3 - Overview map (1/2) of the north part of 17-17.5ºS segment of the SEPR and associated sentry dives. Black text and arrows indicate RR2106 Super Stations.

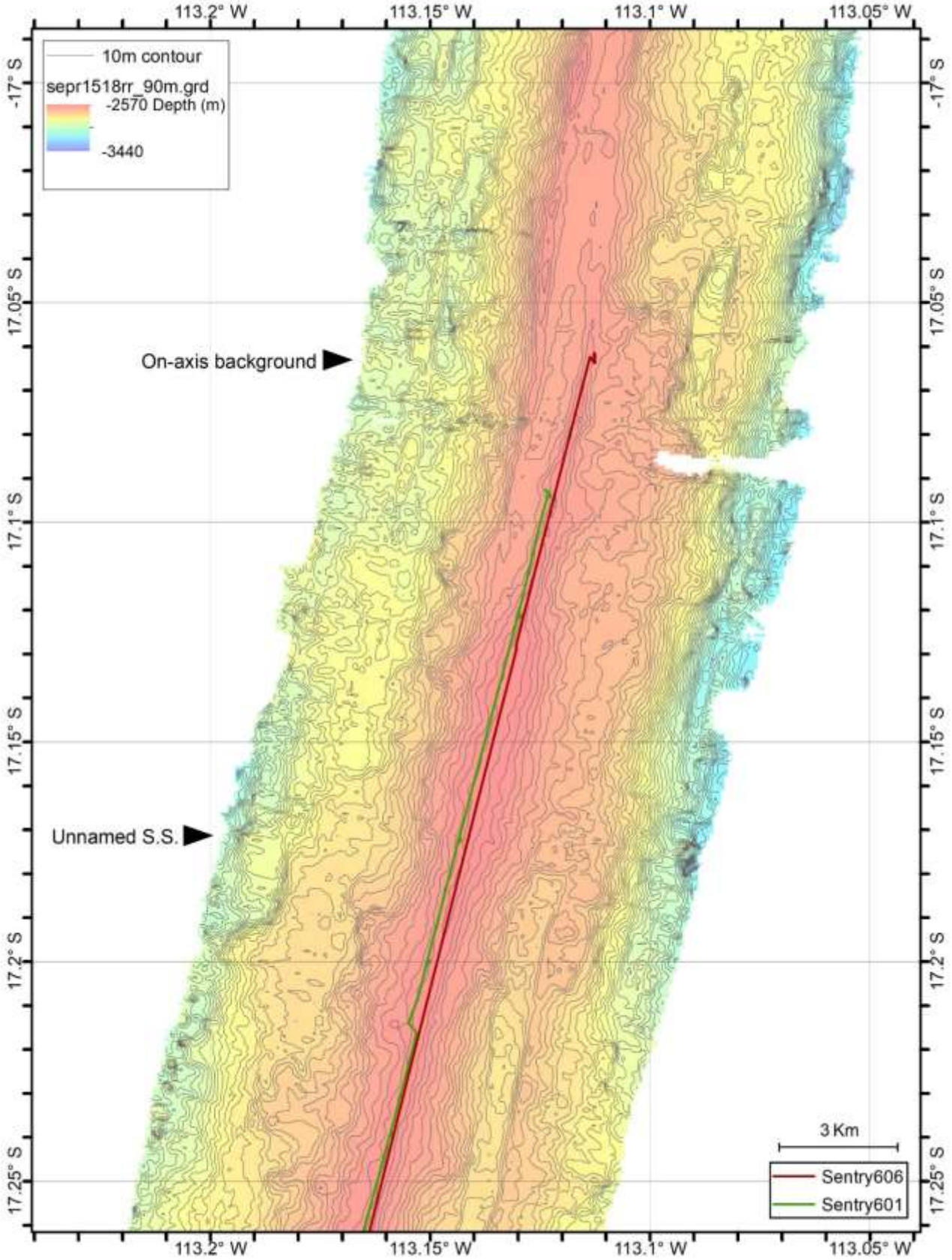


Figure SM4 - Overview map (2/2) of the south part of 17-17.5ºS segment of the SEPR and associated sentry dives. Black text and arrows indicate RR2106 Super Stations.

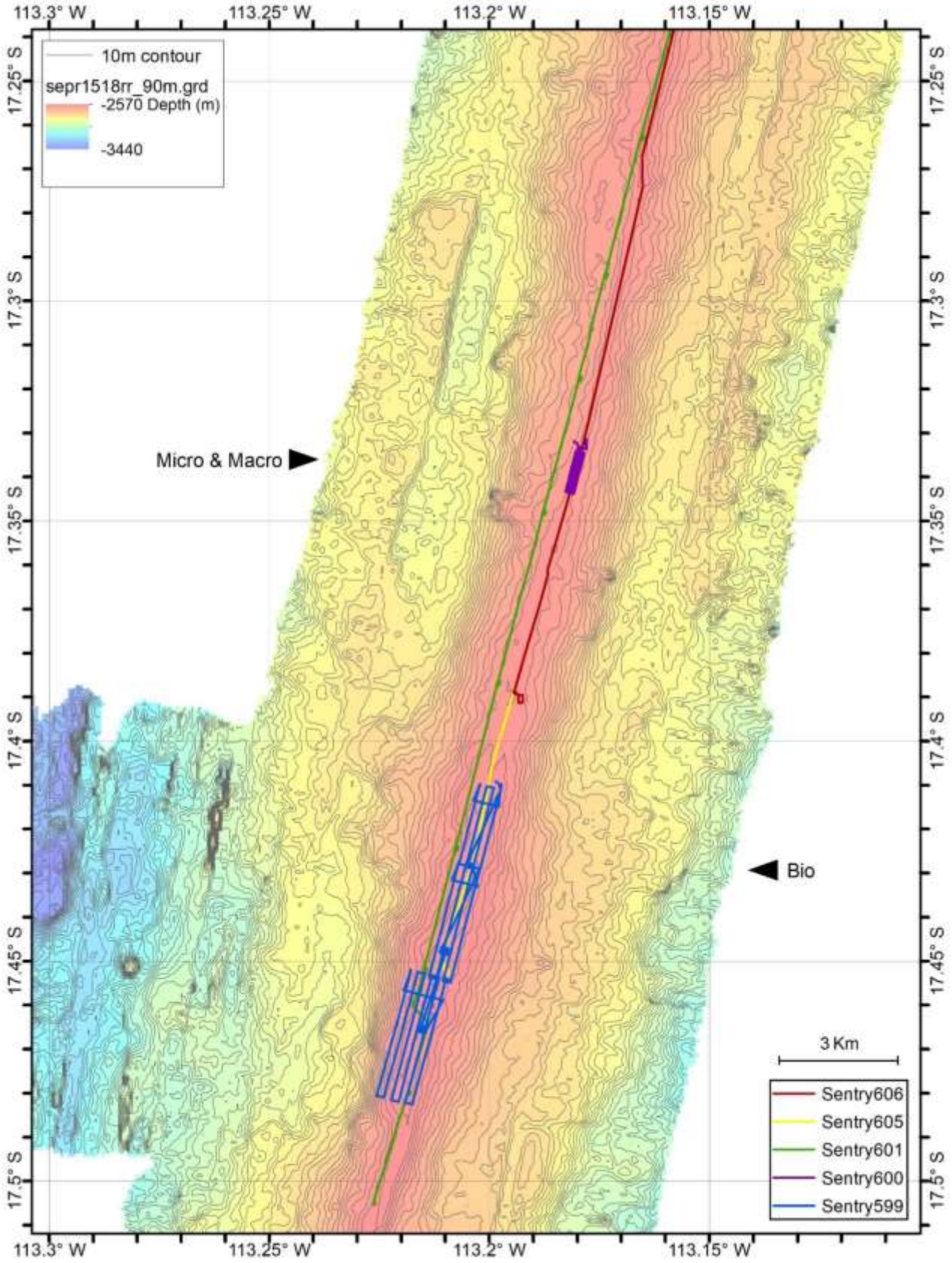


Figure SM5 - Overview map of the north part of 17.5-18ºS segment of the SEPR and associated sentry dives. Black text and arrows indicate RR2106 Super Stations

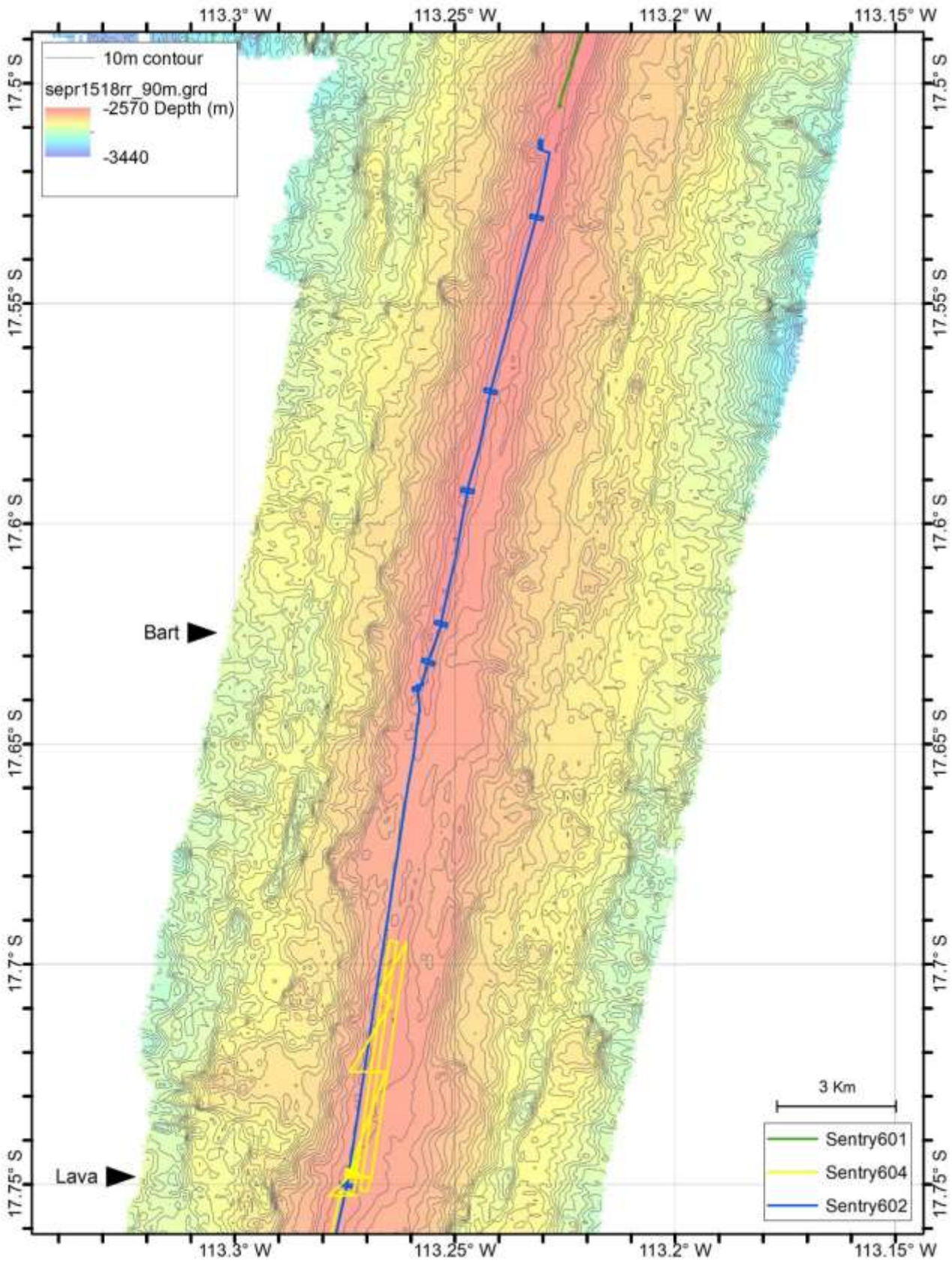
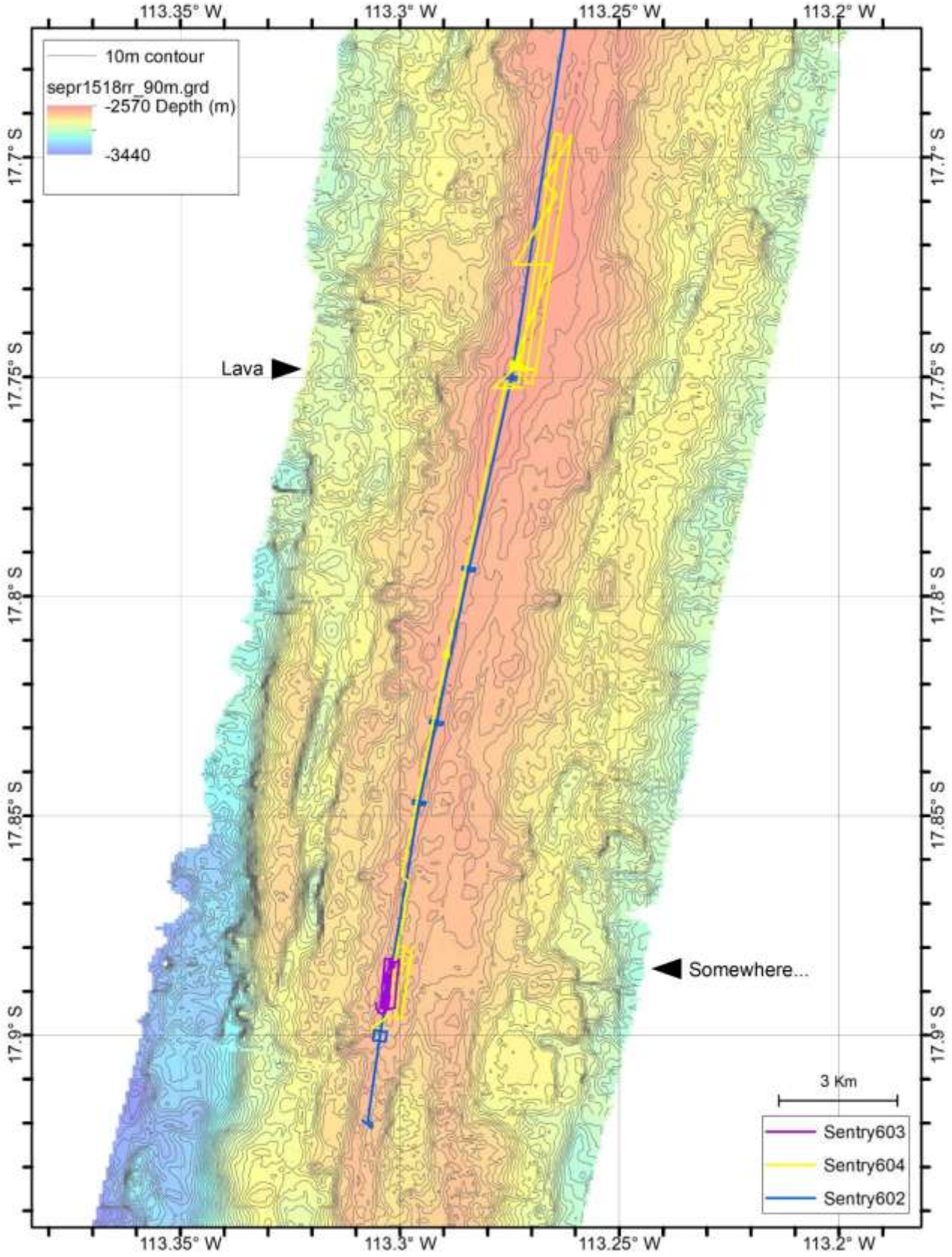


Figure SM6 - Overview map of the south part of 17.5-18ºS segment and associated sentry dives. Black text and arrows indicate RR2106 Super Stations. 90m-gridded RR2106 multibeam bathymetry ends at ~17.9S so the bottom section has been filled in with pre-existing lower resolution bathymetry.



Sentry sonar data processing

Side-scan processing

Following the dive, WHOI Sentry team merged navigation corrected from USBL with DVL in order to generate JSF files in the proc folder of the Sentry data drive. All processing of the side-scan was done using SonarWiz 7. NavInjector in SonarWiz was used to merge navigation files, each JSF was imported to a SonarWiz project for either low frequency (either 120 or 240 kHz) or high frequency (540 kHz) designated by sss-hf or sss-lf respectively. Files with turns were split and the turns were omitted from the mosaics. Files along a single straight line were then aggregated. The lines were bottom tracked. Gains were adjusted on a visual qualitative basis to attempt to equalize the backscatter across the swath and improve the uniformity of the overall mosaic by reducing line-to-line average variations in backscatter intensity. Mosaics were exported as tiled GeoTIFF files, which may be found in the UserTiles section of the SonarWiz project.

Side-scan mosaics were produced, either into multiple GEOTIFF files that can be tiled together in GIS software, or into a single GEOTIFF file. These were produced using a combination of Automatic Gain Control (AGC), Automatic Time Varying Gain (TVG), and Empirical Gain Normalization (EGN), as indicated for each dataset. Low-frequency side-scan was not processed for near-bottom photo survey boxes.

240Khz was collected during 5 of the earlier Sentry dives (597, 598, 599, 601, 602) as the low-frequency channel. A regular interference pattern is present in all 240Khz side-scan mosaics collected during this cruise, which is likely caused by interference with the 300Khz DVL on board Sentry. This led to the use of the 120Khz low-frequency sonar instead, with dive 600 and 603-606 set to 120Khz.

SEPR segment south of Gofar Transform zone: 5ºS

Sentry597

Dive Sentry597 followed a ~9km trackline along the ridge axis at the 5°S segment of the SEPR (4.980-5.055ºS, 106.385-106.405ºW). This dive was partly intended as a test for simultaneous operation of Sentry with a ship towed CTD. The specifics of these combined survey operations are discussed elsewhere in this cruise report. Sentry drove at a nominal 8m altitude and collected side-scan sonar, photographs and in-situ water column data. On this dive Sentry did collide with lava pillars on the seafloor at a few locations along the track, leading to sonar artifacts at those locations. As a result of this outcome, subsequent plume-mapping was planned at no lower than 15m altitude for obstacle avoidance while maintaining plume-sensing sensitivity for the ORP and LSS sensors. with near-bottom (~10m) runs for photo surveys in small boxes.

Low-frequency side-scan

Low-frequency (240Khz) side-scan was collected along the trackline. The resulting side-scan mosaic, made using AGC, is contained in both a single GEOTIFF file (sentry597_lf_SCI.tif) and as a collection of 3 individual tiles (sentry597_lf/*.tif) gridded at 0.33m resolution. (figure SM7)

High-frequency side-scan

High-frequency (540Khz) side-scan was collected along the trackline. The resulting side-scan mosaic, made using EGN and AGC, is contained as a collection of 3 GEOTIFF tiles gridded at 0.2m resolution (sentry597_hf/*.tif). (figure SM8)

Figure SM7 - Sentry597 low-frequency side-scan mosaic. The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. The repeated interference pattern of white patches along the swatch extent is present in all 240Khz mosaics. Darker shades are lower intensity.

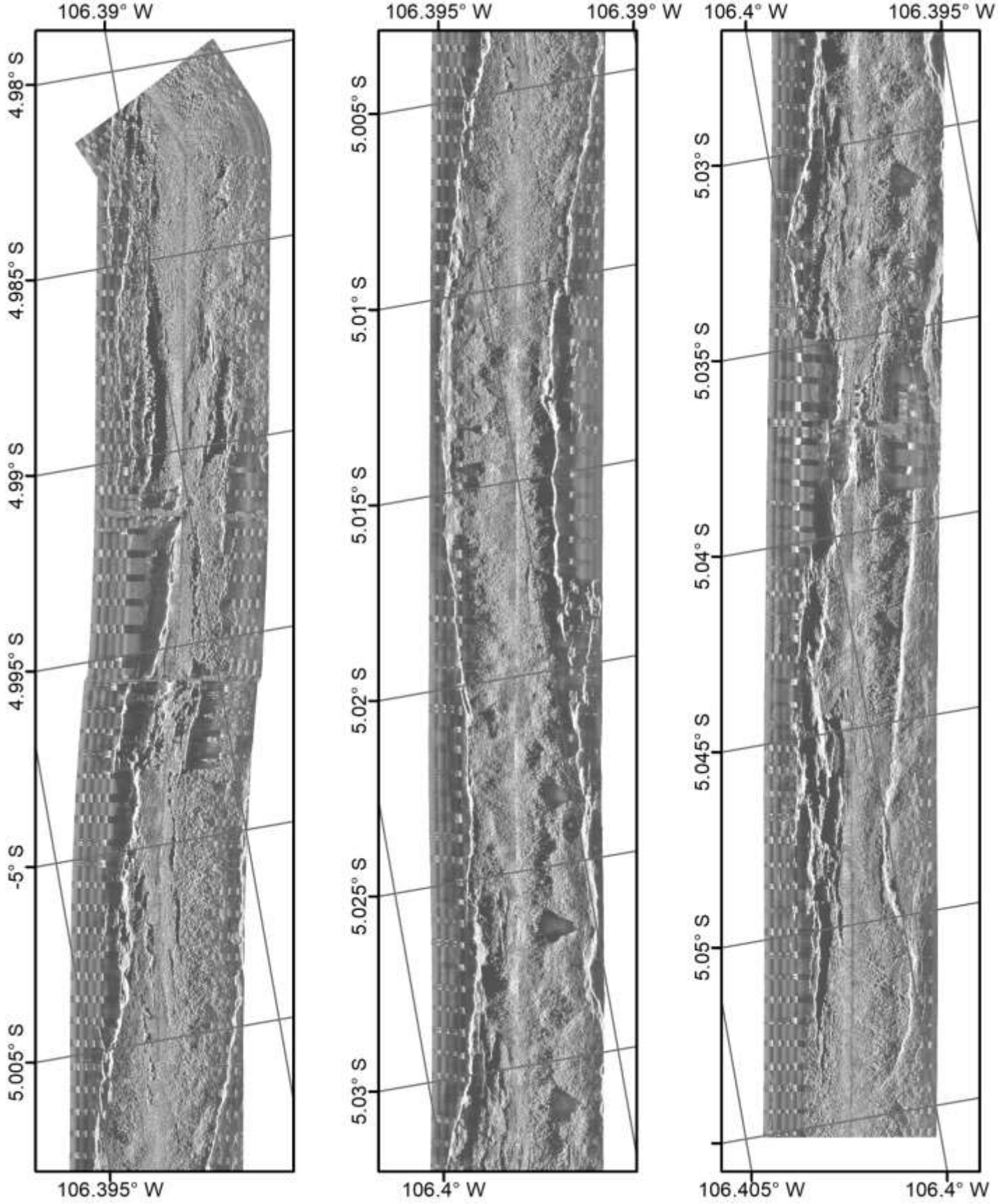
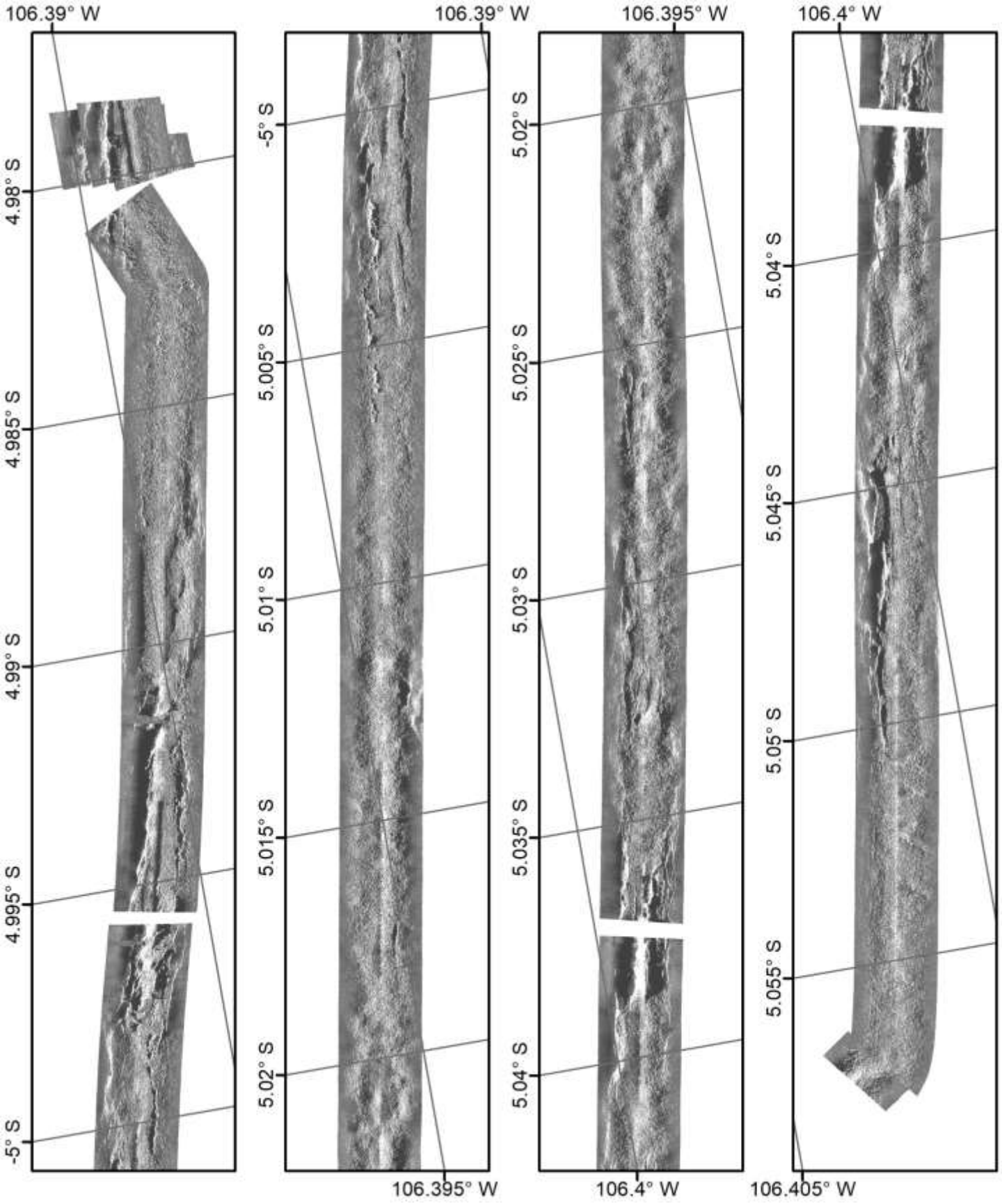


Figure SM8 - Sentry597 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. Darker shades are lower intensity.



