

ST3ART FOLLOW-ON: FIDUCIAL REFERENCE MEASUREMENTS (FRM) - S3 LAND ALTIMETRY	Ref	NOV-FE-1464-NT-090	
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## 2 Campaign Log

LOCEAN maintains a mooring at 78°N 20°E, monitoring hydrography and currents. This mooring, however, did not include sea ice monitoring capabilities. The position of the mooring is relatively close to Sentinel-3 ground tracks. Although the mooring cannot be moved over large distances since it is part of a long-term monitoring setup, its position can be adjusted within a mile or so to the nearest track.

During the preparation phase, an IPS was acquired from ASL Environmental Sciences, and a frame was built in-house at LOCEAN to attach the instrument to the mooring line. A separate, short companion mooring was retained for technical reasons. The mooring was designed and prepared by A. Lourenco at LOCEAN in the spring of 2025.

A collaboration agreement was set up between CNRS and the University Center in Svalbard (UNIS) under which two staff members from LOCEAN (F. Vivier and A. Lourenco) embarked on the UNIS AGF-214 research cruise led by R. Skogseth, aboard R/V Helmer Hanssen from September 8 to September 16, 2025 (Figure 1, left). Under this agreement, LOCEAN contributes to the founding of an additional day of ship time for Storfjorden mooring operations.

The equipment (instruments, mooring line, weights, etc) was shipped from Paris on August 6, 2025, and arrived in Longyearbyen on August 26, 2025.

Norwegian Authorities delivered permission for mooring installation to the French Embassy in Oslo on August 27, 2025.

F. Vivier and A. Lourenco flew to Longyearbyen on September 3, 2025. The equipment was recovered and transferred aboard R/V H Hanssen. The ship departed on time on September 8, 2025. Prior to mooring operations, scheduled on September 13, F. Vivier and A. Lourenco participated in scientific activities onboard with UNIS students, as agreed.



Figure 1: Left panel: R/V Helmer Hanssen, Longyearbyen on September 8, 2025. Right panel: IPS on the ship deck.

The IPS mooring was assembled on the deck ahead of time (Figure 1, right). The IPS is programmed to operate between October 15 to June 15, and to switch to sleep mode during the summer period (June 15 to October 15) when sea ice is absent. With this operational cycle, the IPS is theoretically autonomous for more than three years before the batteries are depleted. A check of the programming of the instrument was performed as follows: the IPS was set to wake up for 12h on September 10, 2025 before going back to sleep mode. We could hear the dim ping noise on the instrument ceramics, indicating a proper wake-up and a correct programming.

The recovery of the LOCEAN mooring M1 started on September 13, 2025, at 6:30 UTC. Despite multiple interrogations, no response was obtained from the acoustic releaser. A rapid sonar survey showed that the mooring was still at its expected position. The release command was thus sent, but the mooring did not surface. The cruise leader (R. Skogseth)

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and the Captain agreed to attempt to drag the mooring. The maneuver proved successful, and the mooring was brought on deck at 9:00 UTC. The head of the mooring was covered with biofouling after 4 years at sea.

A bathymetric survey between the historical mooring position and the closest Sentinel-3 track position to the west was then performed. These observations enabled us to confirm the intended position for the IPS mooring at the crossover point of Sentinel-3 and IceSat-2 ground tracks, located 1 NM away. The new position of the historical mooring, shifted closest to the IPS point, was also decided (Figure 2, right).

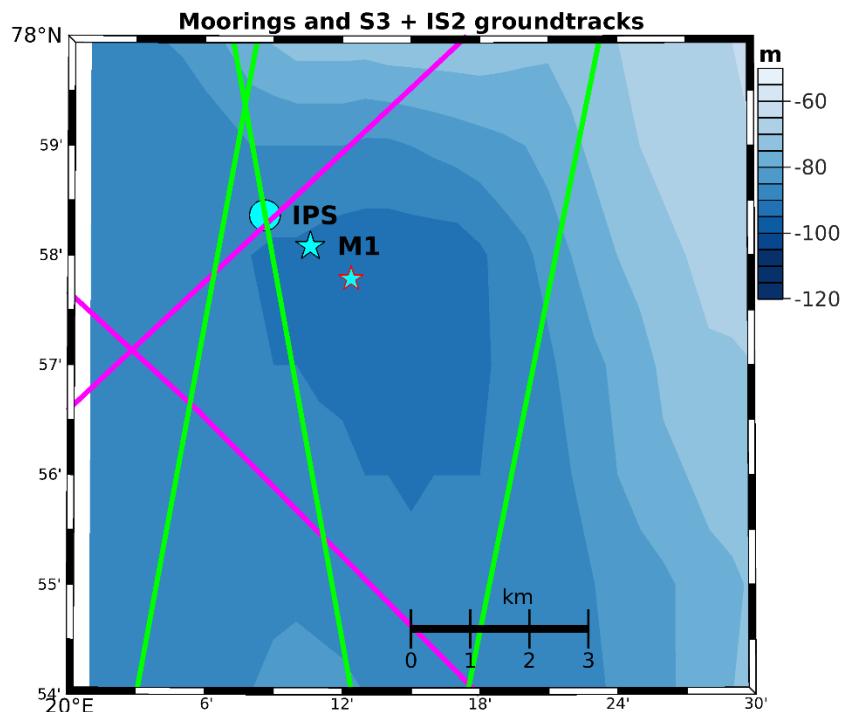


Figure 2: Left panel: Deployment of the IPS mooring. Right panel: IPS mooring position (circle), Sentinel 3 ground track (magenta), and IceSat-2 ground track (green). The former and new M1 positions are also shown (star).

The deployment for the IPS mooring was scheduled at 21:00 UTC (Figure 2, left). The historical mooring M1 was refitted and assembled on deck in the intervening time. The IPS mooring was deployed headfirst from the back of the ship and gently dragged into position. The anchor was released at 22:15 UTC at the target position. The deployment of the historical mooring followed smoothly using a similar maneuver (headfirst). The anchor was released on the target point at 22:59 UTC.

The mooring positions are as follows:

- IPS: 77° 58.366' N, 20° 08.602' E (deployed on September 13, 2025, 22:15 (UTC)).
- M1: 77° 58.086' N, 20° 10.599' E (deployed on September 13, 2025, 22:59 (UTC)).

The ship arrived in Longyearbyen on September 16, 2025, at 14:00 UTC. LOCEAN equipment was temporarily moved to UNIS storage facilities before being shipped back to Paris. F. Vivier and A. Lourenco departed Longyearbyen on September 18, 2025.