SEPR Segment 01: 16.5-17°S

Sentry598

Dive sentry598 collected both 240Khz low-frequency and 540 khz high-frequency side-scan on a single survey line ~30km along the axial summit (16.665-16.926°S, 113.062-113.10°W). Distinct segments of sonar mapping were separated by near-bottom photo surveys.

Low-frequency side-scan

The processed 250Khz low-frequency side-scan was mosaicked using TVG +3 or +4, and is contained in 13 individual GEOTIFF tiles gridded at 0.5m resolution (sentry598-lf/*.tif). (figure SM9)

High-frequency side-scan

The 540Khz high-frequency side-scan mosaic, produced using AGC 40-36, is contained in 17 GEOTIFF tiles gridded at 0.25m resolution (sentry598-hf/UserTiles/sentry598-hf-SCI/*.tif). The plot of this mosaic below is broken up into 3 separate map plots so that the full trackline can be effectively displayed. The geographic orientations of the panels within each plot are rotated at various angles relative to the page as the orientation of the ridge axis is progressively more NE-SW as it moves southward in this area. (figures SM10-12)

Figure SM9 - Sentry598 low-frequency side-scan mosaic Darker shades are lower intensity.

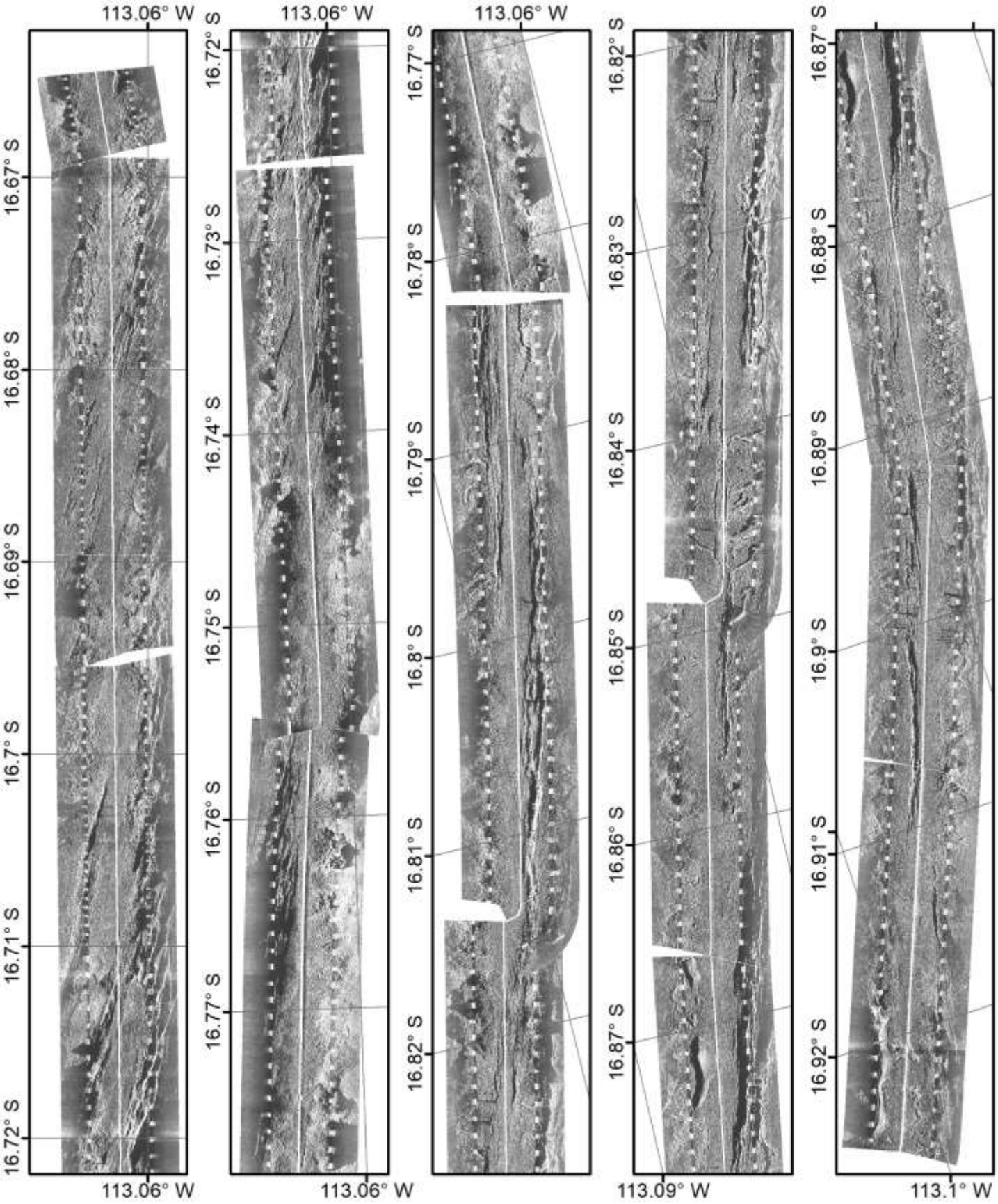


Figure SM10 - Sentry598 high-frequency side-scan mosaic. (plot 1/3) Darker shades are lower intensity.

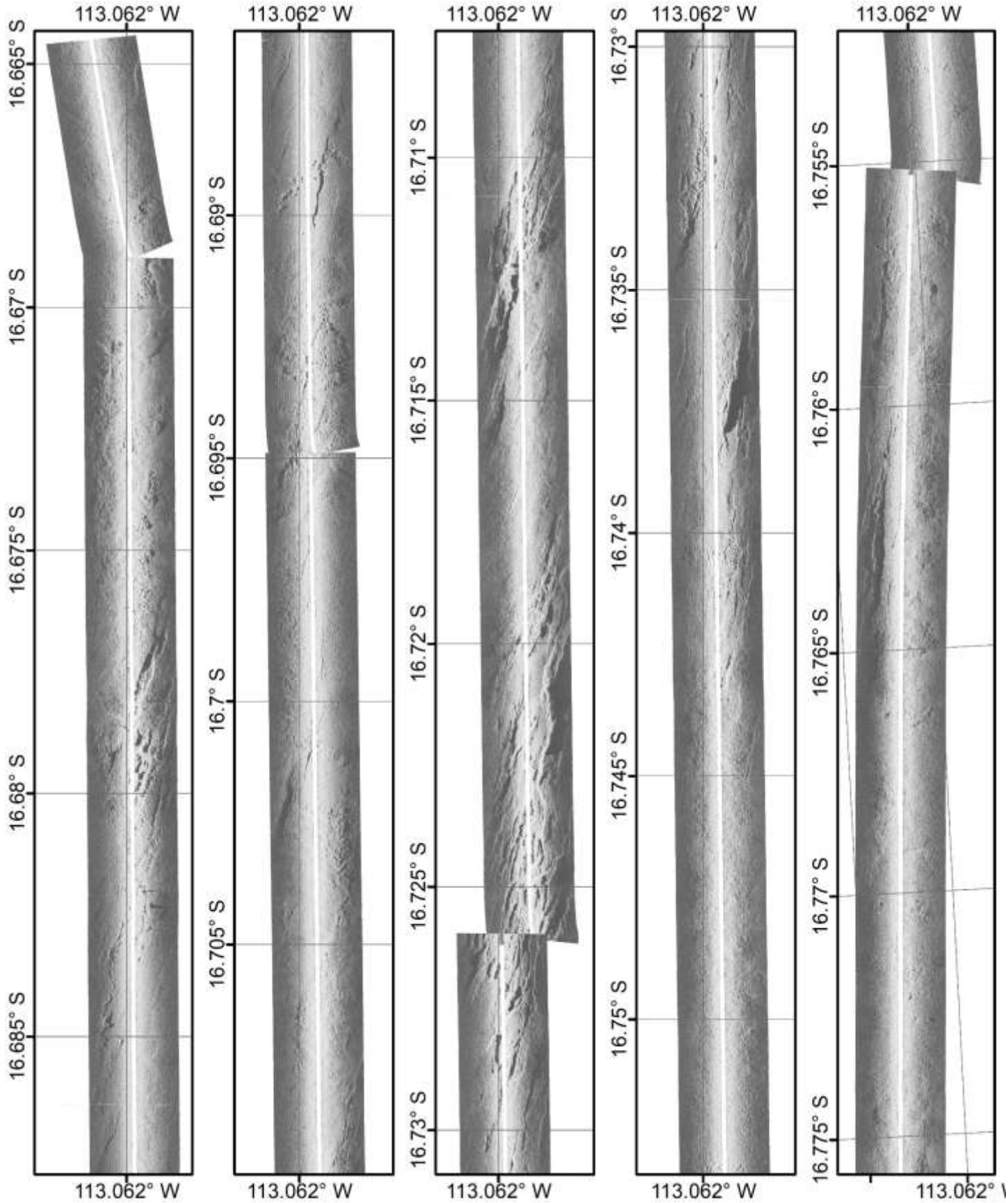


Figure SM11 - Sentry598 high-frequency side-scan mosaic. (plot 2/3) Darker shades are lower intensity.

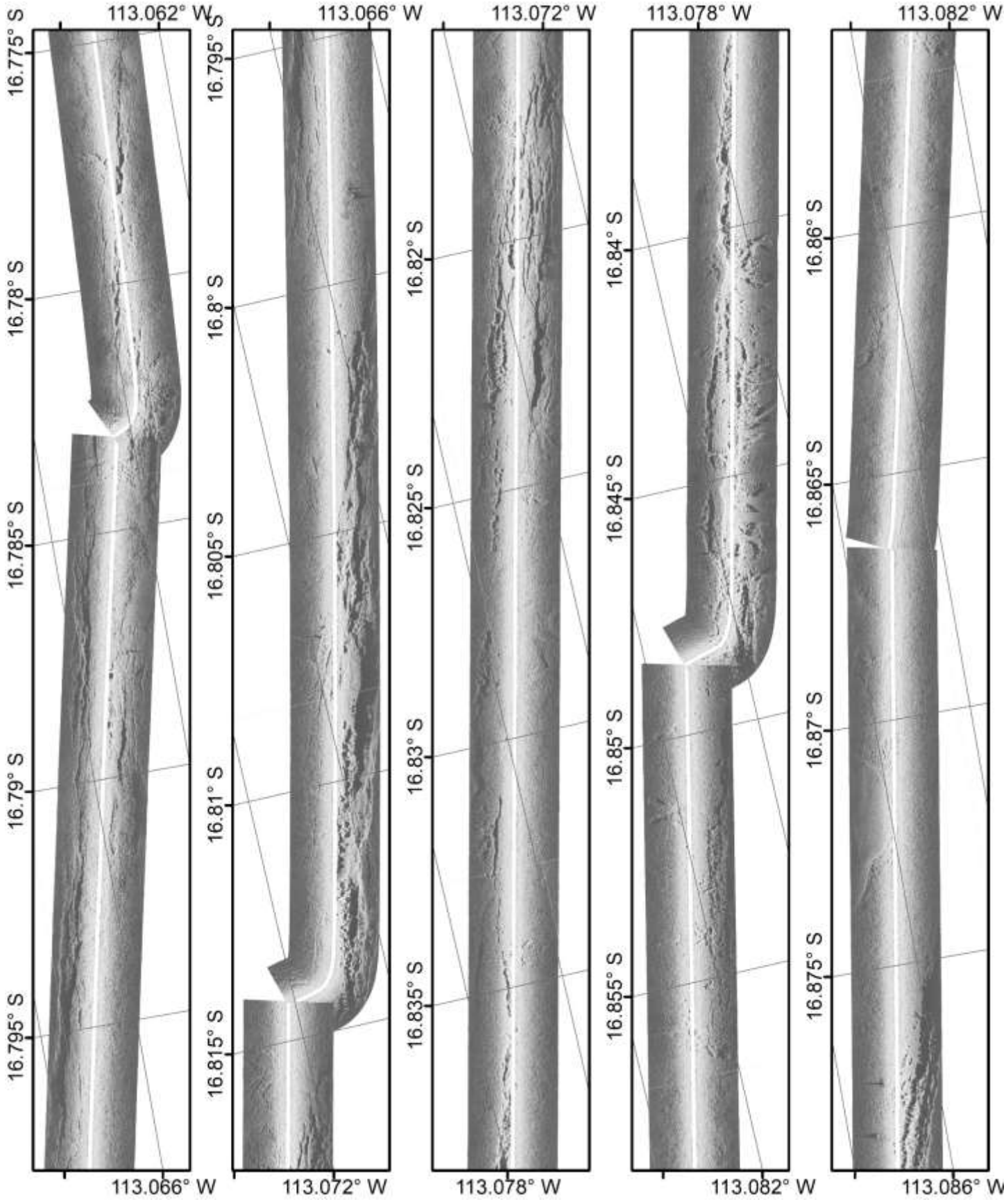
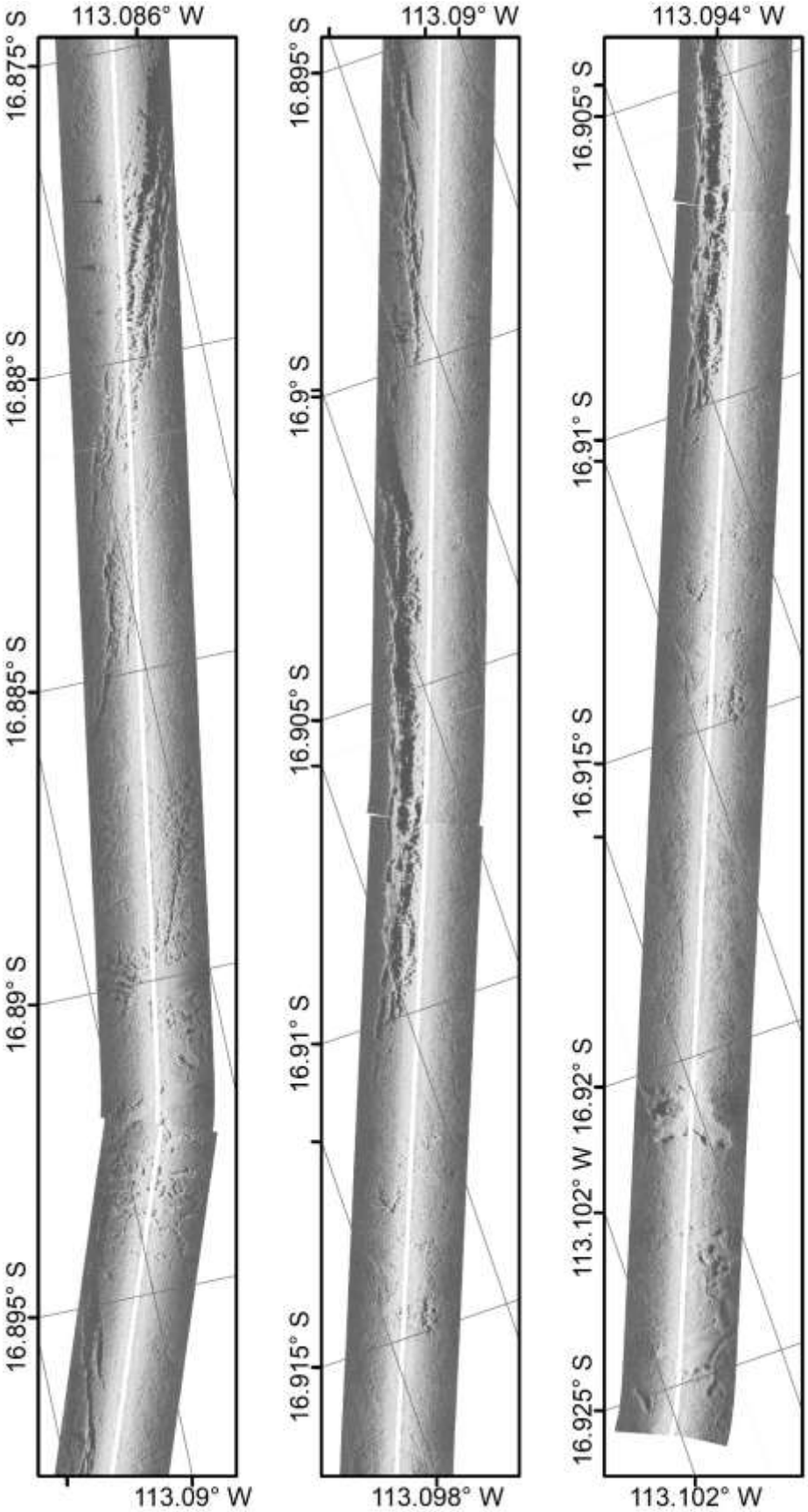


Figure SM12 - Sentry598 high-frequency side-scan mosaic. (plot 3/3)
Darker shades are lower intensity.



SEPR Segment 02: 17°-17.5°S

Sentry599

Dive sentry599 conducted 3 overlapping sonar surveys along the axial summit of the Aldo-Kihi region (17.41°-17.58°S, 113.2°-113.23°W). These were interspersed with 3 near-bottom photo boxes.

Low-frequency side-scan

Low-frequency 120 Khz side-scan was collected coincidently with the multibeam along the same survey trackline. The processed side-scan data is broken into 2 mosaics: West-looking and East-looking (figures SM14, SM15). Each of these mosaics consists of 3 separate GEOTIFF tiles gridded at 0.7m resolution.

Files: sentry599-lf/

East look: sentry599-lf-NAldo_Elook.itf, sentry599-lf-SAldo-Elook.itf, sentry599-lf-Kihi-Elook.itf

West look: sentry599-lf-NAldo_Wlook.itf, sentry599-lf-SAldo-Wlook.itf, sentry599-lf-Kihi-elook.itf

High-frequency side-scan

High-frequency 540Khz side-scan was also collected during the multibeam survey. However, at the altitude of the multibeam survey (65m<) the high-frequency has a wide nadir area (~45m) that is comparable to the width of the swath on each side (~70m). This leads to the resulting mosaic, produced using ACG 30-5 and TVG 10, having large empty areas within the survey extent. The resulting side-scan image is contained as 9 GEOTIFF tiles gridded at 0.25m resolution (sentry599-hf/*.tif). (figure SM16).

Figure SM13 – Side-scan backscatter intensity of Aldo Lake area. Sentry599 low-frequency (120 kHz) west-looking mosaic of overlapping swaths. Darker shades are lower intensity.

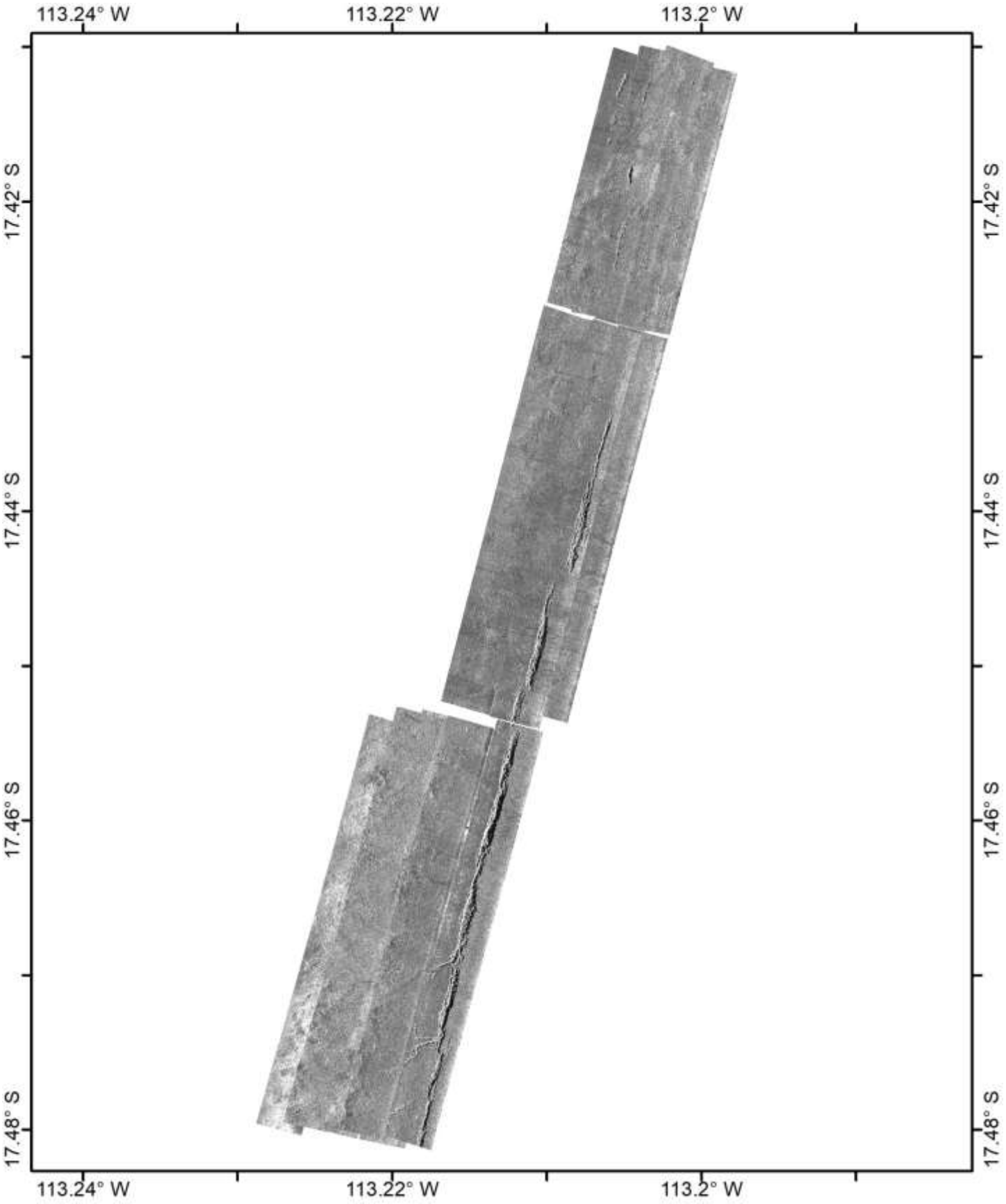


Figure SM14 - Side-scan backscatter intensity of Aldo Lake area collected at 65m alt. Sentry599 low-frequency (120 kHz) west-looking mosaic of overlapping swaths. Darker shades are lower intensity.

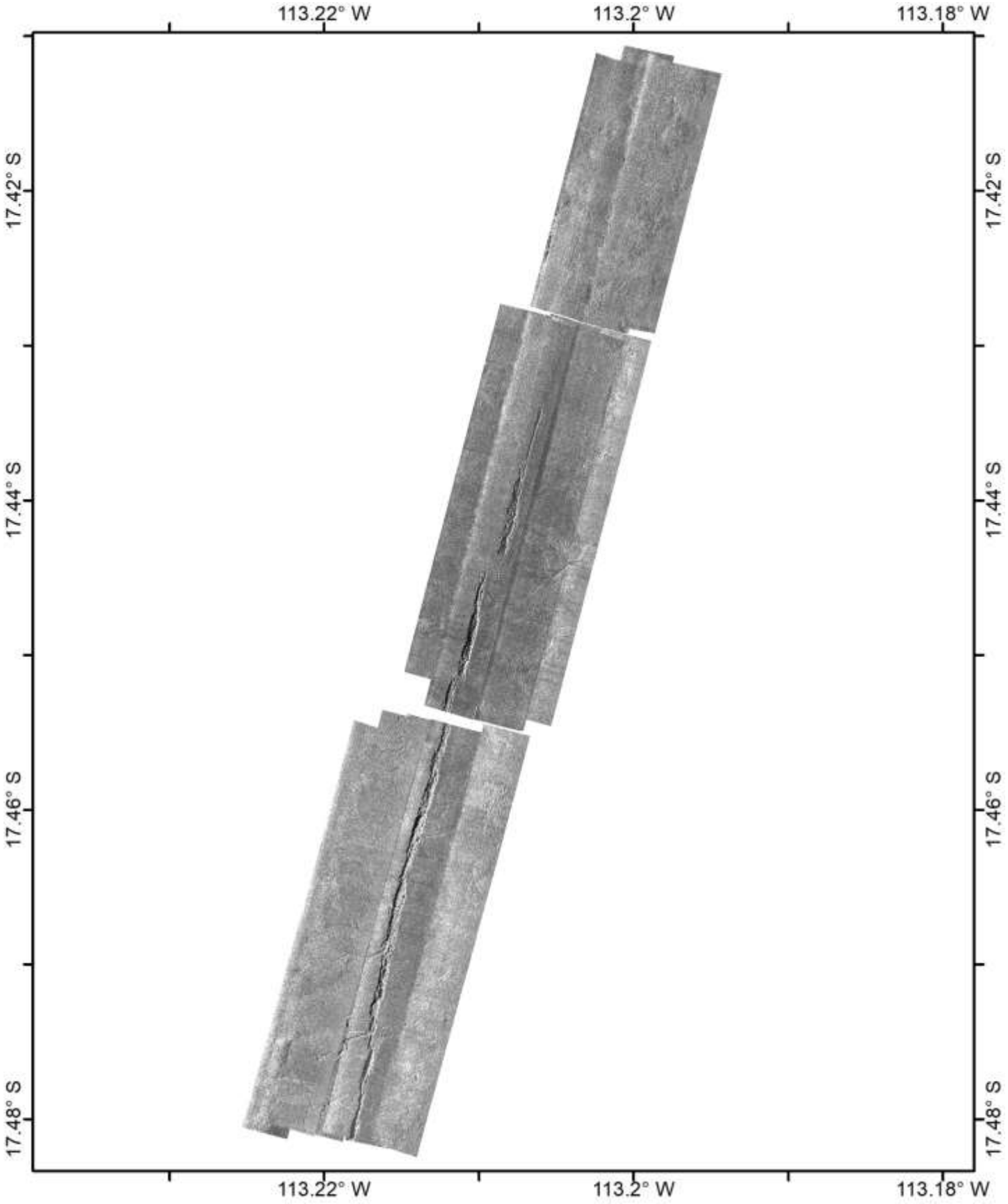
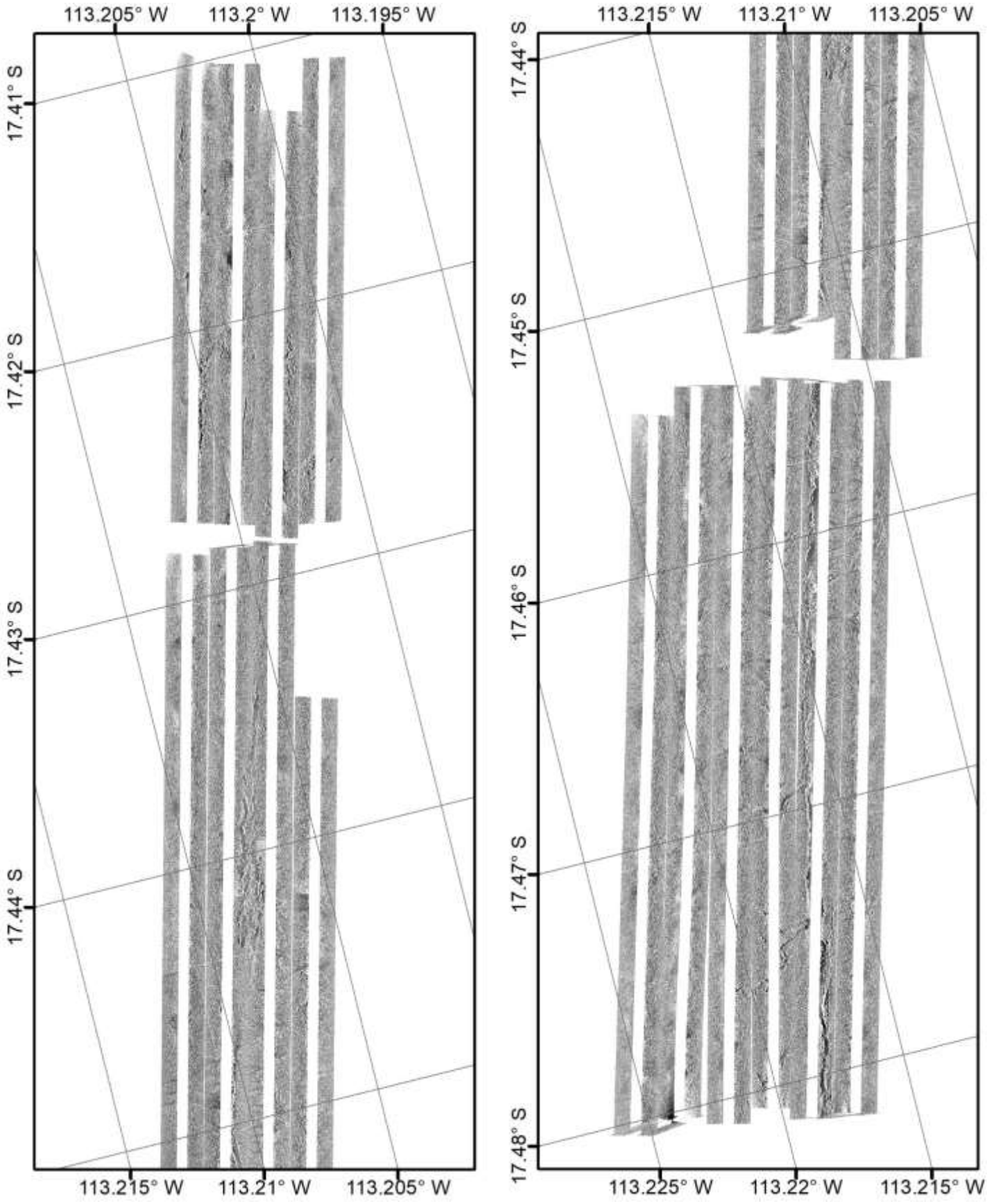


Figure SM15 - Sentry599 high-frequency side-scan mosaic. Darker shades are lower intensity.



Sentry600

Dive sentry600 consisted of 2 ~1km lines at 65m altitude for multibeam collection followed by a near-bottom photo survey at ~8-10m altitude within the same area (17.332-17.344^{o}S, 113.178-113.183^{o}W)

Low-frequency side-scan

Sentry600 collected low-frequency 120 Khz side-scan during the 2 ~1km multibeam survey lines. These have been mosaiced together into a single GEOTIFF file gridded at 0.5m resolution (sentry600-lf/sentry600-lf-sci.tif). This mosaic applied EGN and AGC 21-25. (figure SM18)

High-Frequency side-scan

After the multibeam/ low-frequency side-scan survey, sentry proceeded to a low-altitude photo survey box with repeated E-W passes in a mow-the-lawn pattern. During this survey, high-frequency 540Khz was collected. This has been broken into 2 different mosaics, created using AGC and TVG: North-looking and South-looking. Each mosaic consists of 2 GEOTIFF files gridded at 0.25m resolution. (North-look: sentry600-hf-sci-nlook/*.tif; South-look: sentry600-hf-sci-slook/*.tif). (figures SM19, SM20)

Figure SM16 - Sentry600 low-frequency (120 kHz) side-scan mosaic of the same area as Fig SM17. Darker shades are lower intensity.

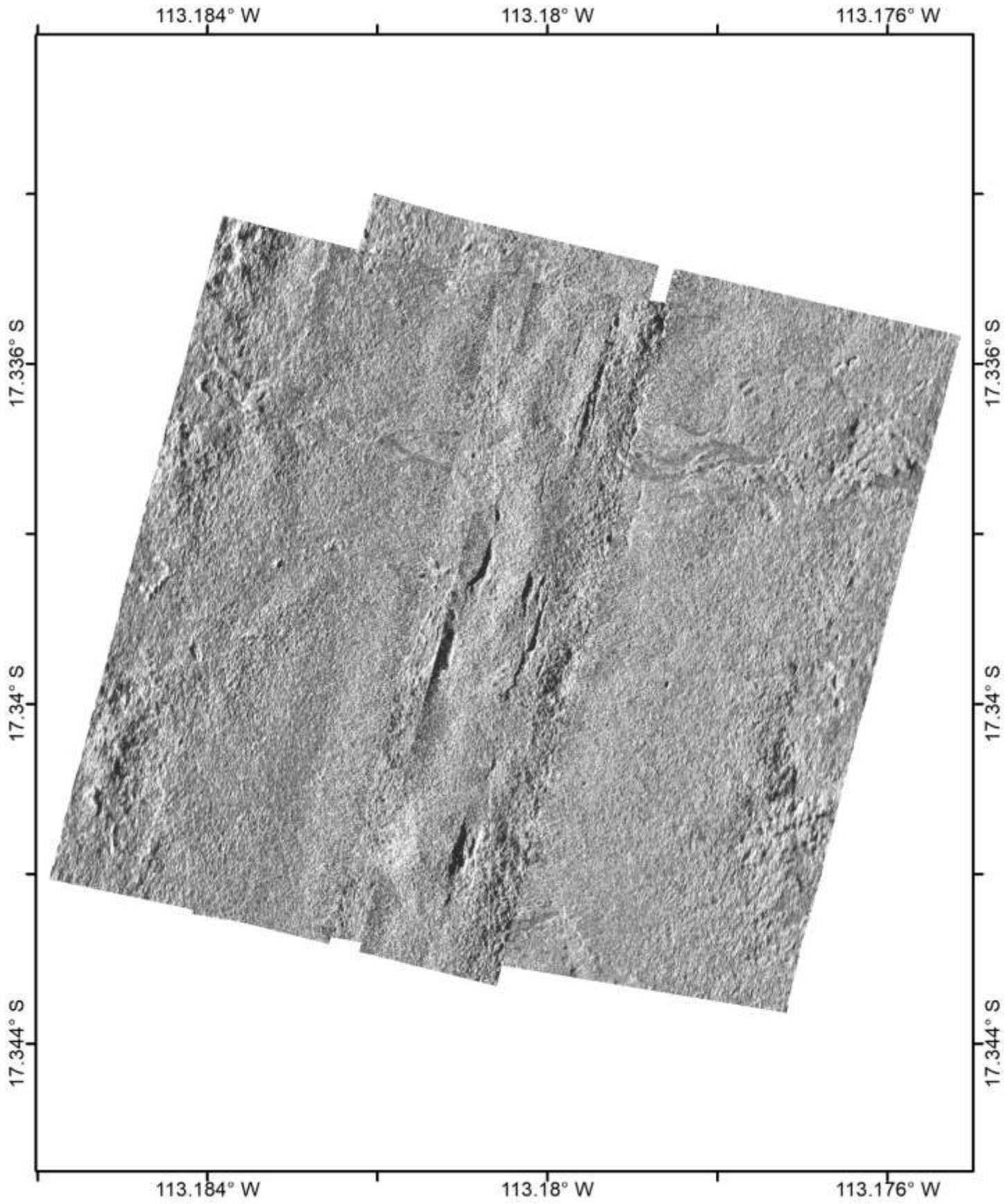


Figure SM17 - Sentry600 high-frequency side-scan mosaic (North looking). Darker shades are lower intensity.

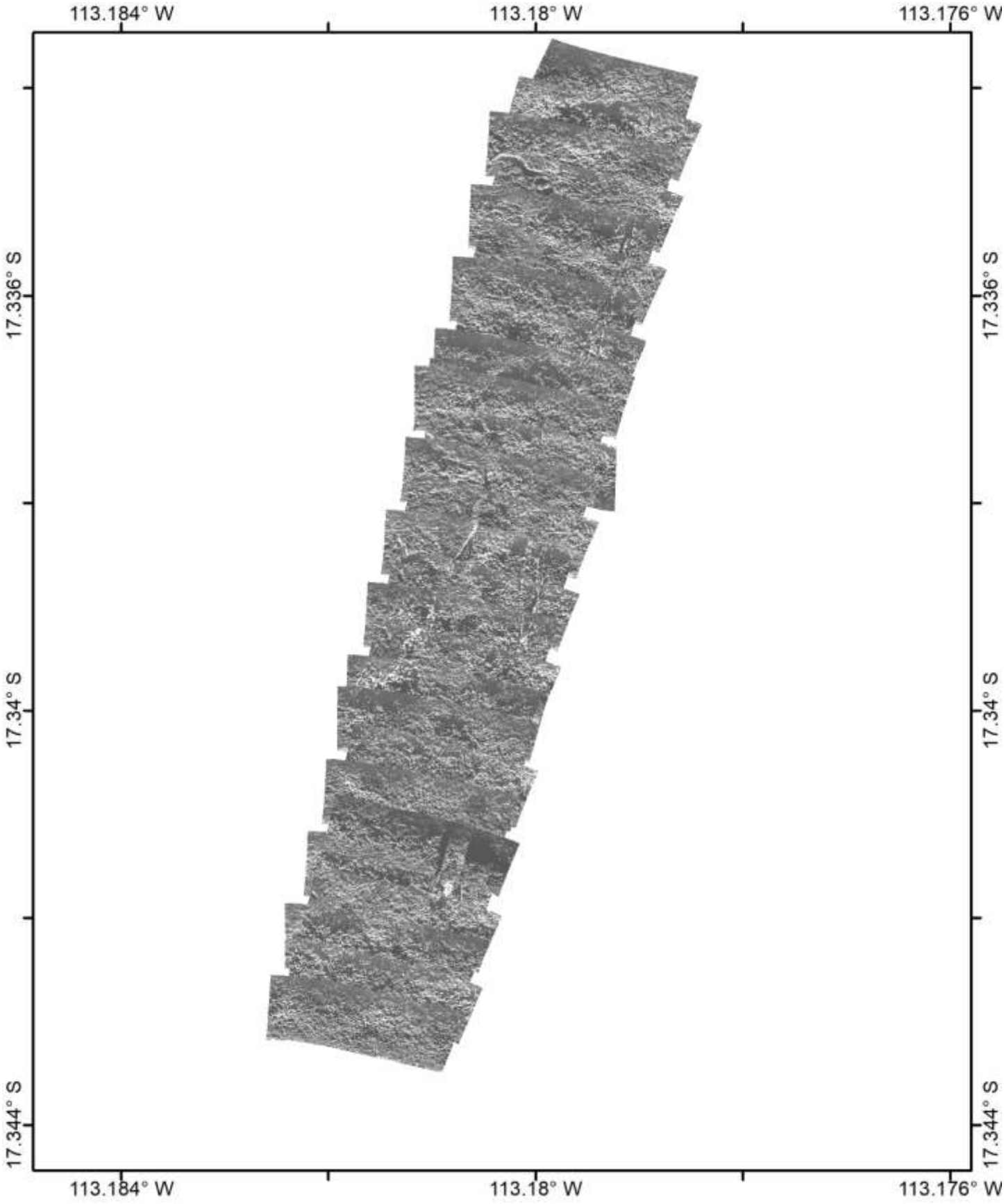
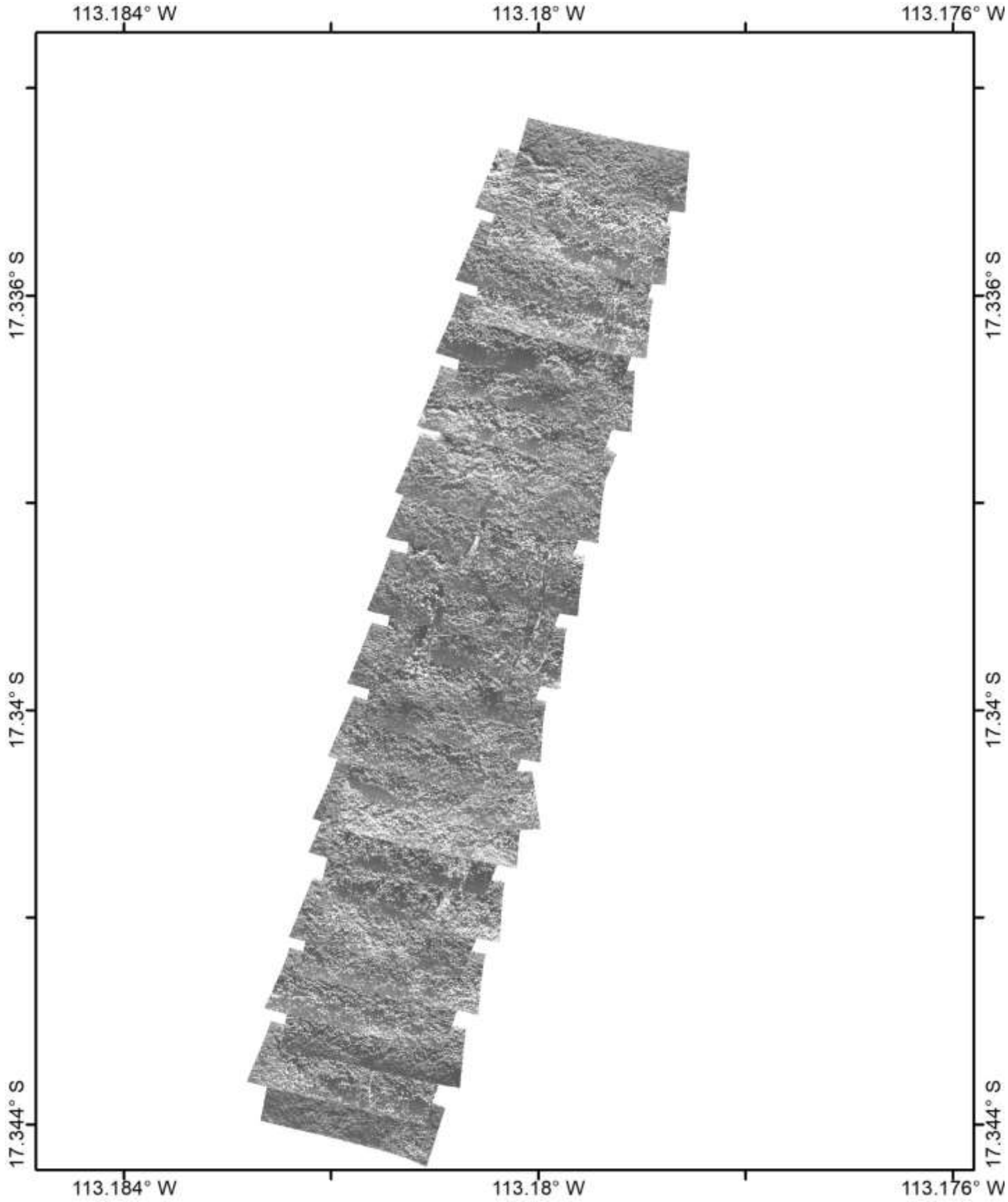


Figure SM18 - Sentry600 high-frequency side-scan mosaic (South looking). Darker shades are lower intensity.



Sentry601

Sentry601 surveyed a single line stretching ~45km along-axis (17.095-17.504°S, 113.122-113.229°W). Sentry operated at 15m altitude collecting side-scan, with small near-bottom photo runs at regular intervals along the trackline conducted at ~8m altitude.

Low-frequency side-scan

The processed 240Khz side-scan was mosaiced using AGC 18-51. The resulting mosaic is contained in 15 individual GEOTIFF tiles (sentry601_lf/*.tif). (figures SM21, SM22)

High-frequency side-scan

540Khz side-scan was collected along the trackline. The resulting mosaic, produced using EGN and AGC, is contained in 17 individual GEOTIFF tiles gridded at 0.25m resolution (sentry601-hf/*.tif). (figures SM23-26)

Both side-scan mosaics are broken up into separate map plots so that the full trackline can be effectively displayed. The geographic orientations of the panels within each plot are rotated relative to the page to account for the NE-SW orientation of the ridge axis.

Figure SM19 - Sentry601 low-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the ridge axis. (Plot 1/2). Darker shades are lower intensity.

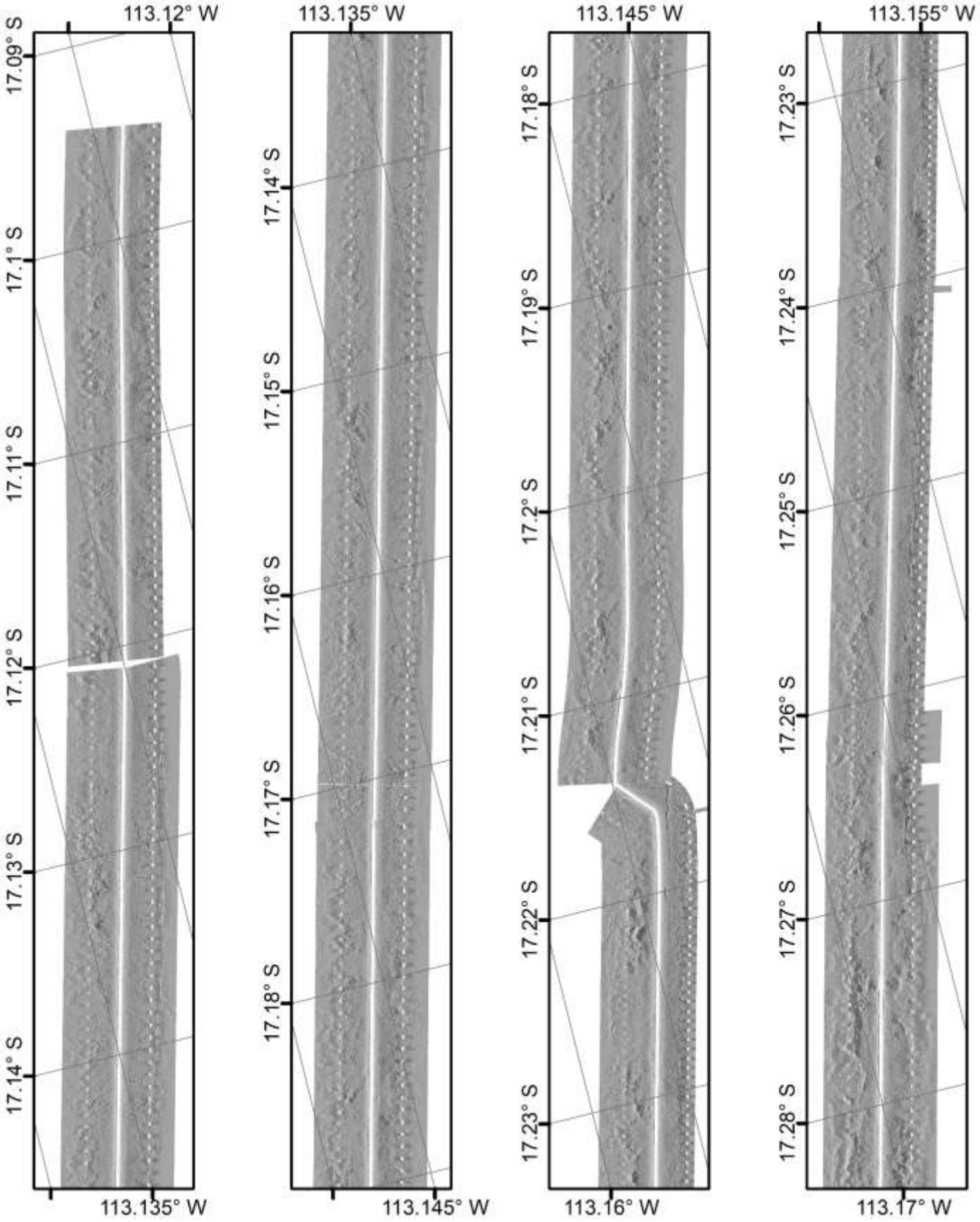


Figure SM20 - Sentry601 low-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the ridge axis. (Plot 2/2) Darker shades are lower intensity.

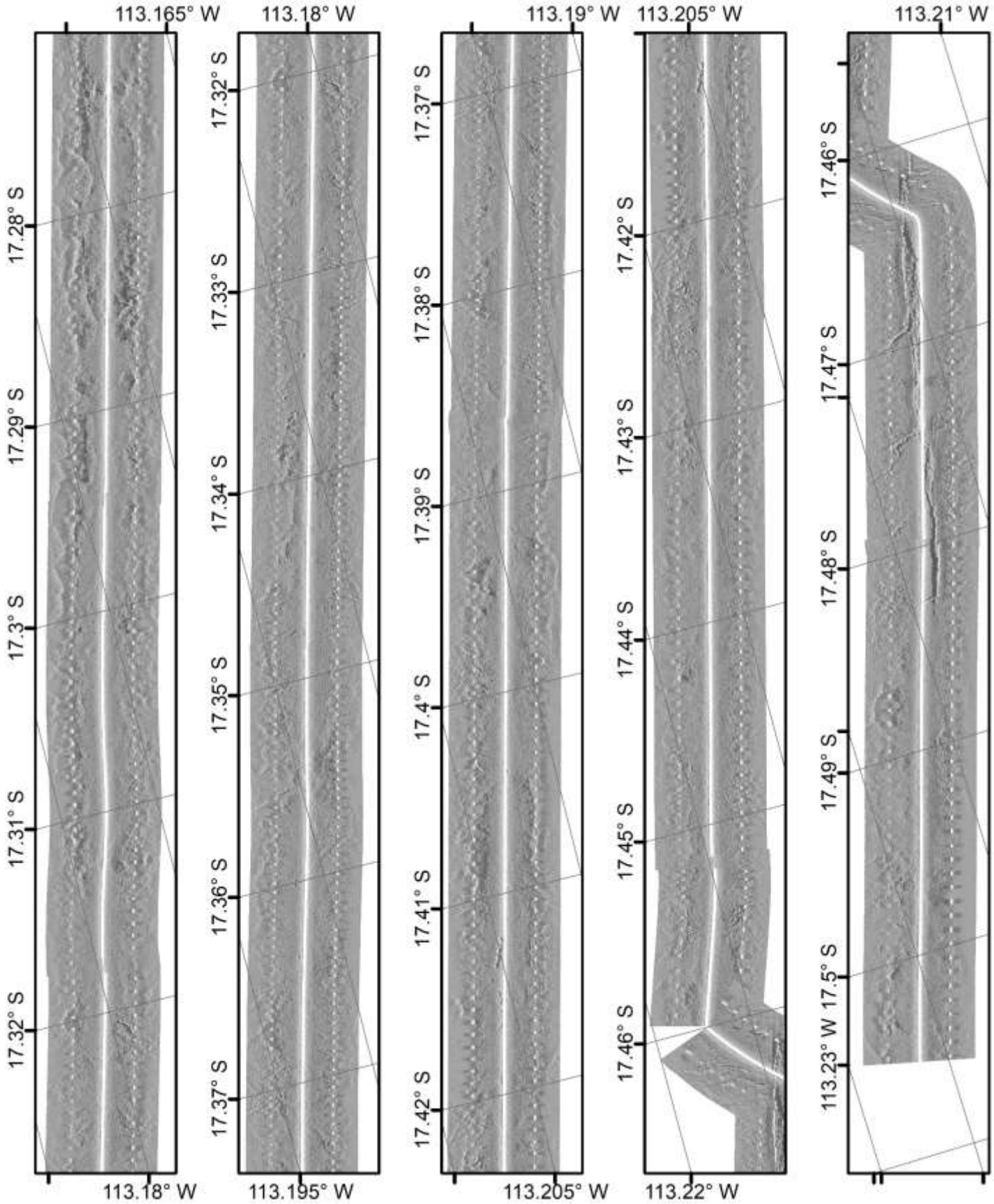


Figure SM21 – Sentry 601 high-frequency side-scan mosaic (map 1/4). The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. Darker shades are lower intensity.

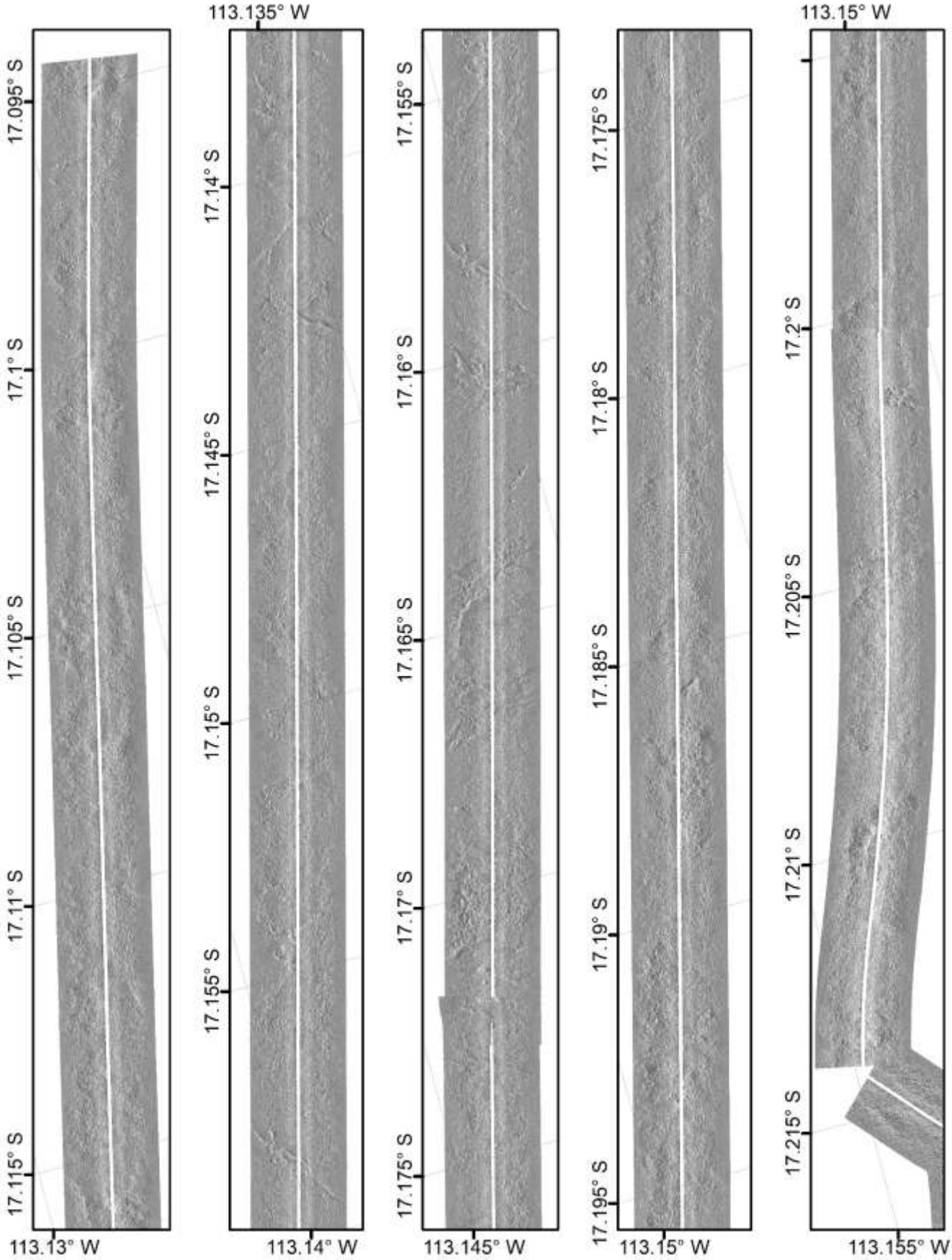


Figure SM22 - Sentry 601 high-frequency side-scan mosaic (map 2/4). The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. Darker shades are lower intensity.

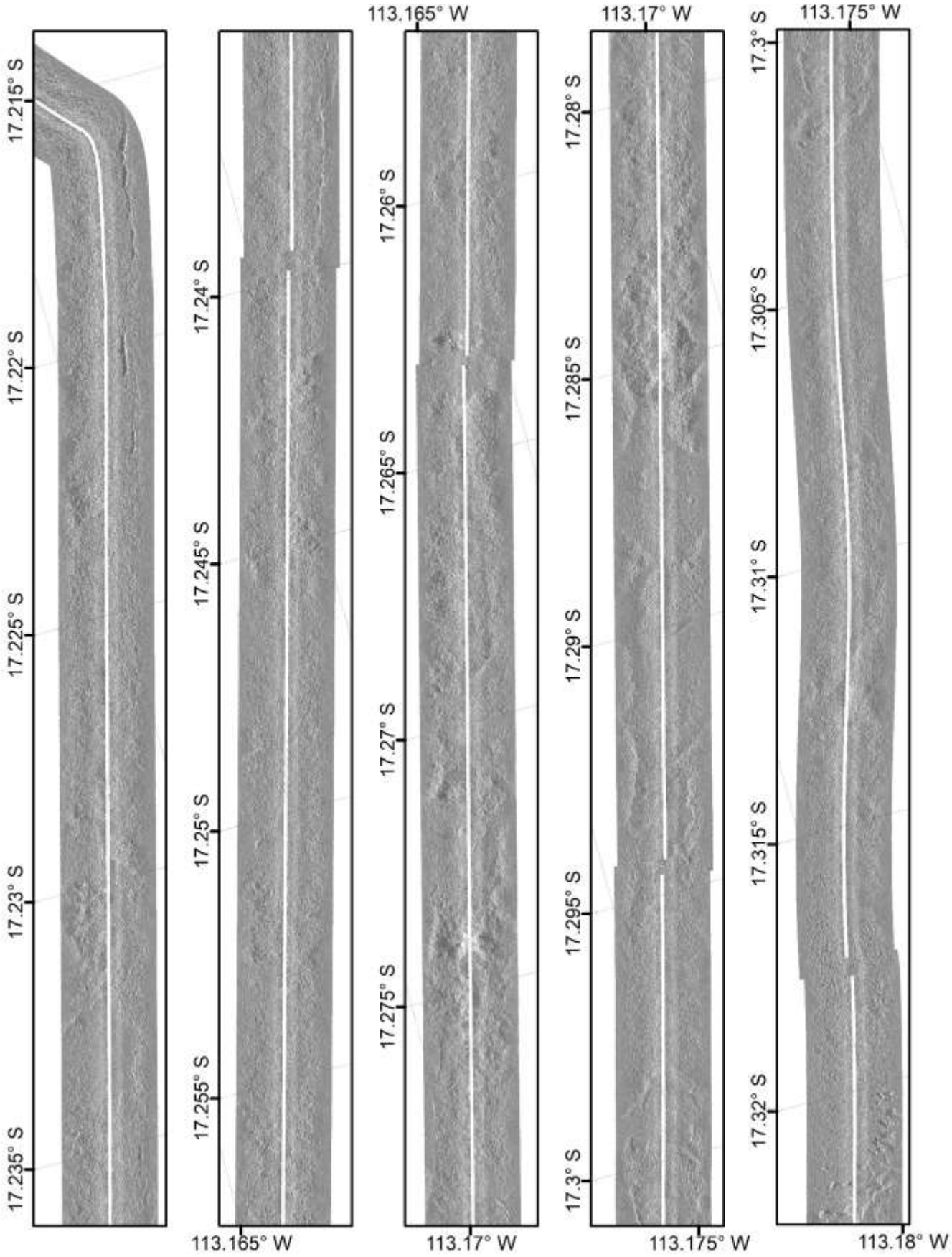


Figure SM23 - Sentry 601 high-frequency side-scan mosaic (map 3/4). The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. Darker shades are lower intensity.

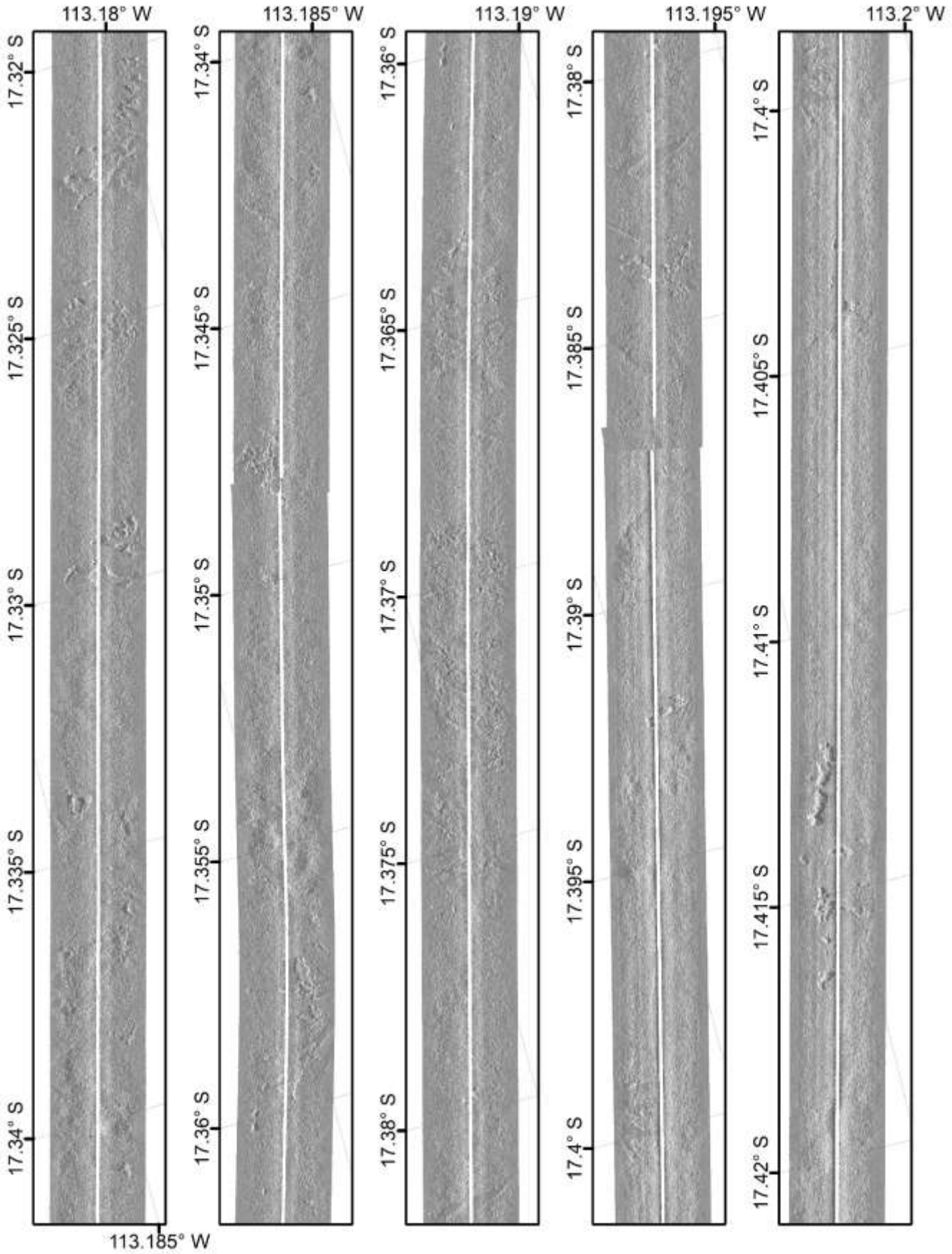
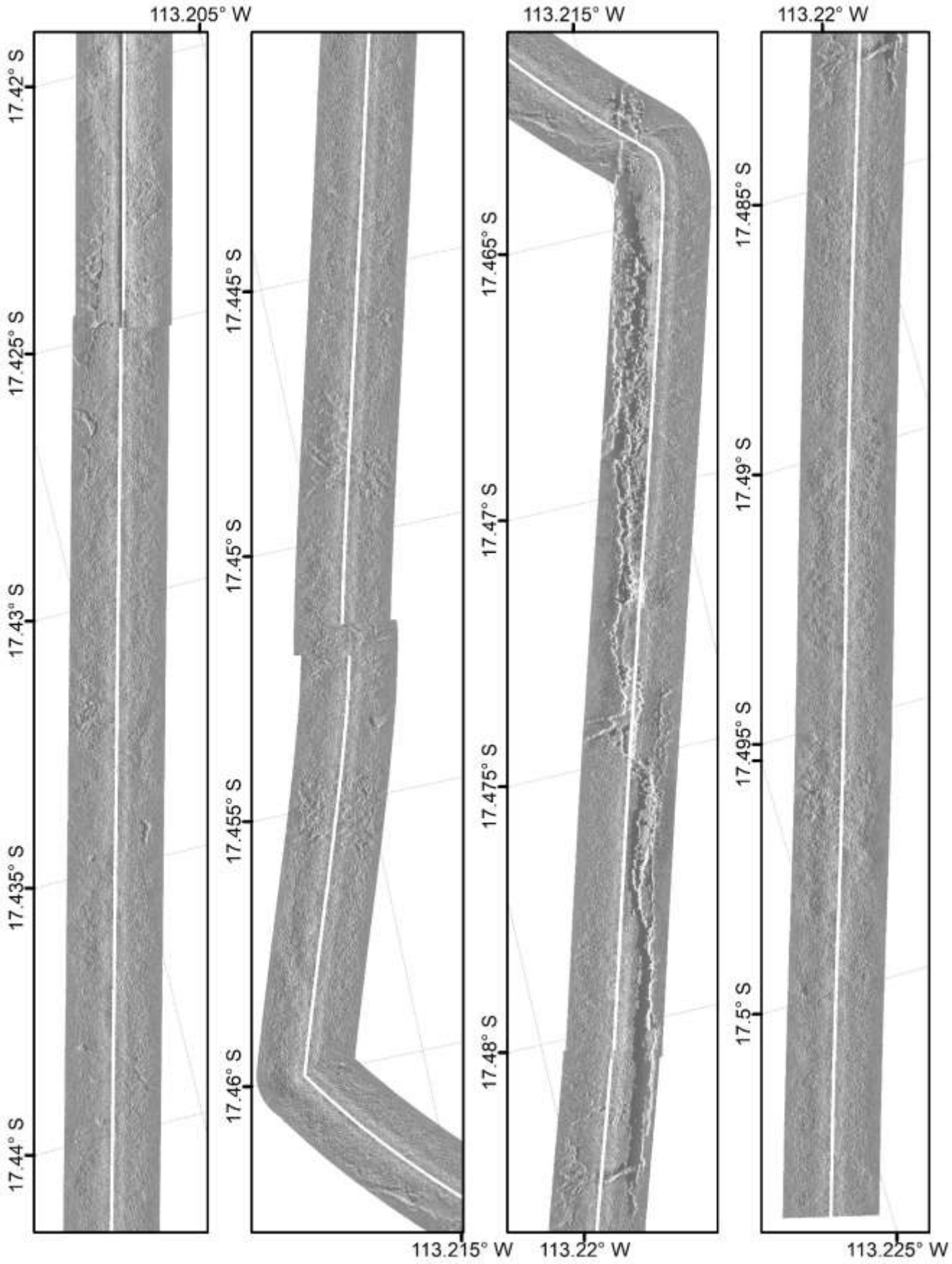


Figure SM24 - Sentry 601 high-frequency side-scan mosaic (map 4/4). The geographic orientations of the panels are rotated to account for the NE-SW orientation of the ridge axis. Darker shades are lower intensity.



Sentry605

Sentry dive 605 ran a tracklike ~7km along the ridge axis from South to North at 15m altitude (17.385-17.450°S, 113.193-113.212°W).

Low-frequency side-scan

Low-frequency 120 Khz side-scan was collected along the survey line. A side-scan mosaic was produced using EGN and AGC 40-4 that is contained in a single GEOTIFF file gridded at 0.5m resolution (sentry605-lf/sentry605-lf.tif). (figure SM27)

High-frequency side-scan

Along the dive trackline, high-frequency 540Khz side-scan was also collected. The resulting side-scan mosaic, produced using EGN, is contained in 4 individual GEOTIFF tiles gridded at 0.25m resolution (sentry605-hf/.tif). A destripe function was applied in processing with a length of 95 pings. (figure SM28)

Figure SM25 - Sentry605 low-frequency side-scan mosaic. The panels are rotated because of the NE-SW orientation of the ridge axis. Darker shades are lower intensity.

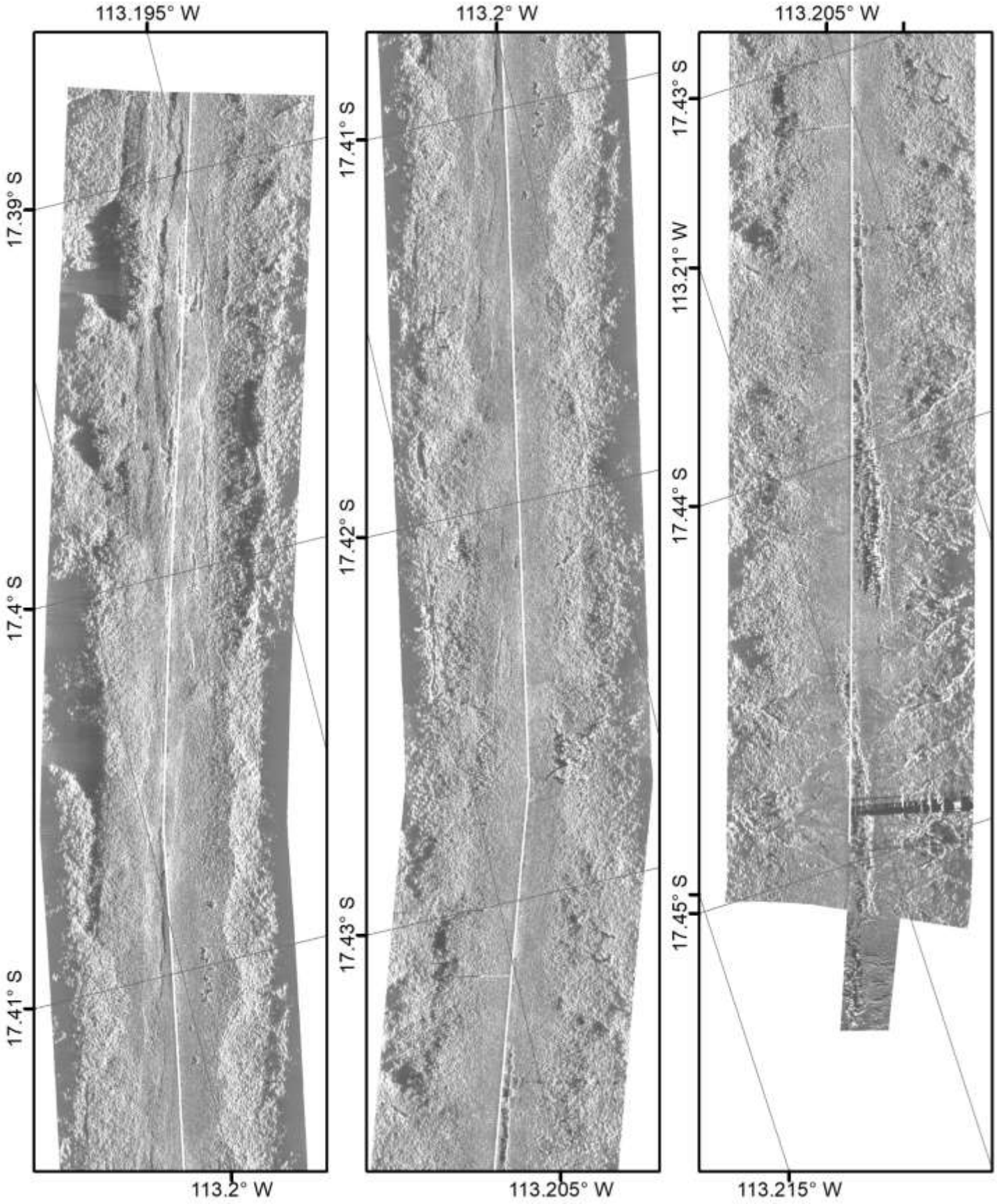
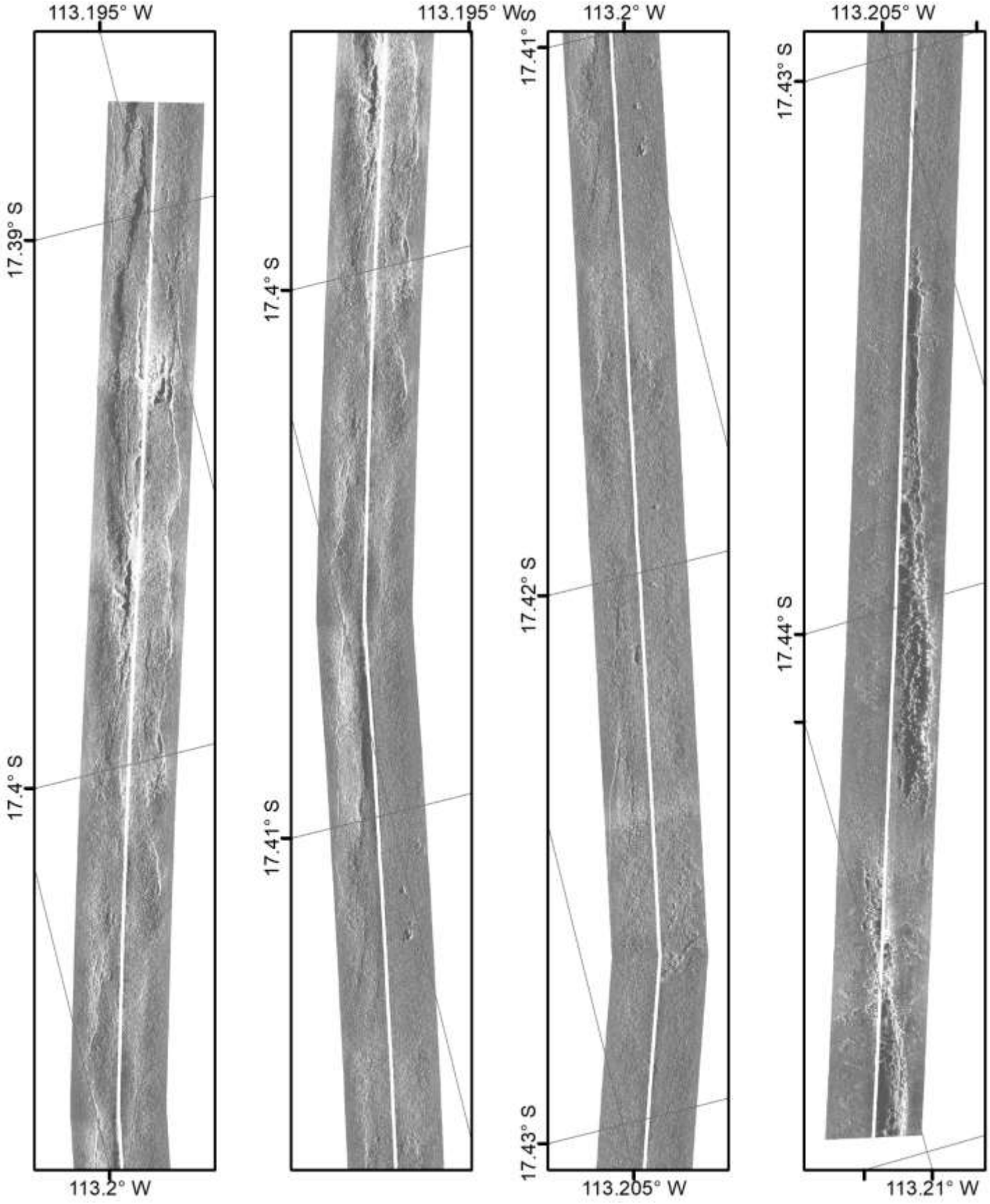


Figure SM26 - Sentry605 high-frequency side-scan mosaic. Panels are rotated because of the NE-SW orientation of the ridge axis. Darker shades are lower intensity.



Sentry606

Sentry606 ran a single along-axis trackline at 15m altitude (17.062-17.388°S, 113.113-113.194°W).

Low-frequency side-scan

Low-frequency 120Khz side-scan was collected along the length of the trackline. The resulting mosaic, produced using EGN, is contained in 12 individual GEOTIFF tiles gridded at 0.5m resolution (sentry606-lf/sentry606_lf/*.tif). (figures SM29-31).

High-frequency side-scan

High-frequency 540Khz side-scan was also collected for the along-axis trackline. The resulting mosaic, produced with EGN, is contained as 15 individual GEOTIFF tiles gridded at 0.25m resolution (sentry606-hf/UserTiles/sentry606_hf/*.tif). (figures SM32-36)

Both the low-frequency and high-frequency side-scan mosaics are broken up into separate map plots so that the full tracklines can be effectively displayed. The geographic orientations of the panels within each plot are rotated relative to the page to account for the NE-SW orientation of the ridge axis.

Figure SM27 - Sentry606 low-frequency side-scan mosaic. The geographic orientation of each panel is rotated relative to the figure to account for the NE-SW orientation of the ridge axis. (Plot 1/3). Darker shades are lower intensity.

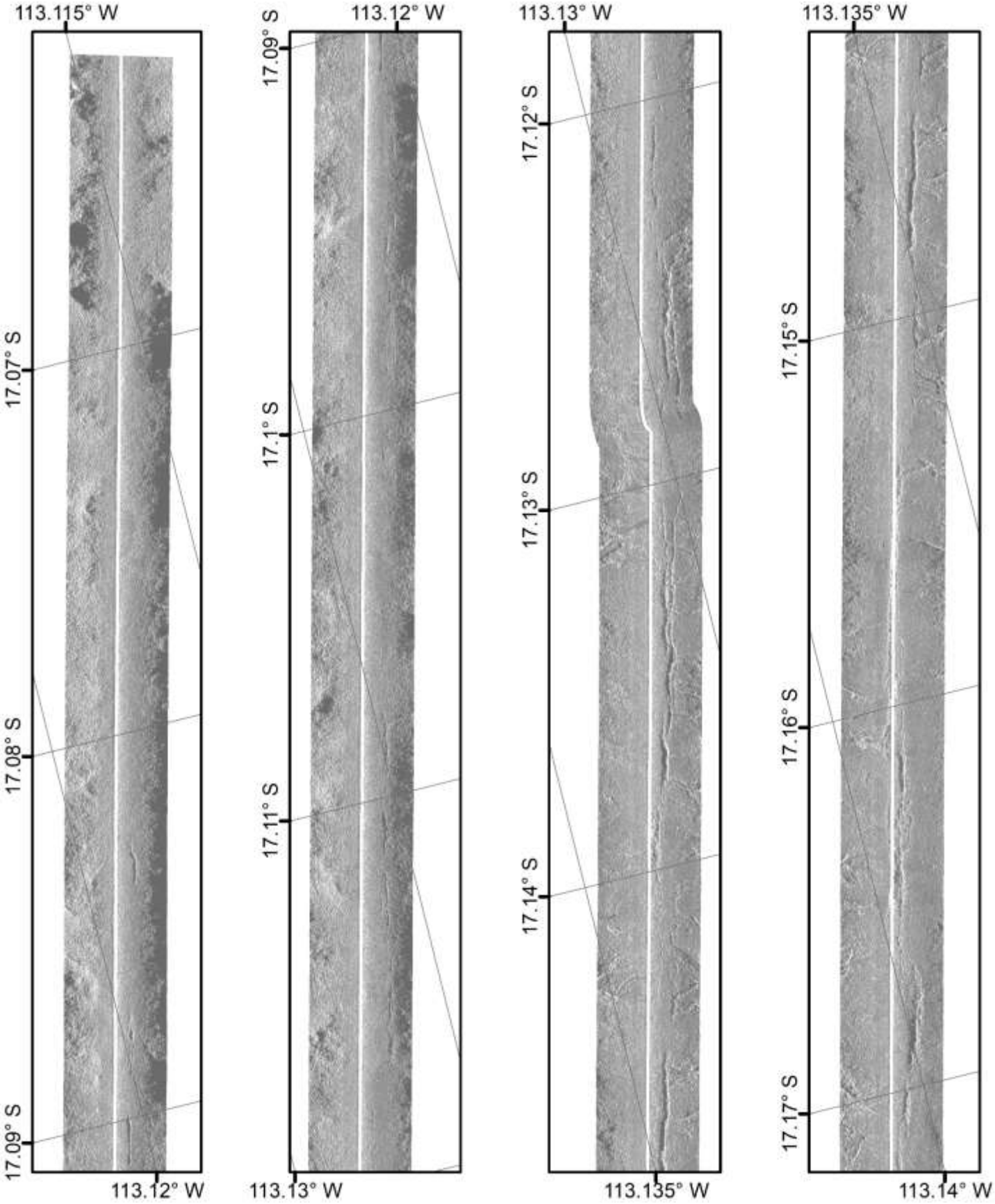


Figure SM28 - Sentry606 low-frequency side-scan mosaic. The geographic orientation of each panel is rotated relative to the figure to account for the NE-SW orientation of the ridge axis. (Plot 2/3) Darker shades are lower intensity.

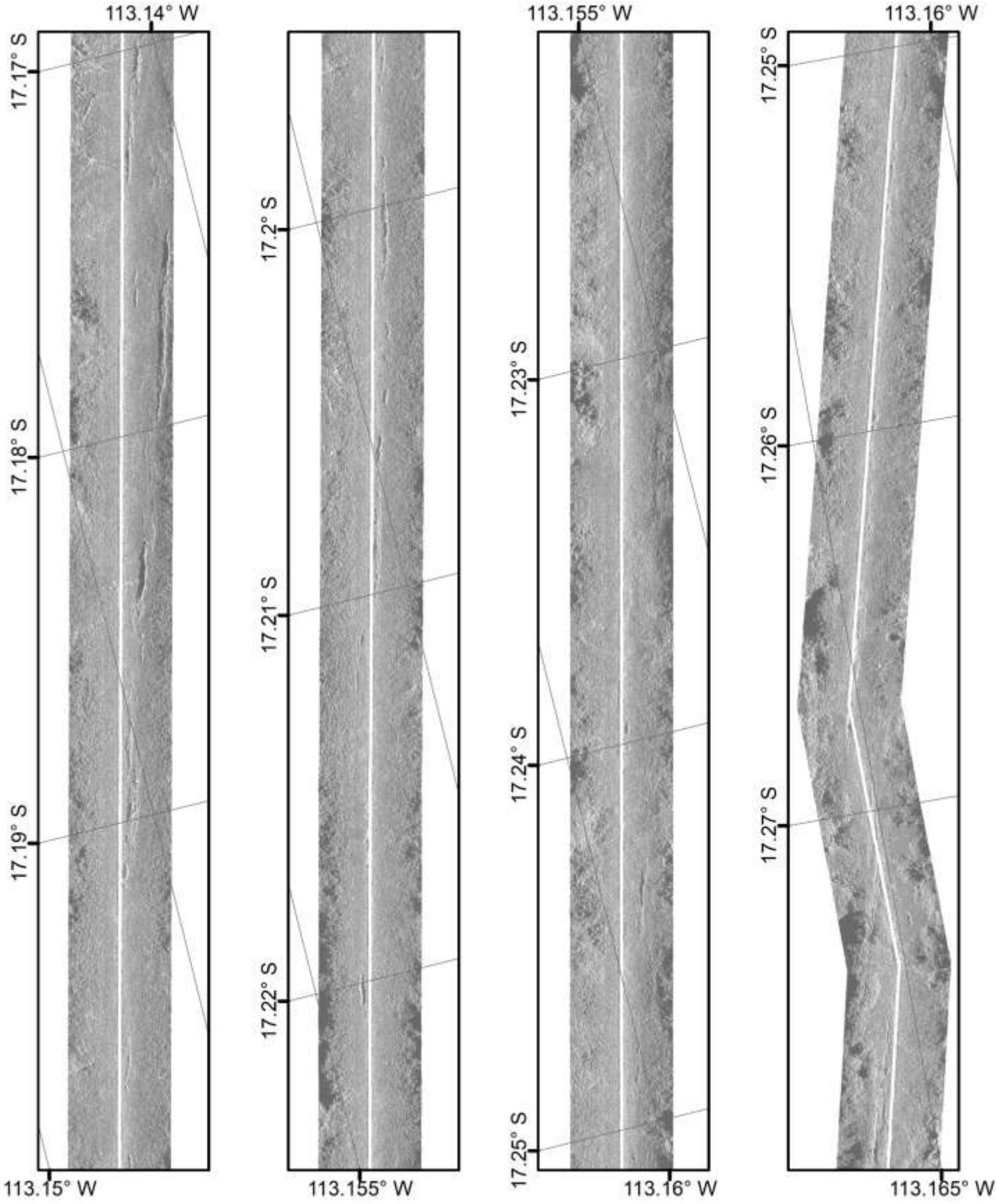


Figure SM29 - Sentry606 low-frequency side-scan mosaic. The geographic orientation of each panel is rotated relative to the figure to account for the NE-SW orientation of the ridge axis. (Plot 3/3) Darker shades are lower intensity.

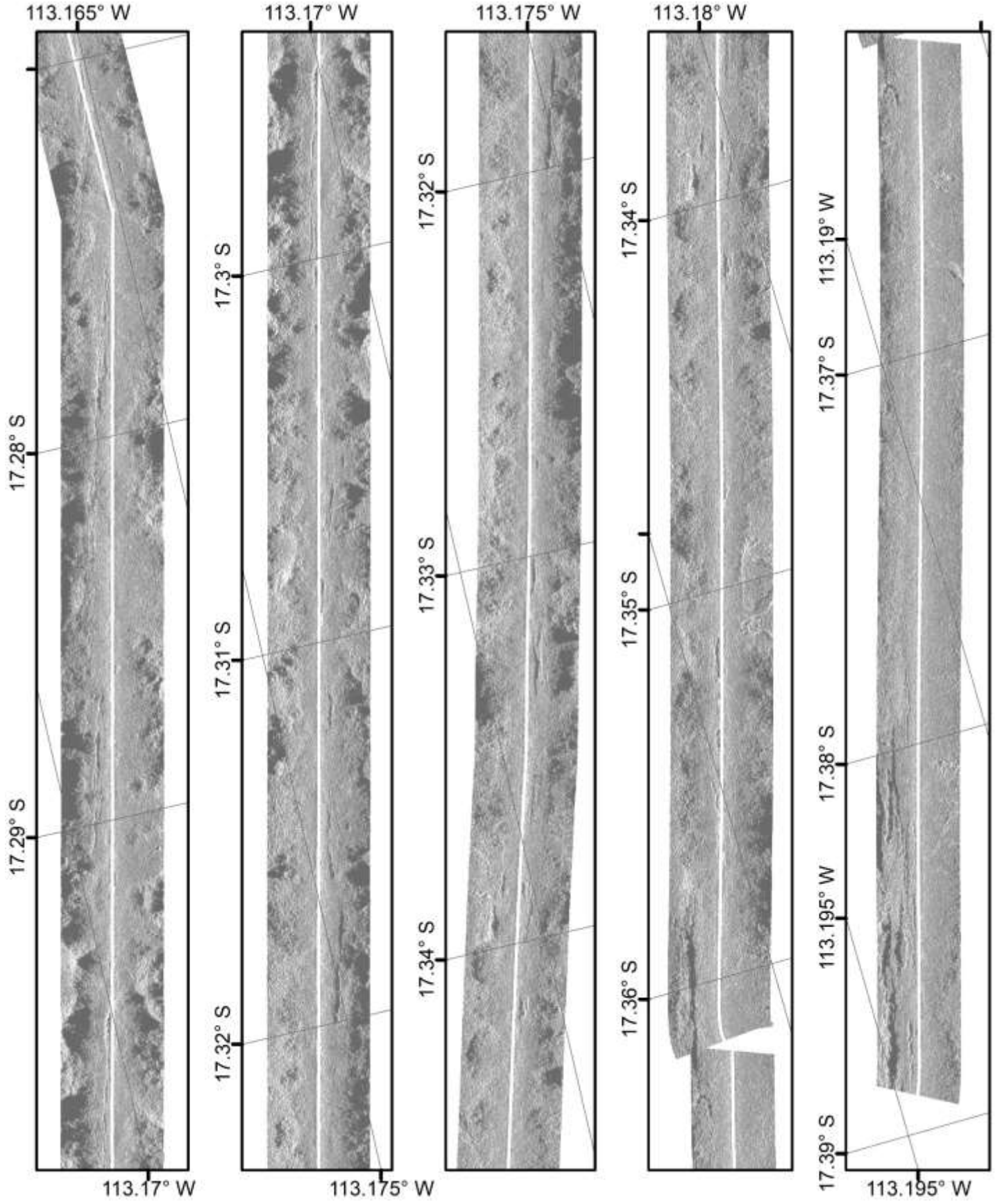


Figure SM30 - Sentry606 high-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the trackline. (plot 1/5) Darker shades are lower intensity.

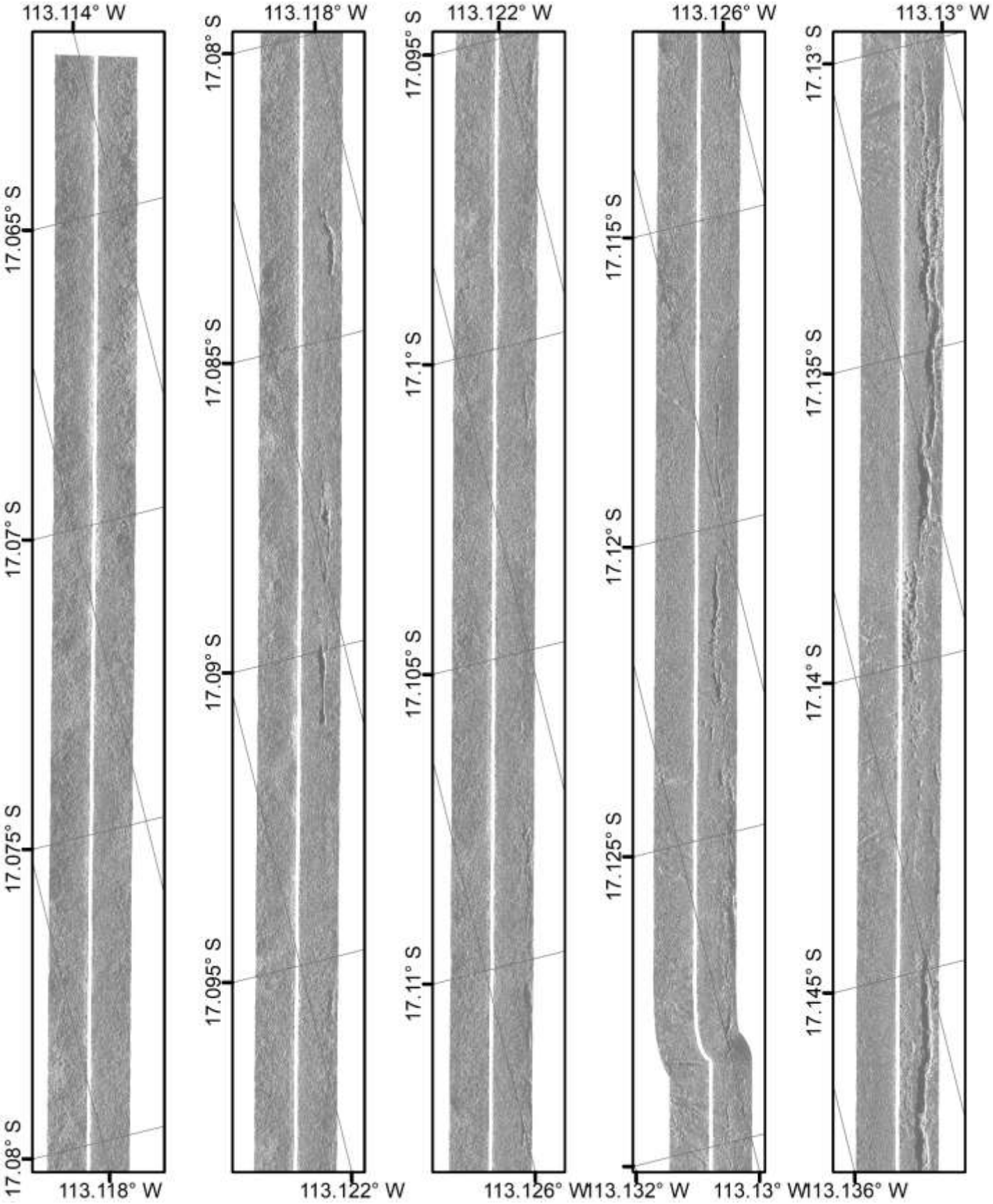


Figure SM31 - Sentry606 high-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the trackline. (plot 2/5) Darker shades are lower intensity.

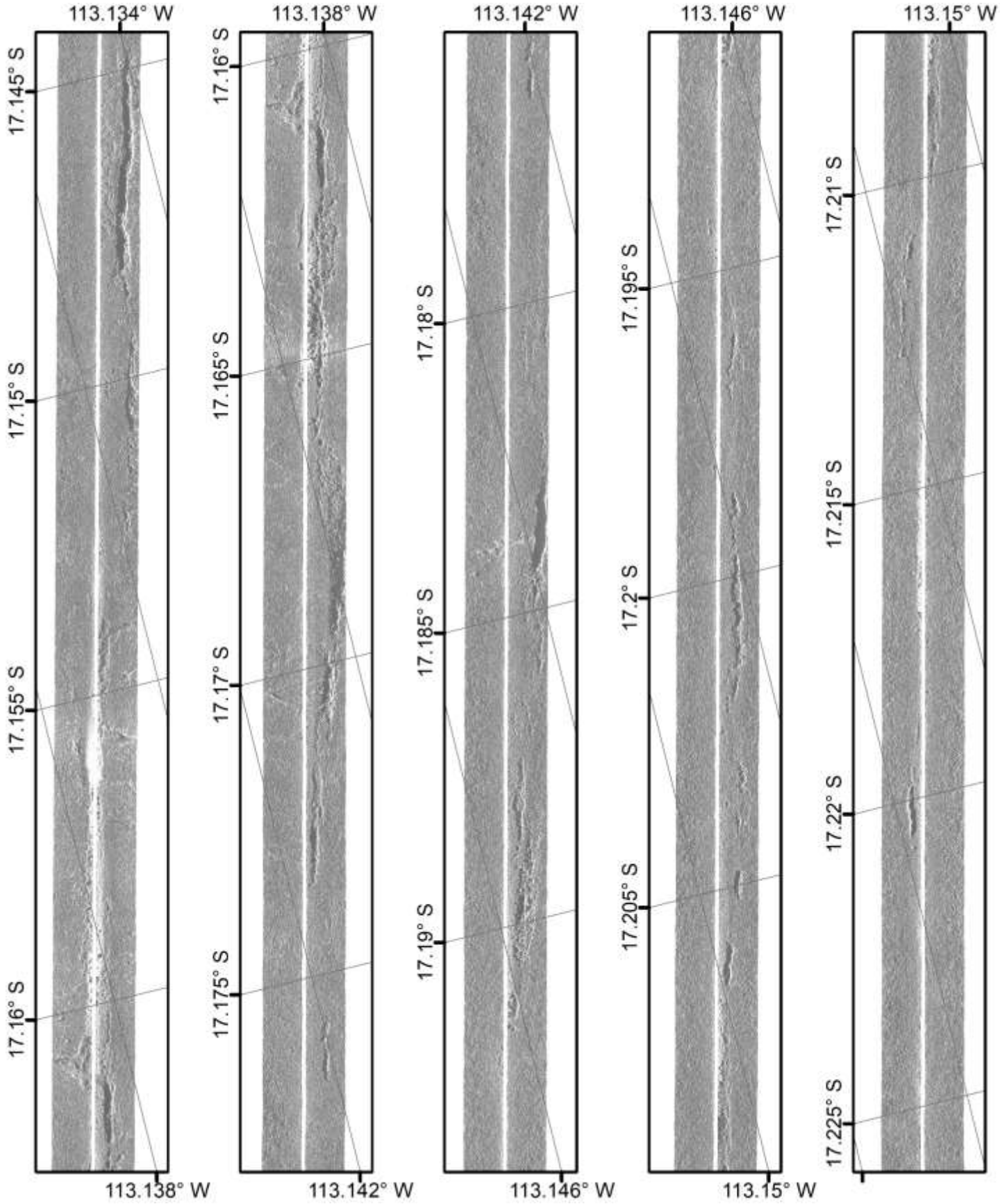


Figure SM32 - Sentry606 high-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the trackline. (plot 3/5) Darker shades are lower intensity.

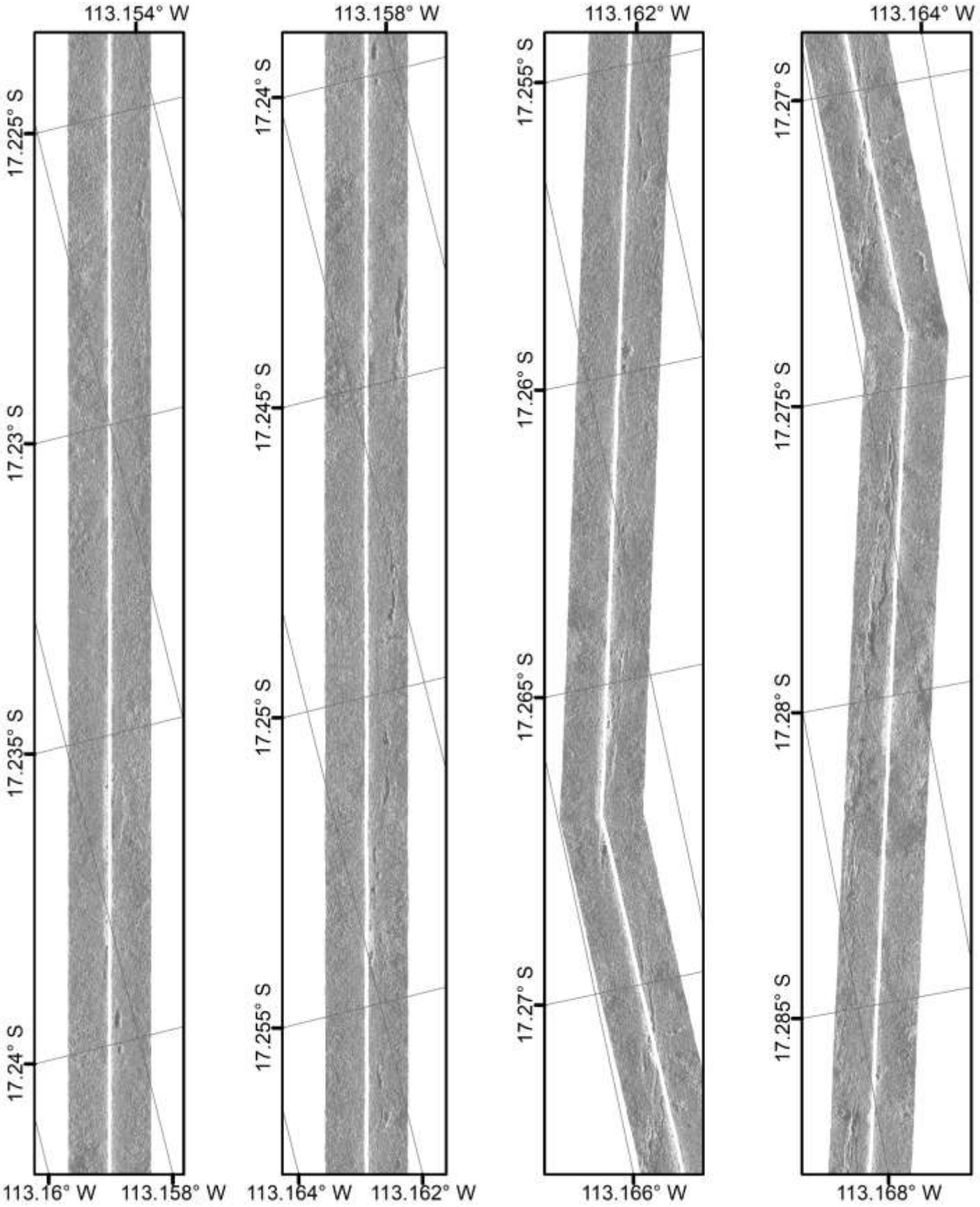


Figure SM33 - Sentry606 high-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the trackline. (plot 4/5) Darker shades are lower intensity.

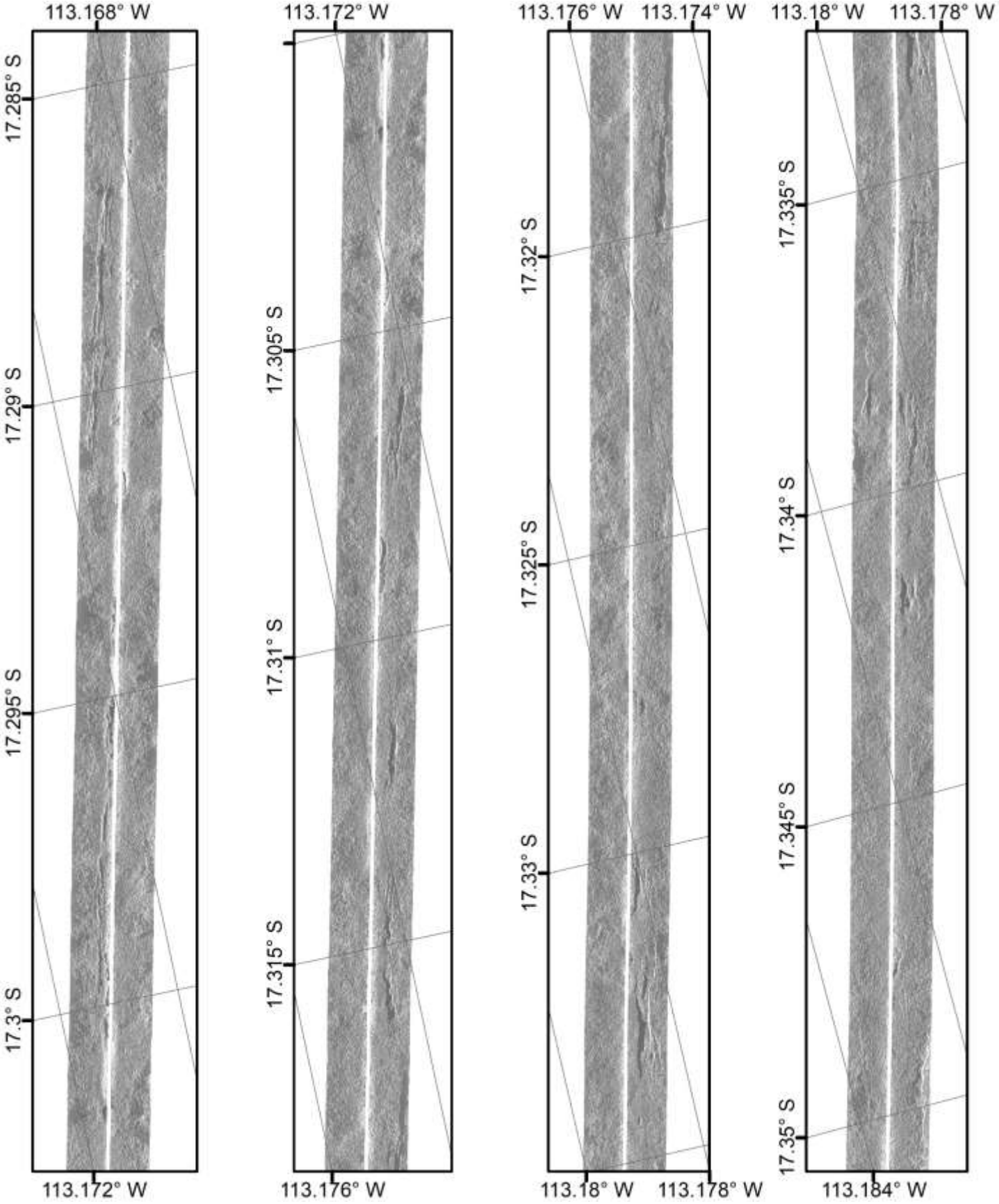
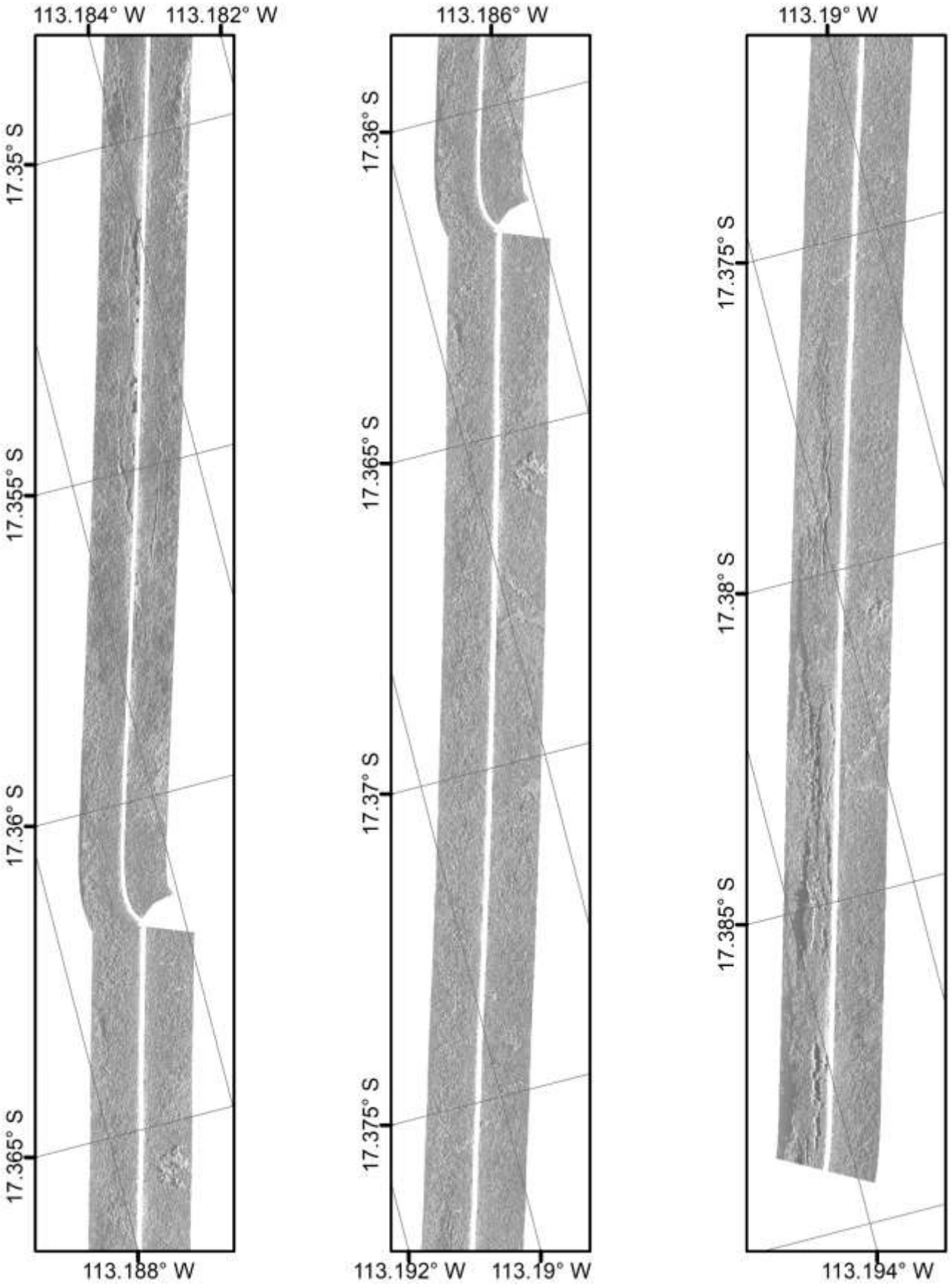


Figure SM34 - Sentry606 high-frequency side-scan mosaic. The geographic orientation of the panels is rotated relative to the figure to account for the NE-SW orientation of the trackline. (plot 5/5) Darker shades are lower intensity.



SEPR Segment 03: 17.5-18°S

Sentry602

Sentry602 surveyed along a single trackline ~45km long along the ridge crest (17.518-17.919°S, 113.226-113.311°W). Sections of the dive were targeted side-scan surveys, which were interspersed with near-bottom photo boxes.

Low-frequency side-scan

Low-frequency 240Khz side-scan was collected along the survey length. The resulting mosaic, produced using AGC 15-15, is contained as 27 individual GEOTIFF tiles gridded at 0.5m resolution (sentry602-lf/*.tif). (figure SM37)

High-frequency side-scan

Along the length of the survey, high frequency 540Khz side-scan was also recorded. The resulting mosaic, produced using AGC 15-8 and TVG-3, is contained in 18 individual GEOTIFF tiles gridded at 0.25m resolution (sentry602-hf/*.tif). The plot of the high-frequency side-scan mosaic is broken up into separate map plots so that the full trackline can be effectively displayed. The geographic orientations of the panels within each plot are rotated relative to the page to account for the NE-SW orientation of the ridge axis. (figures SM38-42).

Figure SM35 - Sentry602 low-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the along-axis trackline. Darker shades are lower intensity.

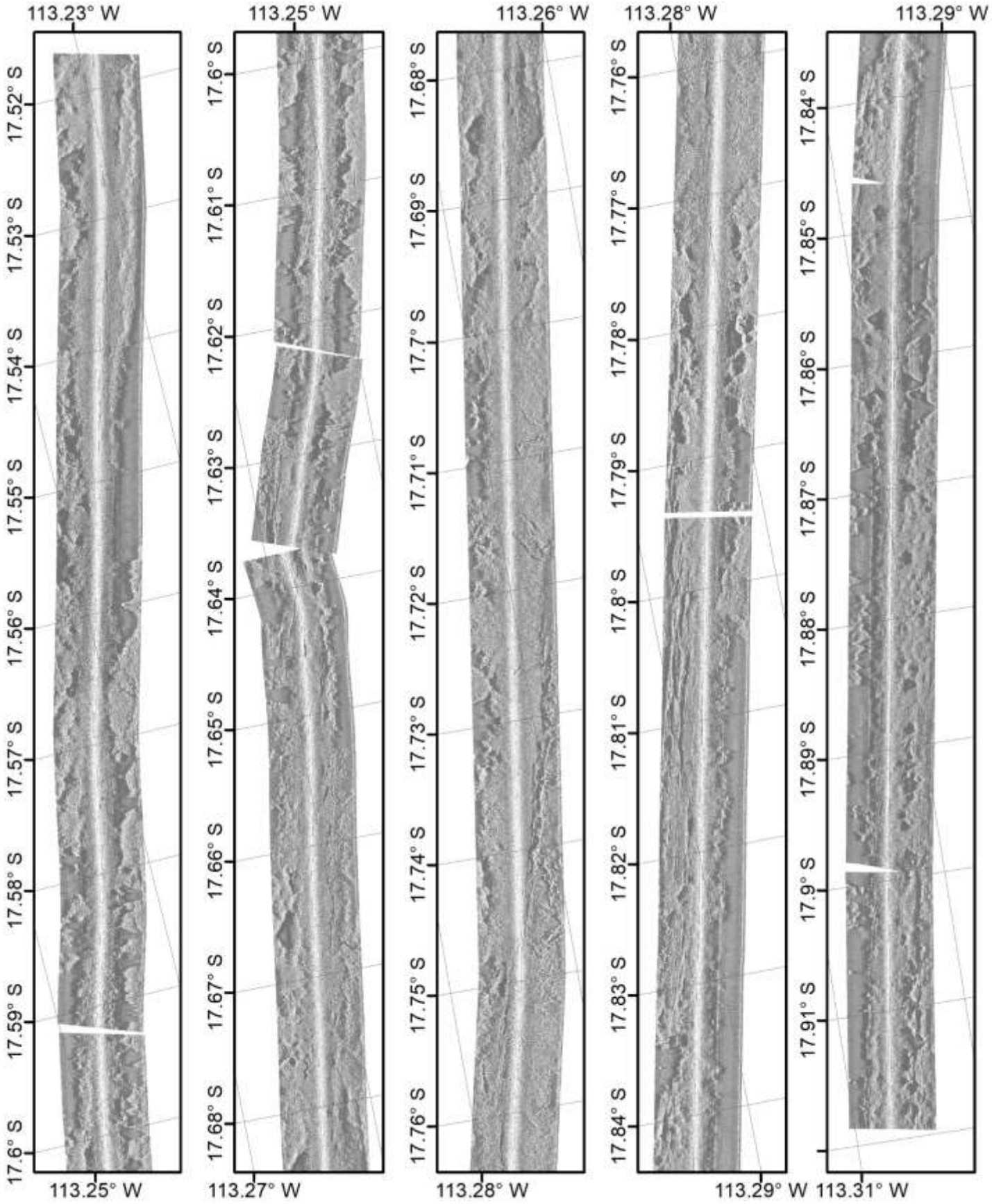


Figure SM36 - Sentry602 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the trackline. (Plot 1/5) Darker shades are lower intensity.

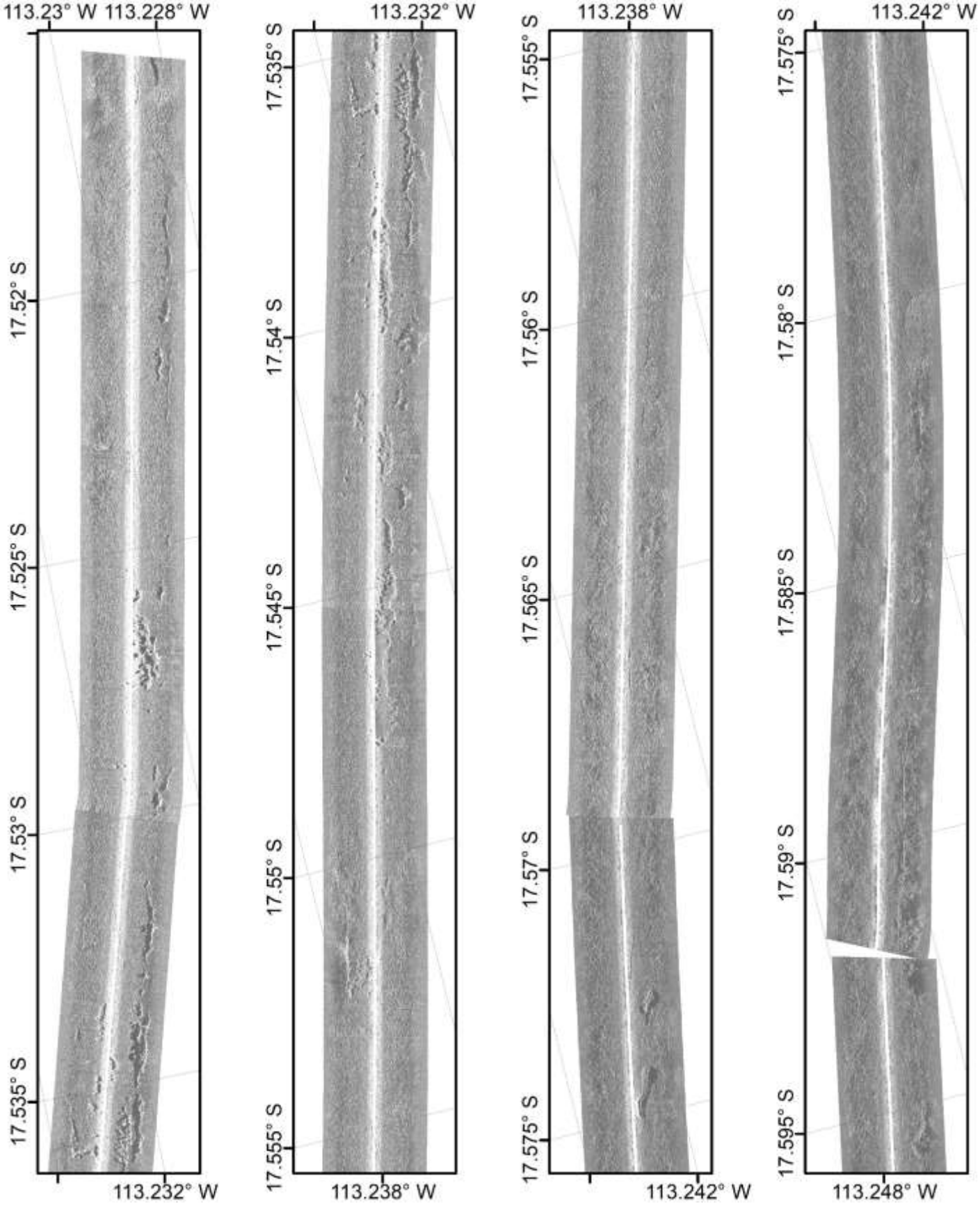


Figure SM37 - Sentry602 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the trackline. (Plot 2/5) Darker shades are lower intensity.

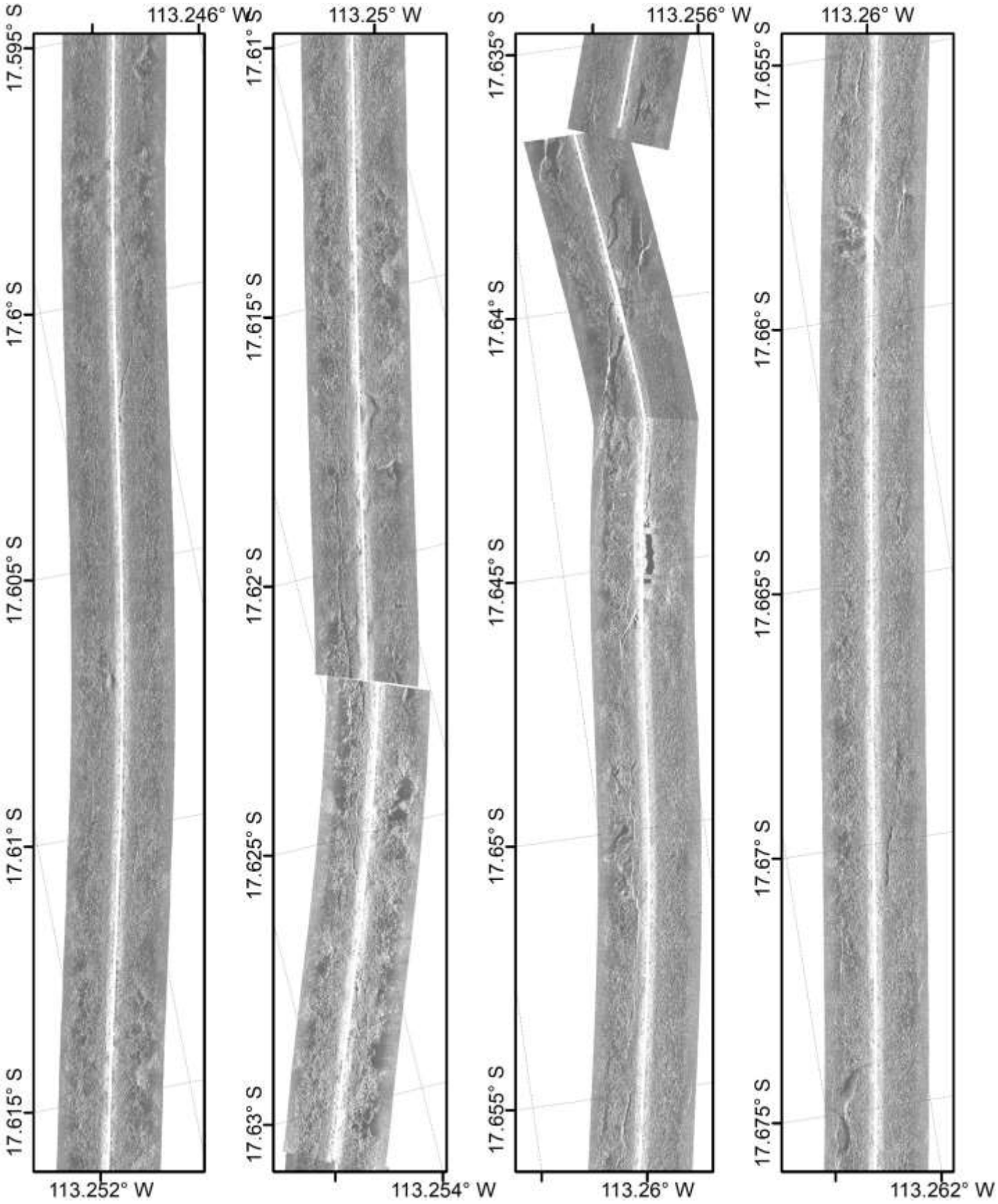


Figure SM38 - Sentry602 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the trackline. (Plot 3/5) Darker shades are lower intensity.

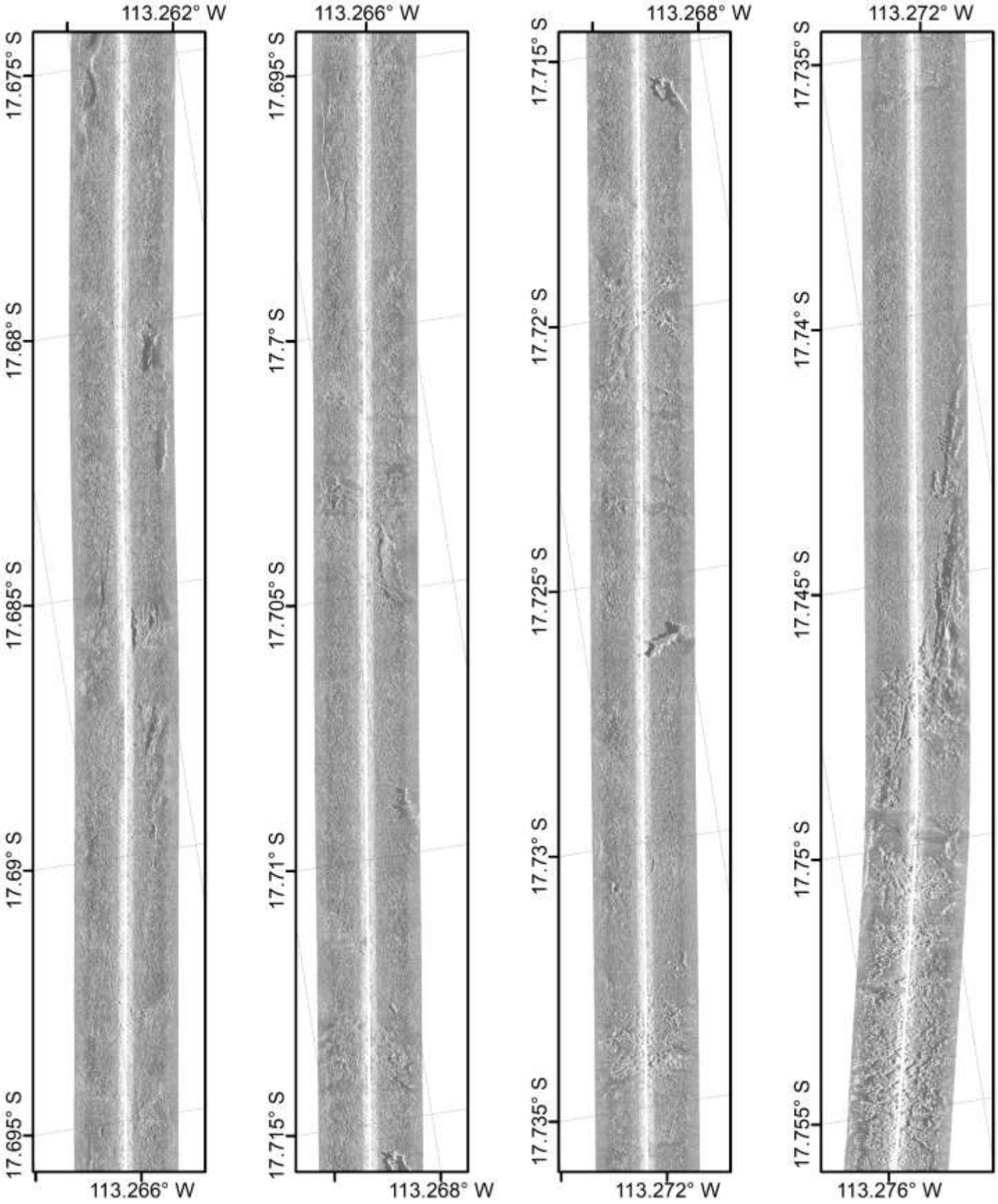


Figure SM39 - Sentry602 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the trackline. (Plot 4/5) Darker shades are lower intensity.

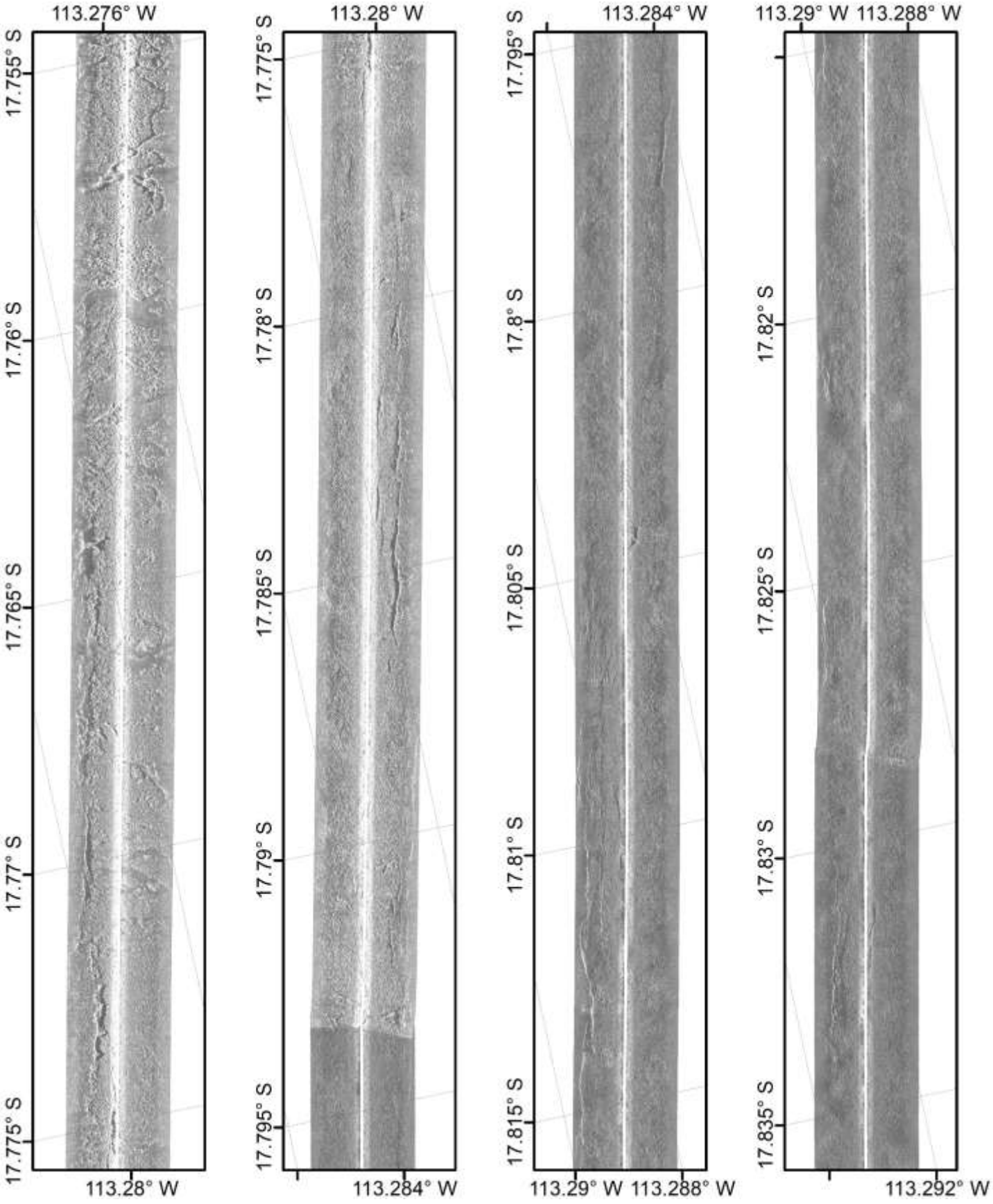
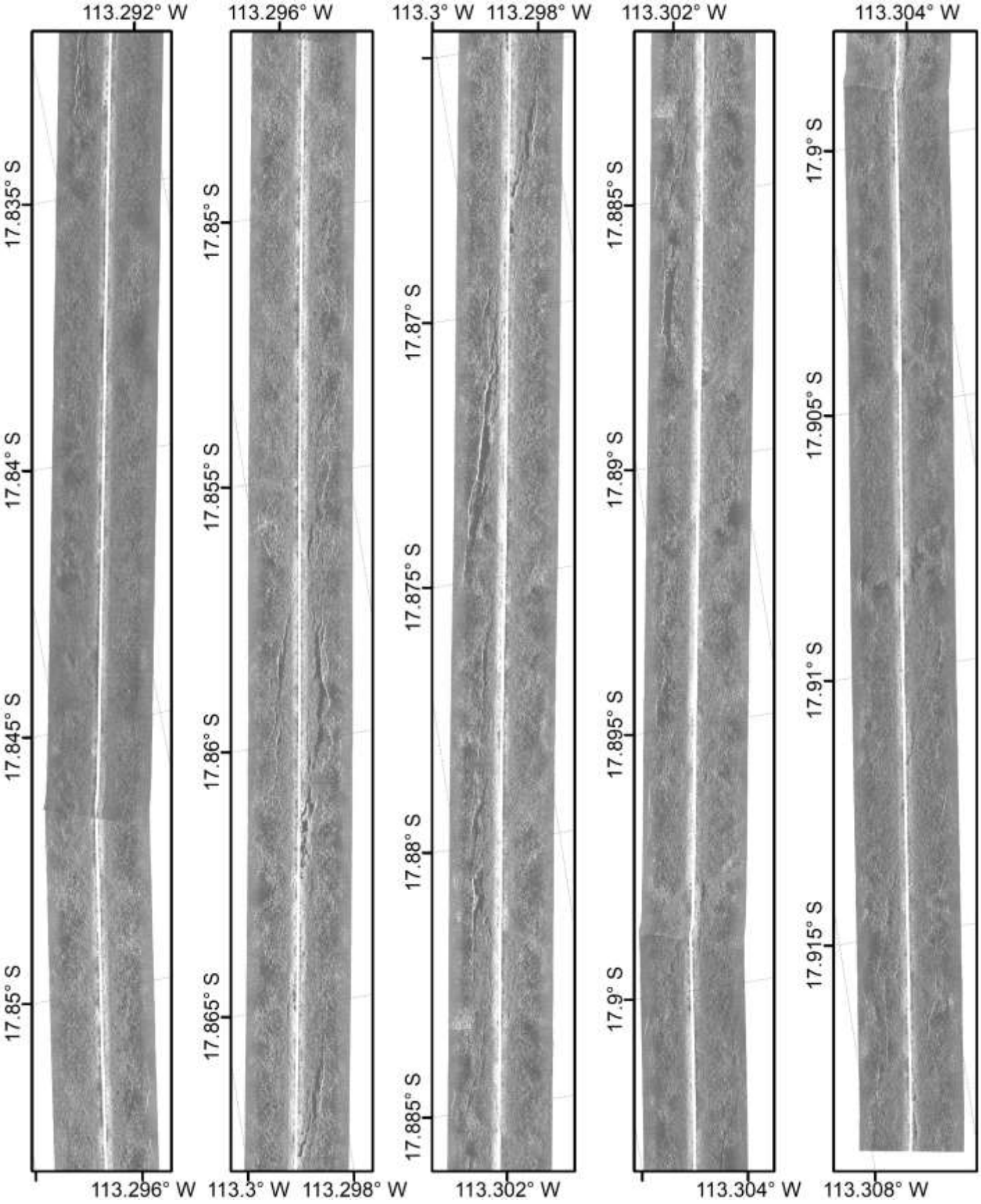


Figure SM40 - Sentry602 high-frequency side-scan mosaic. The geographic orientations of the panels are rotated relative to the figure to account for the NE-SW orientation of the trackline. (Plot 5/5) Darker shades are lower intensity.



Sentry603

Sentry603 consisted of 3 ~1km mapping survey lines spaced 175m apart followed by 4 near-bottom photo boxes within the mapped area (17.883-17.894°S, 113.300-113.304°W).

Low-frequency side-scan

Low-frequency 120Khz side-scan was collected along the 3 mapping transects. The resulting mosaic, produced using TVG, is contained in a single GEOTIFF file at 0.5m pixel resolution (sentry603-lf/sentry603-lf-Sci.tif) (figure SM43).

High-frequency side-scan

During the near-bottom photo surveys, high frequency 540Khz side-scan was collected. The data for each photo box that was collected along the N-S oriented transects of the photo survey has been mosaiced into 3 separate GEOTIFF files (figure SM44). Two of the photo boxes overlap each other and so the side-scan for those two boxes has been mosaiced together.

Files: sentry603-hf/

sentry603-hf-camblock1ns.tif
sentry603-camblock2ns.tif
sentry603-camblock3NS.tif

A GEOTIFF file was also produced, containing a second set of high-frequency side-scan data for the northernmost photo box that is from the E-W oriented transects of the photo survey (sentry603-hf/sentry603-hf-block1EW.tif). These mosaics were produced using TVG and are gridded at 0.25m.

Figure SM41 - Sentry603 low-frequency side-scan mosaic. Darker shades are lower intensity.

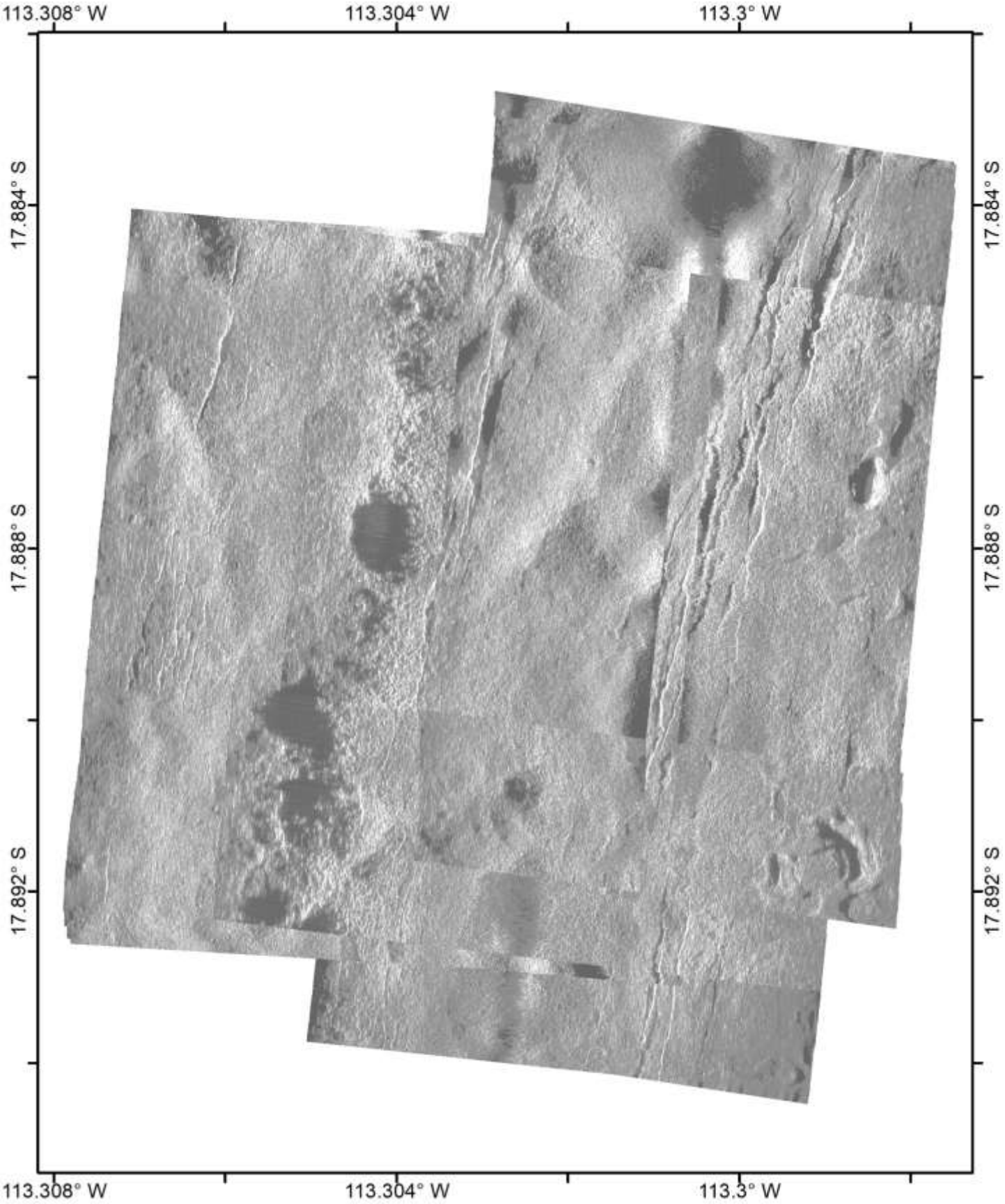
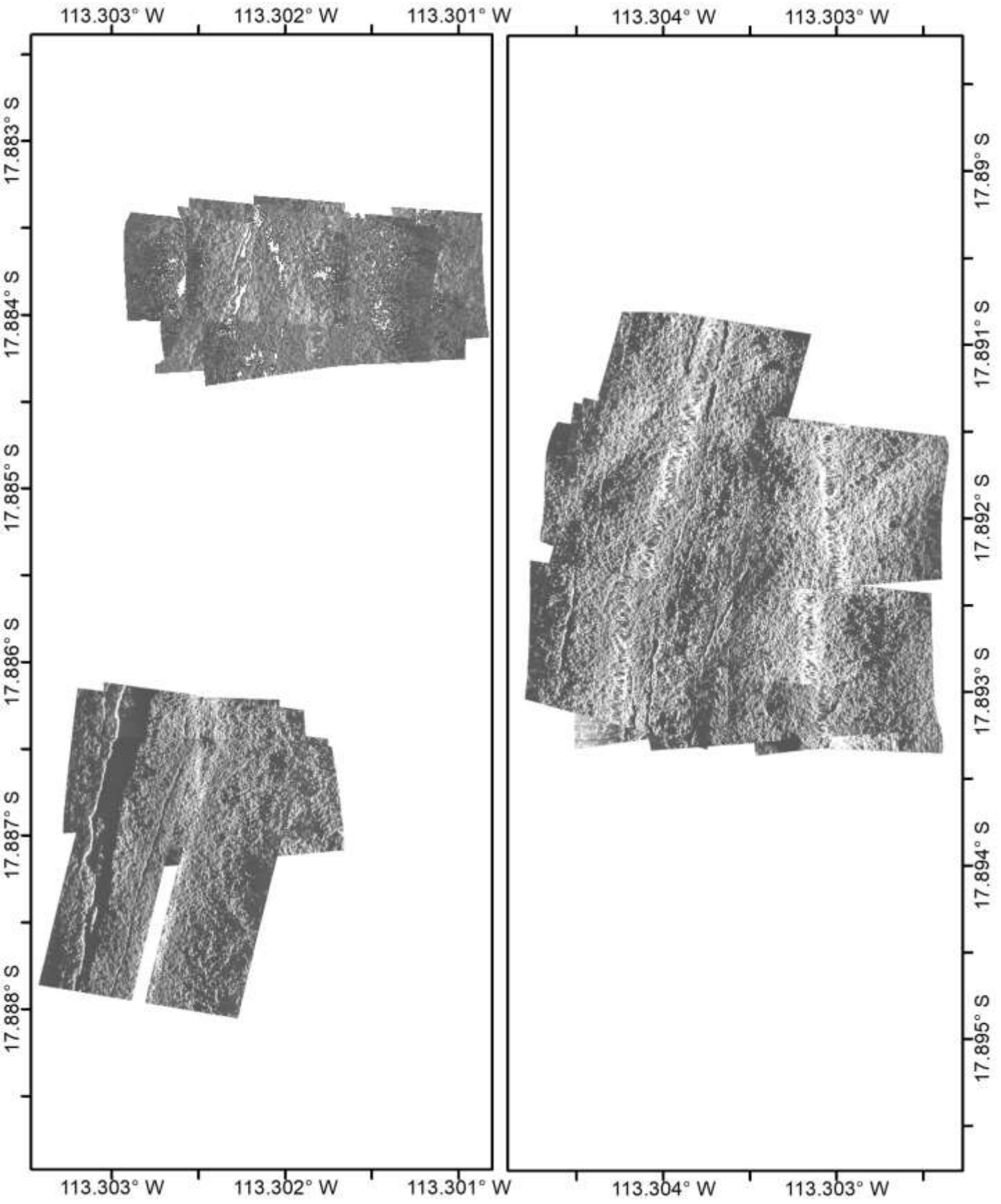


Figure SM42 - Sentry603 high-frequency side-scan for the N-S oriented transects of the photo survey boxes. Darker shades are lower intensity.



Sentry604

Dive Sentry604 was comprised of 2 distinct surveys at 65m altitude separated by a ~14km long transit between them along-which multibeam sonar was also collected (17.7-17.9°S, 113.25-113.32°W). Interspersed with these multibeam surveys and transit were near-bottom photo surveys

Low-frequency side-scan

Pisco Trough area: Low-frequency side-scan mosaics were produced using EGN and gridded at 0.5m resolution. There are 2 mosaics, one for the West-look side-scan and one for the East-look. The West-look mosaic is contained in 2 individual GEOTIFF tiles (sentry604-lf/UserTiles/sentry604_lf_pisco_w/*.tif) (figure SM48). The East-look mosaic is contained in a single GEOTIFF file (sentry604-lf/sentry604_lf_pisco_W.tif) (figure SM49)

Southern multibeam survey area: Low-frequency side-scan mosaics were produced using AGC and at 0.45m pixels. There are 2 mosaics, one for the West-look side-scan and one for the East-look. Both are contained in individual GEOTIFF files (sentry604-lf/ sentry604_lf_Flo_wlook.tif; sentry604-lf/ sentry604_lf_Flo_elook.tif). (figures SM50, SM51)

Transit line: A low-frequency side-scan mosaic was produced for the transit line between the 2 surveys. This is contained in 6 individual GEOTIFF tiles at 0.5m resolution (sentry604-lf/UserTiles/sentry604_lf_transit/*.tif). (figure SM52)

High-frequency side-scan

High-frequency 540Khz side-scan was collected during the near-bottom photo surveys and along the transit line between multibeam surveys. High-frequency side-scan in the area of Pisco Trough was not sufficiently better than low frequency at the 65m multibeam altitude, thus not mosaicked. Two photo boxes and transit have been separated by location. Each area is further separated into 3 distinct GEOTIFF files, containing the East-look, West-look, and combined mosaics. A single side-scan mosaic was also produced for the transit line between the multibeam surveys, contained in 7 individual GEOTIFF tiles (sentry604-hf/UserTiles/sentry604_hf_transitline/*.tif). (figure SM53). All sentry604 high-frequency mosaics are gridded at 0.25m.

Northern photo box: Mosaics were made with EGN.

Combined mosaic: sentry604-hf/sentry604_hf_northerncamblock.tif (figure SM54)

North look: sentry604-hf/sentry604_hf_ncamblock_nlook.tif (figure SM55)

South look: sentry604-hf/sentry604_hf_ncamblock_slook.tif (figure SM56)

Southern photo box: Mosaics were made with AGC.

Combined mosaic: sentry604-hf/sentry604_hf_southerncamblock.tif (figure SM57)

North look: sentry604-hf/sentry604_hf_scamblock_nlook.tif (figure SM58)

South look: sentry604-hf/sentry604_hf_SCamblock_slook.tif (figure SM59)

Figure SM43 - Sentry604 low-frequency side-scan mosaic. This is the West-look mosaic for the Pisco survey area. Darker shades are lower intensity.

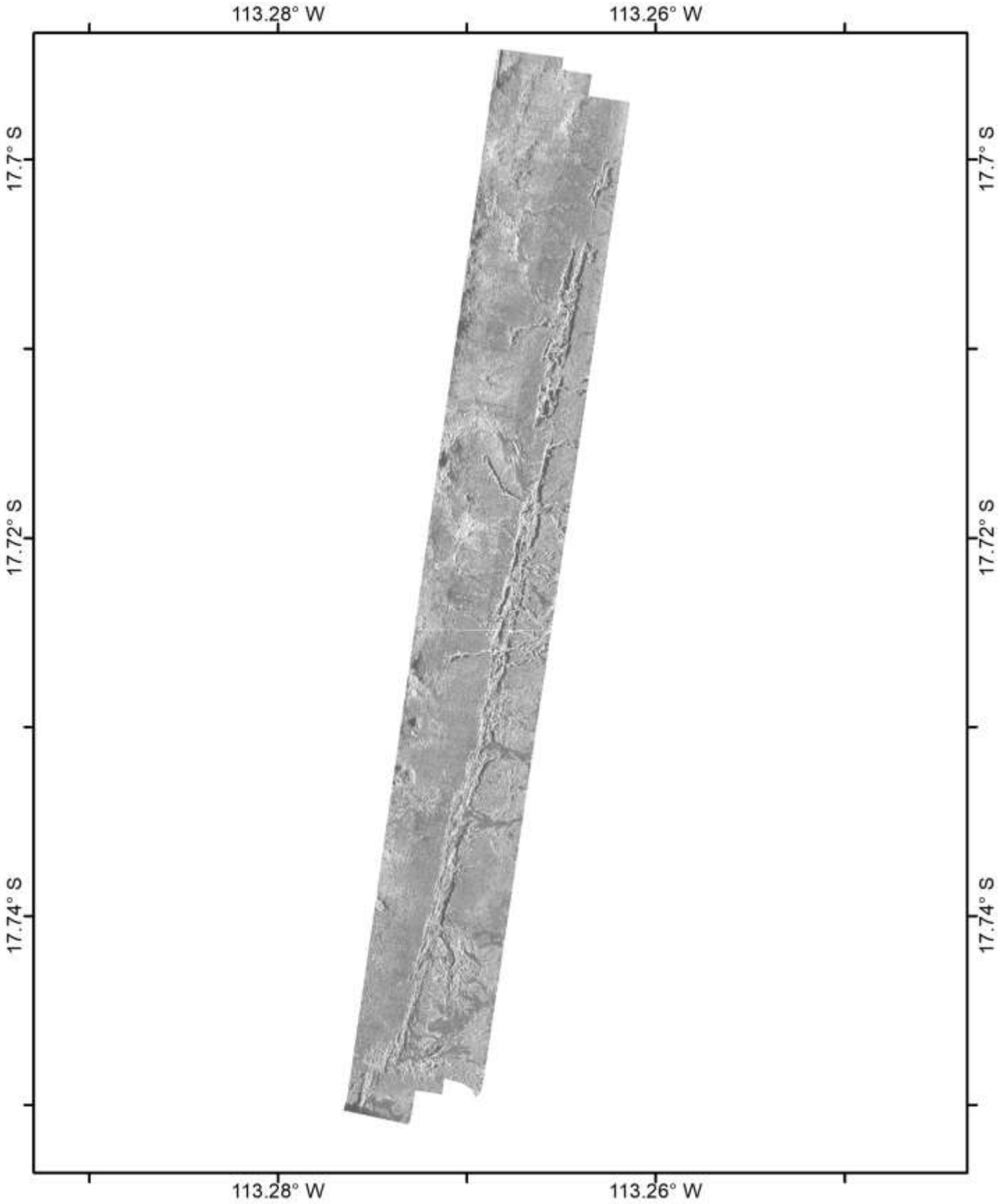


Figure SM44 - Sentry604 low-frequency side-scan mosaic. This is the East-look mosaic for the Pisco survey area. Darker shades are lower intensity.

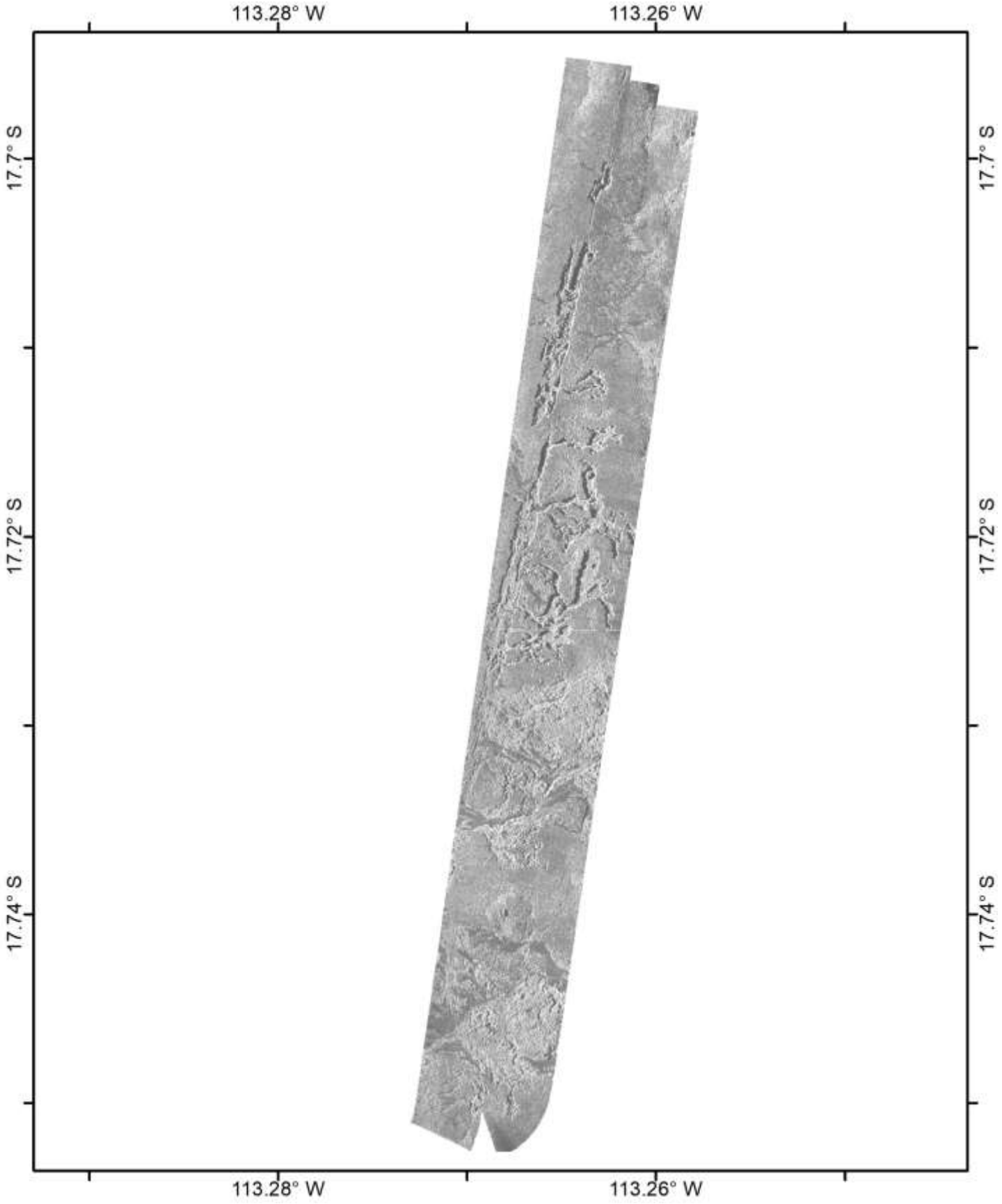


Figure SM45 - Sentry604 low-frequency side-scan mosaic. This is the West-look mosaic for the southern survey area. Darker shades are lower intensity.

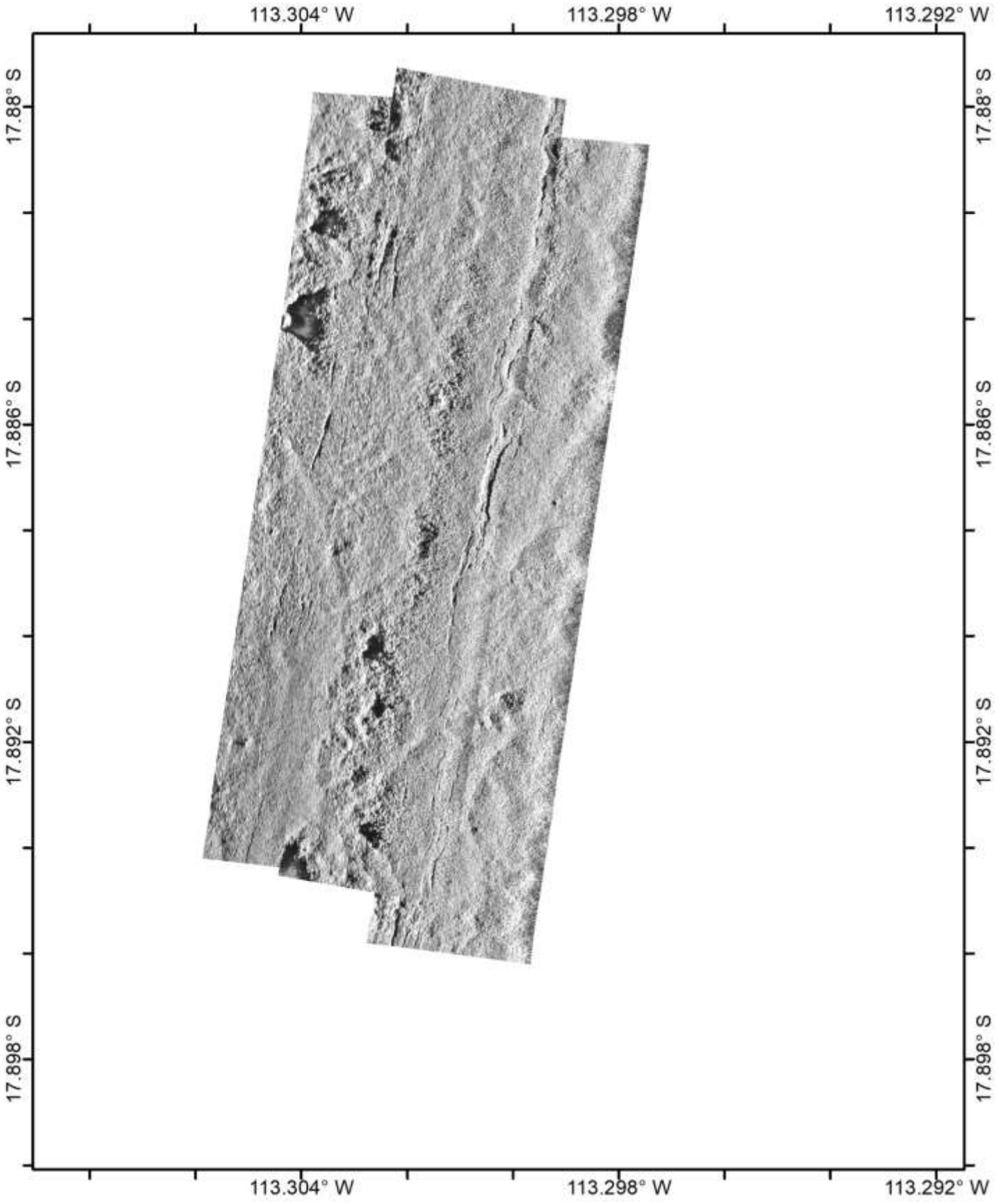


Figure SM46 - Sentry604 low-frequency side-scan mosaic. This is the East-look mosaic from the southern survey area. Darker shades are lower intensity.

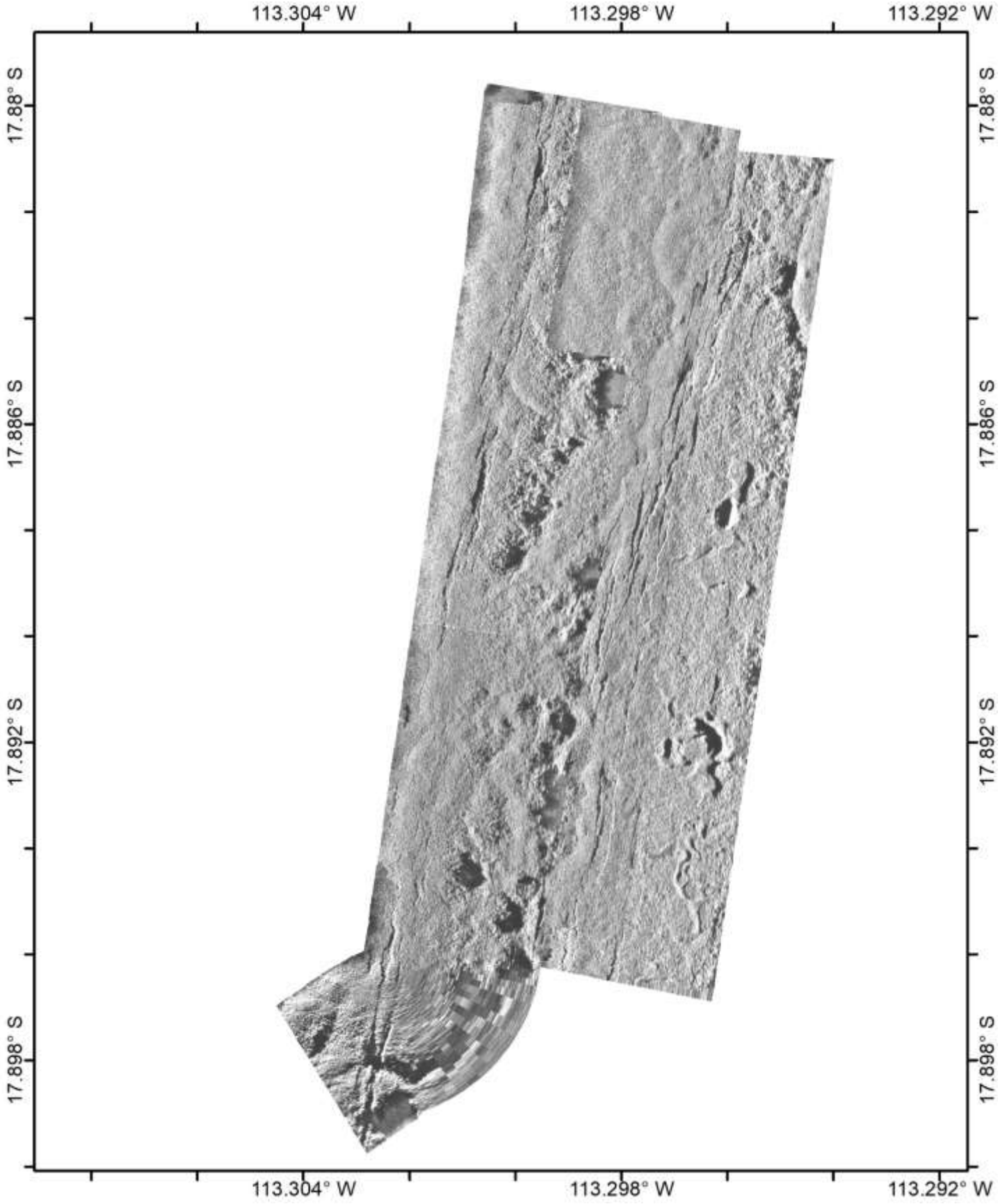


Figure SM47 - Sentry604 low-frequency side-scan mosaic for the transit line between the two multibeam survey areas. Darker shades are lower intensity.

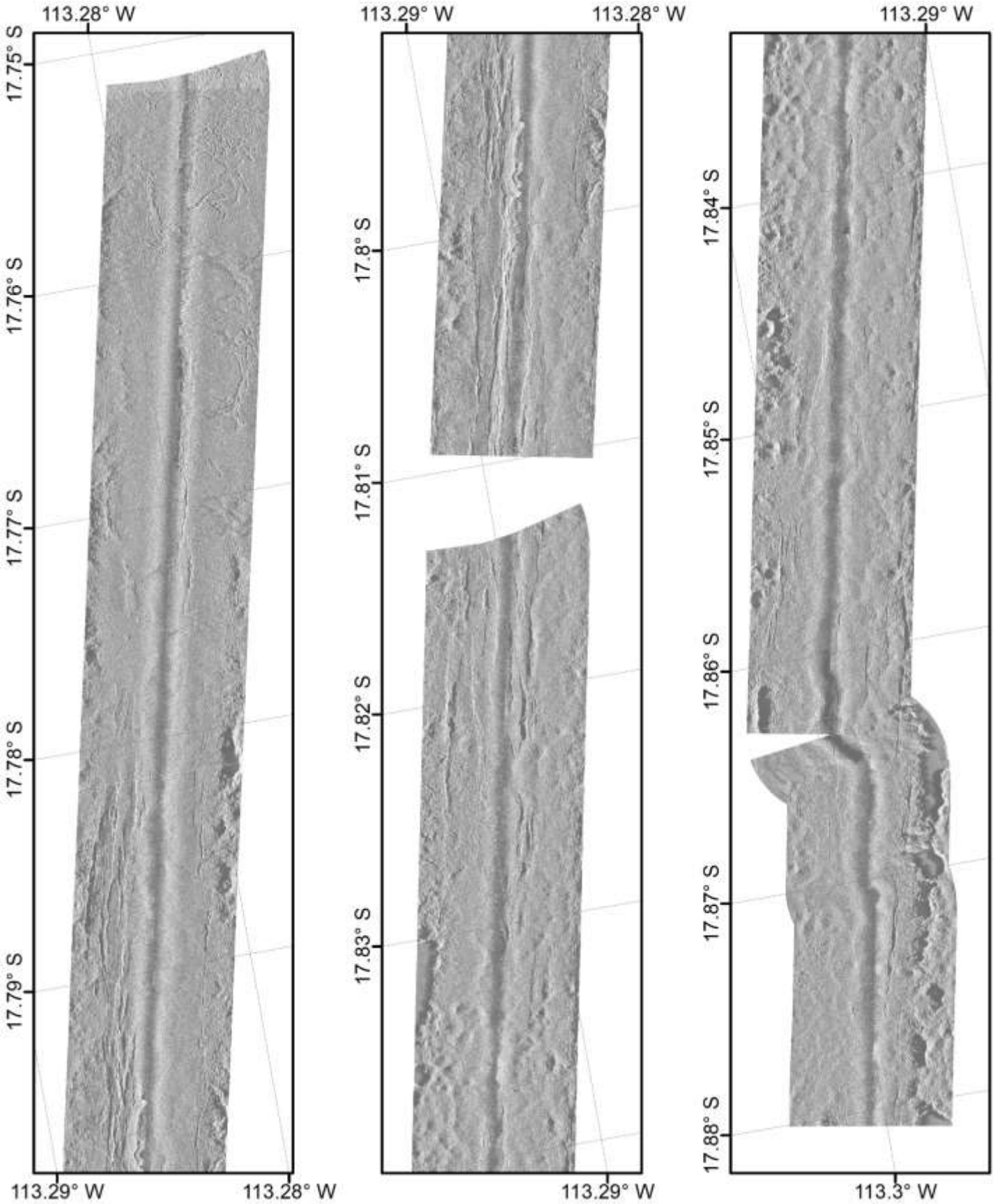


Figure SM48 - Sentry604 high-frequency side-scan mosaic for the transit line between multibeam survey areas. Darker shades are lower intensity.

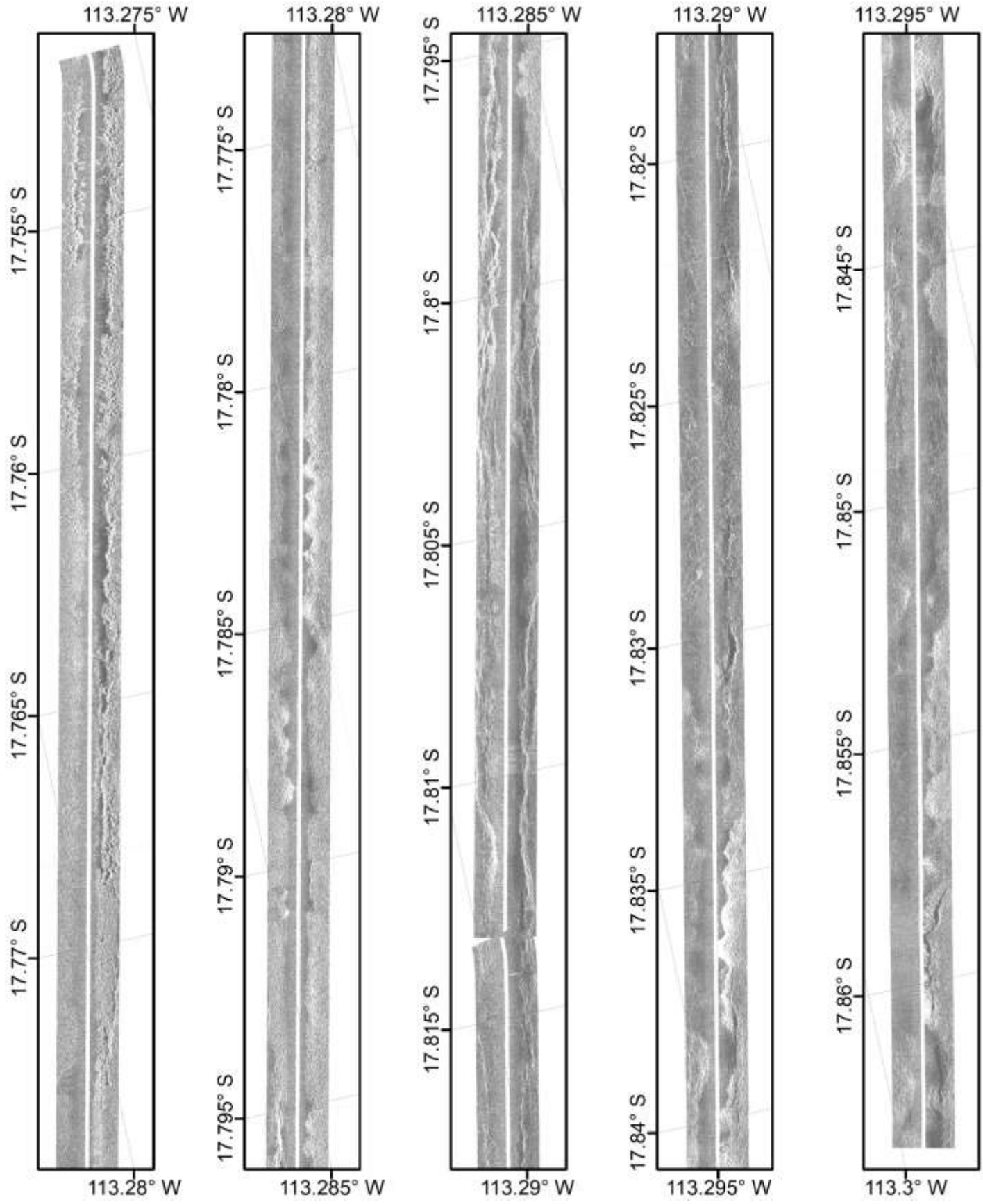


Figure SM49 - Sentry604 high-frequency side-scan mosaic. This is the combined mosaic for the northern photobox survey. Darker shades are lower intensity.

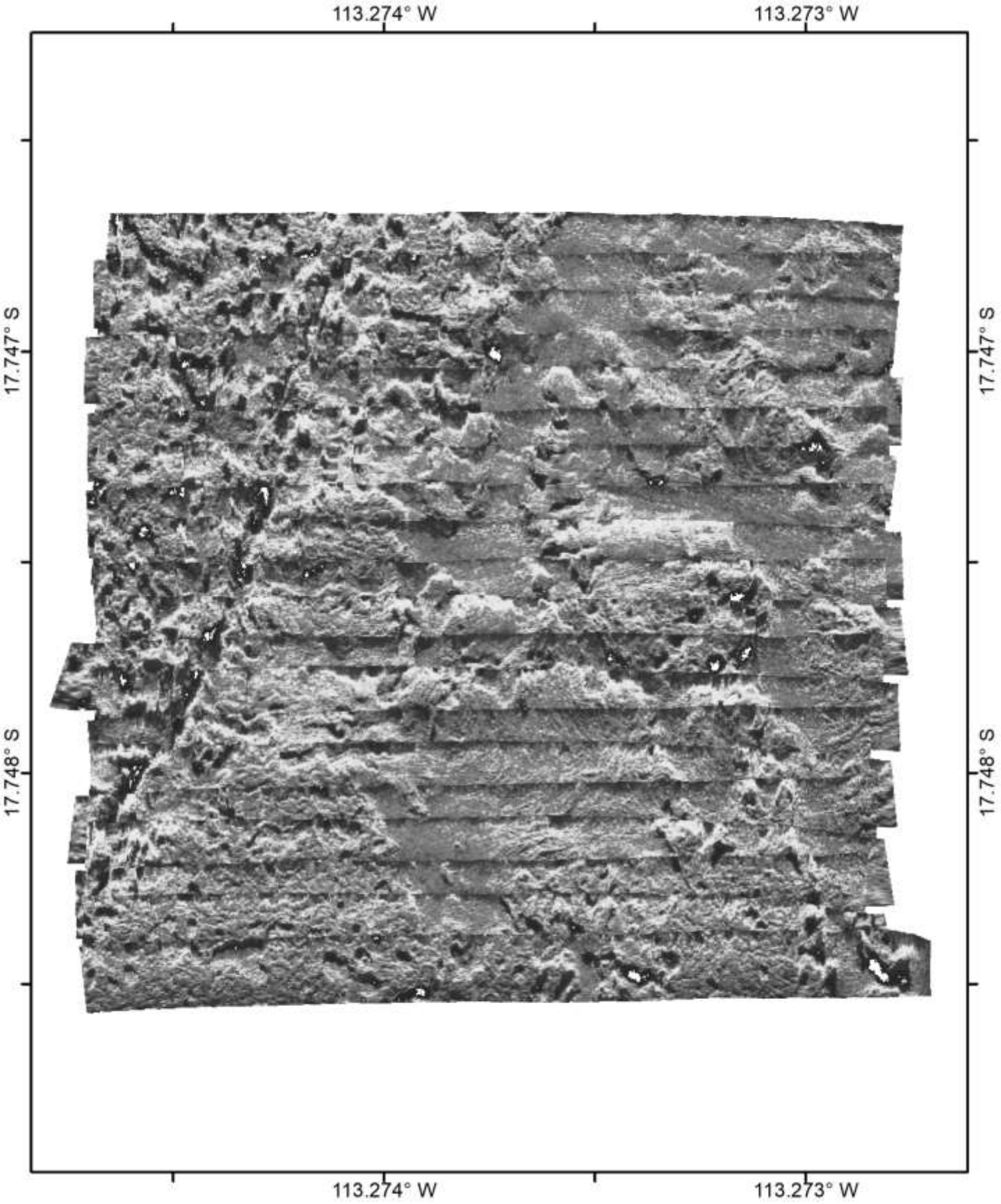


Figure SM50 - Sentry604 high-frequency side-scan mosaic. This is the North-look mosaic for the northern photobox survey. Darker shades are lower intensity.

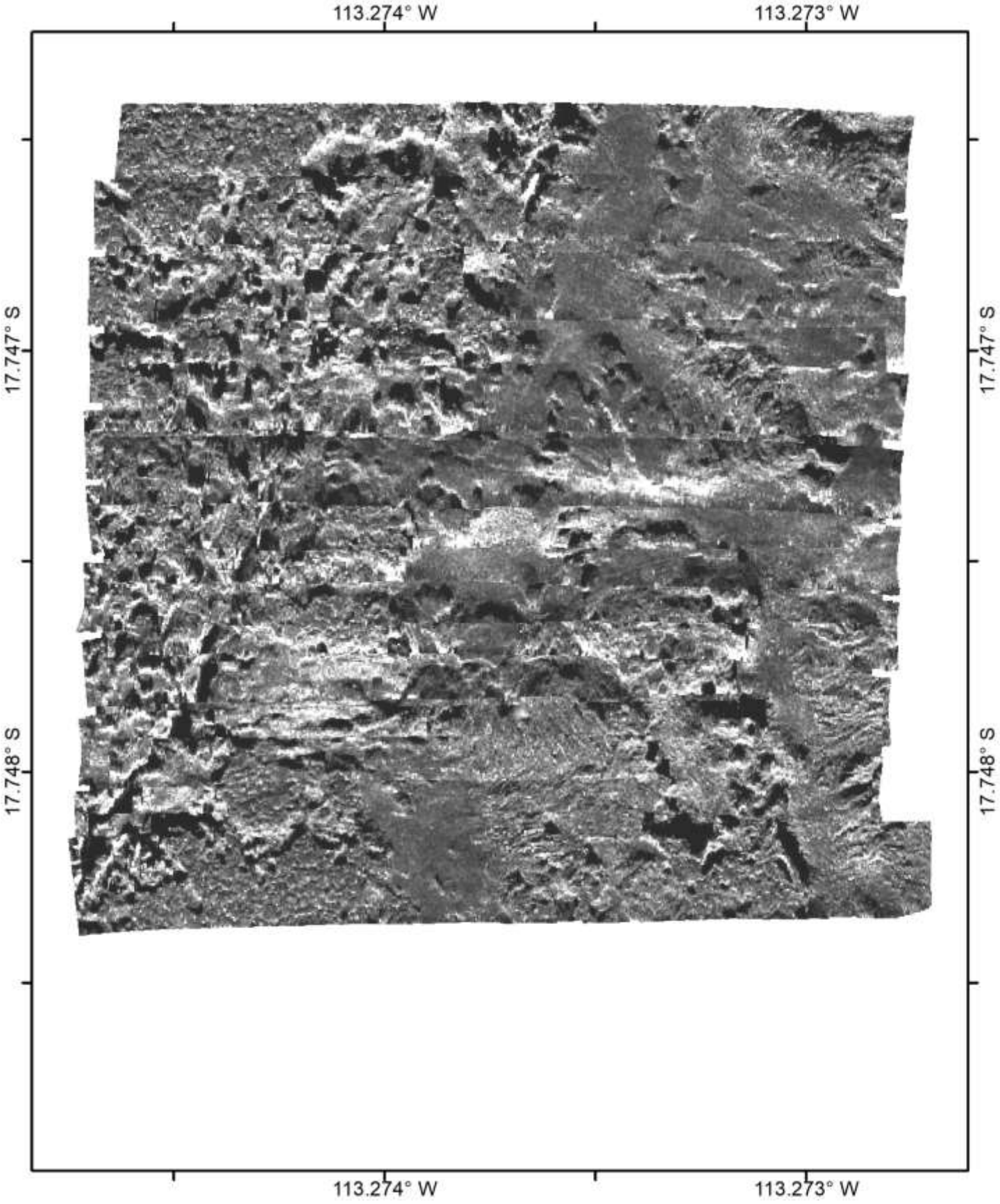


Figure SM51 - Sentry604 high-frequency side-scan mosaic. This is the South-look mosaic for the northern photobox survey. Darker shades are lower intensity.

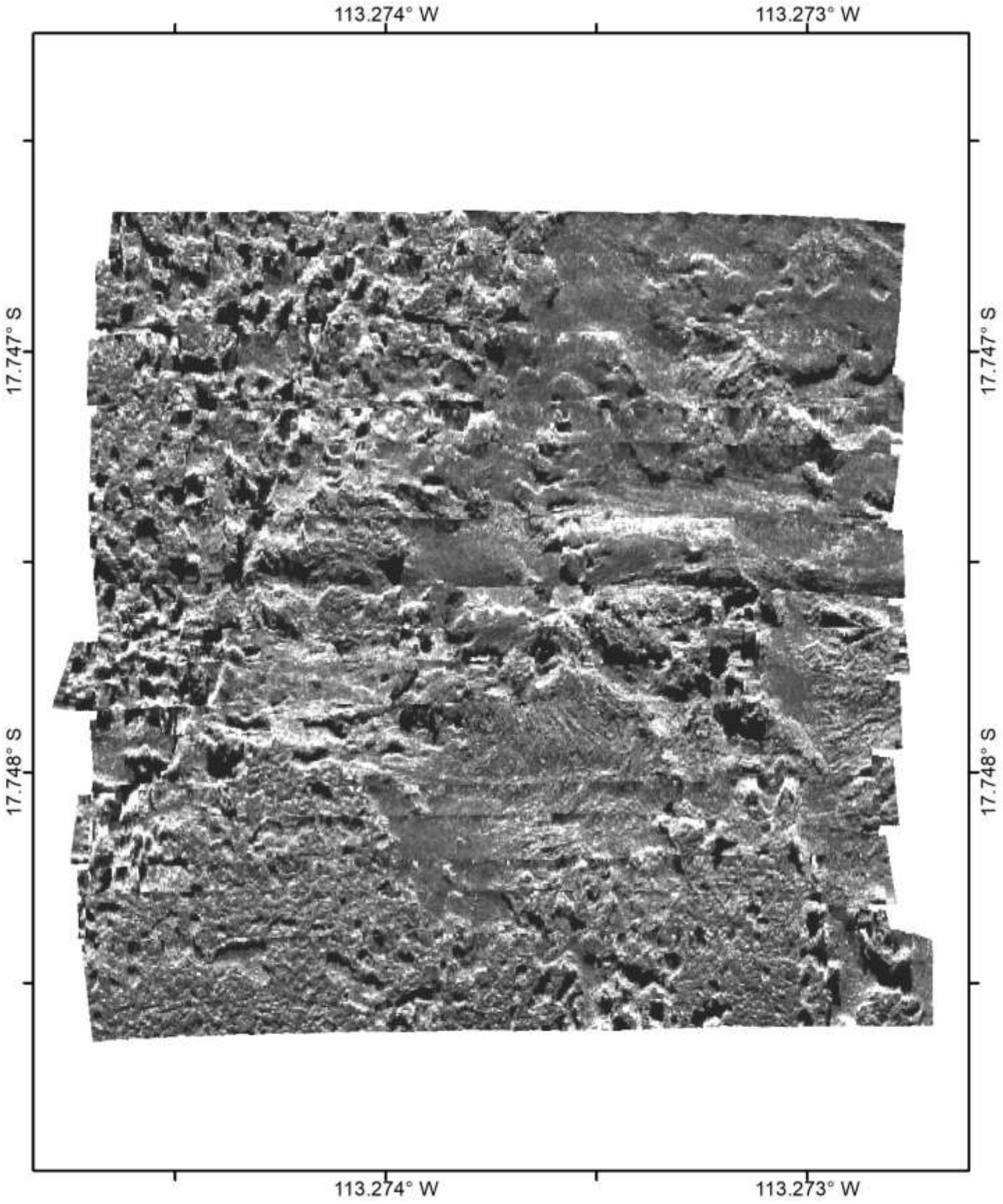


Figure SM52 - Sentry604 high-frequency side-scan mosaic. This is the combined mosaic for the southern photobox survey. Darker shades are lower intensity.

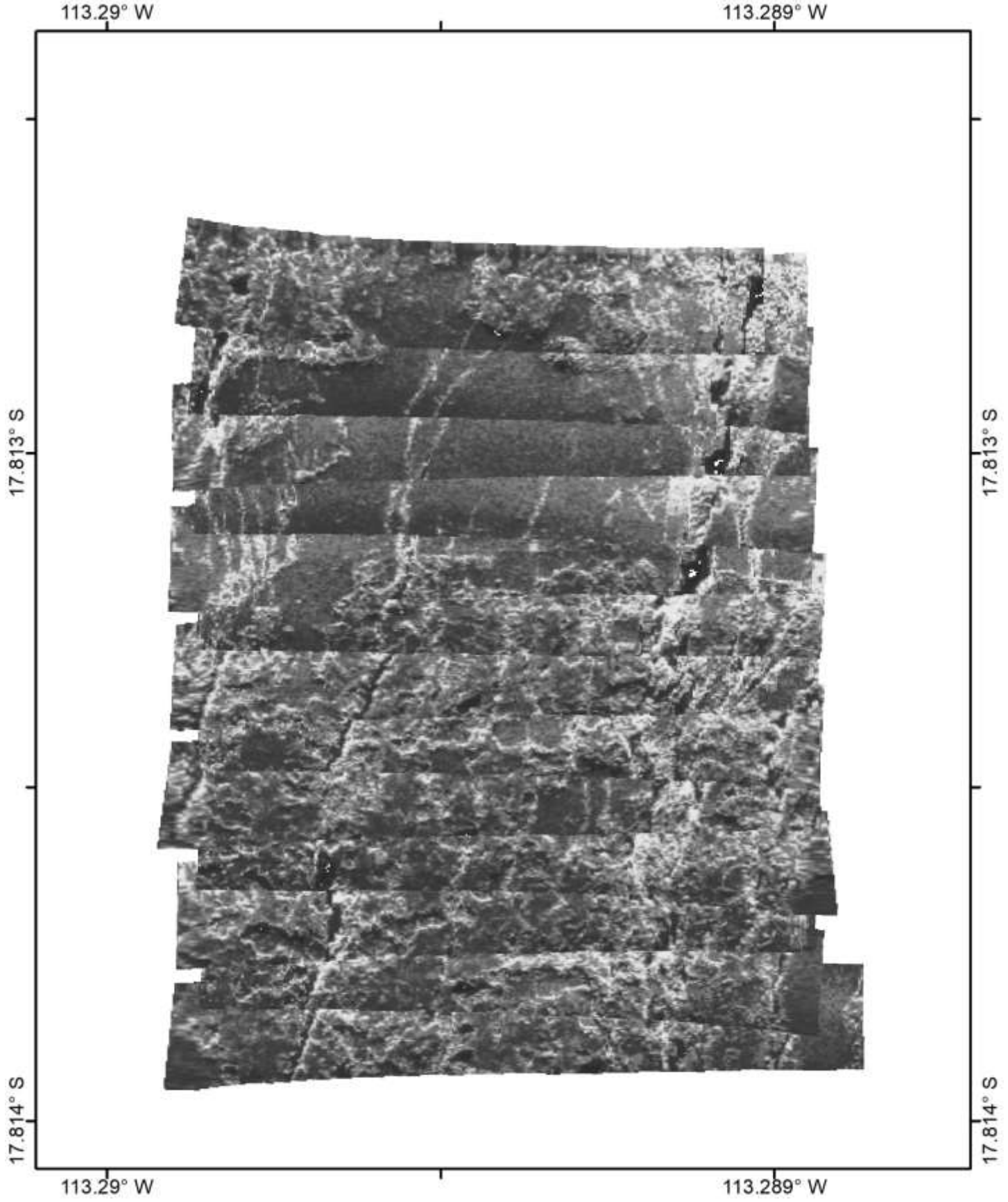


Figure SM53 - Sentry604 high-frequency side-scan mosaic. This is the North-look mosaic for the southern photobox survey. Darker shades are lower intensity.

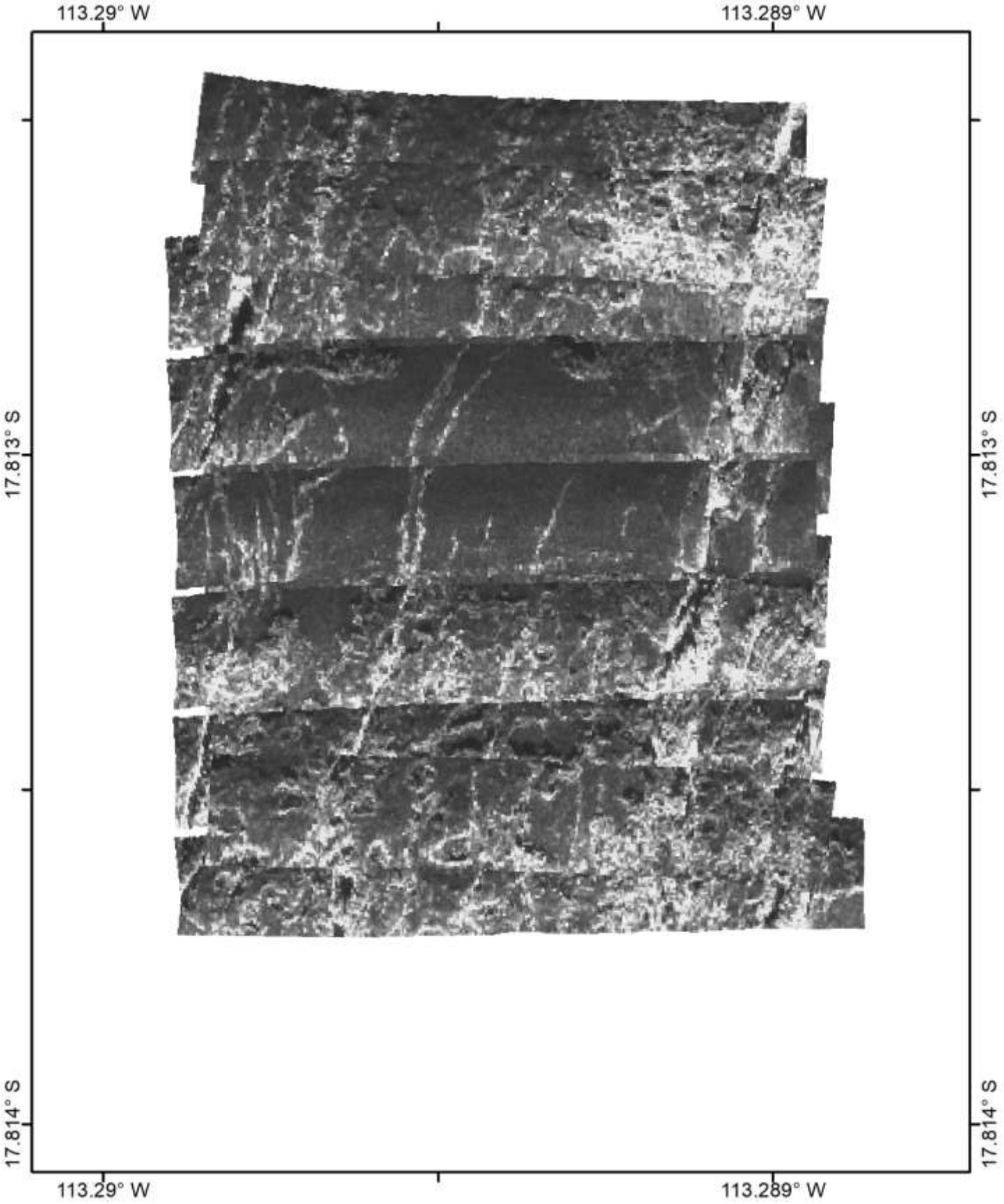


Figure SM54 - Sentry604 high-frequency side-scan mosaic. This is the South-look mosaic for the southern photobox survey. Darker shades are lower intensity.