Short Cruise Report

RV Pelagia

Cruise 64PE546

Texel – Texel

09-07-2025 – 16-07-2025

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1. Research expedition objectives

Research expedition 64PE546 was carried out in the framework of the NoSE (North Sea Atlantic Exchange) project funded by NWO (OCENW.XL21.XL21.075). In the NoSE project we aim to constrain the past, present and future exchange of carbon and other essential nutrients between the North Sea and the Atlantic Ocean.

Project rationale

Continental shelf seas are dynamic regions with high biological primary production (15-30% of the global total), efficient carbon pumps, and intense water-sediment coupling. Therefore, even though shelf seas represent a small fraction of the ocean's surface area (<10%), they are disproportionally important in global nutrient and carbon cycles and play a crucial role in the coupled ocean climate system by virtue of their high CO_2 uptake capacity. The North Sea is a highly productive continental shelf sea and a globally significant CO_2 sink. However, the processes that govern the transport and eventual fate of carbon and associated major and trace nutrients (i) cycling and burial in North Sea sediments and (ii) their transport into the Atlantic Ocean are poorly constrained. This lack of understanding restricts our ability to predict the responses of North Sea biogeochemistry, biological productivity and CO_2 uptake to ongoing environmental change and anthropogenic pressures (particularly important due to its proximity to densely populated coastal areas and intensive use), as well as the consequences of this response for the surrounding Atlantic Ocean. It is therefore essential to quantify the processes that export carbon from the North Sea more accurately, and their drivers and variability, because each export pathway is likely to respond differently to future environmental change. In NoSE we focus on the Norwegian Trench, recognizing it as the main export route of North Sea carbon and nutrients into the Atlantic Ocean and the most important area of sediment accumulation. Acting as the final filter for waters flowing out into the Atlantic Ocean and as a major depositional area, biogeochemical cycling and sediment deposition in the Norwegian Trench likely controls North Sea nutrient and organic matter budgets and export.

Objectives

Main objectives of the *RV Pelagia* 64PE546 expedition were:

- Monitor water column characteristics and particle fluxes through time. The recovery of three moored observatories that were deployed for during expedition 64PE534 in 2024.
- Determine how carbon and nutrient fluxes in North Sea waters are shaped by pelagic processes by collecting water column profiles with the CTD and water sampling.
- Calibrate sensors deployed on the moorings during CTD casts.
- Characterize seafloor sediment characteristics and megafaunal abundance using a tethered video platform.
- Collect sediment samples with box and multi corer for experiments to be carried out at NIOZ to study the impact of benthic processing on the transport and burial of carbon and nutrients in(to) the Norwegian Trench.

2. Research expedition narrative

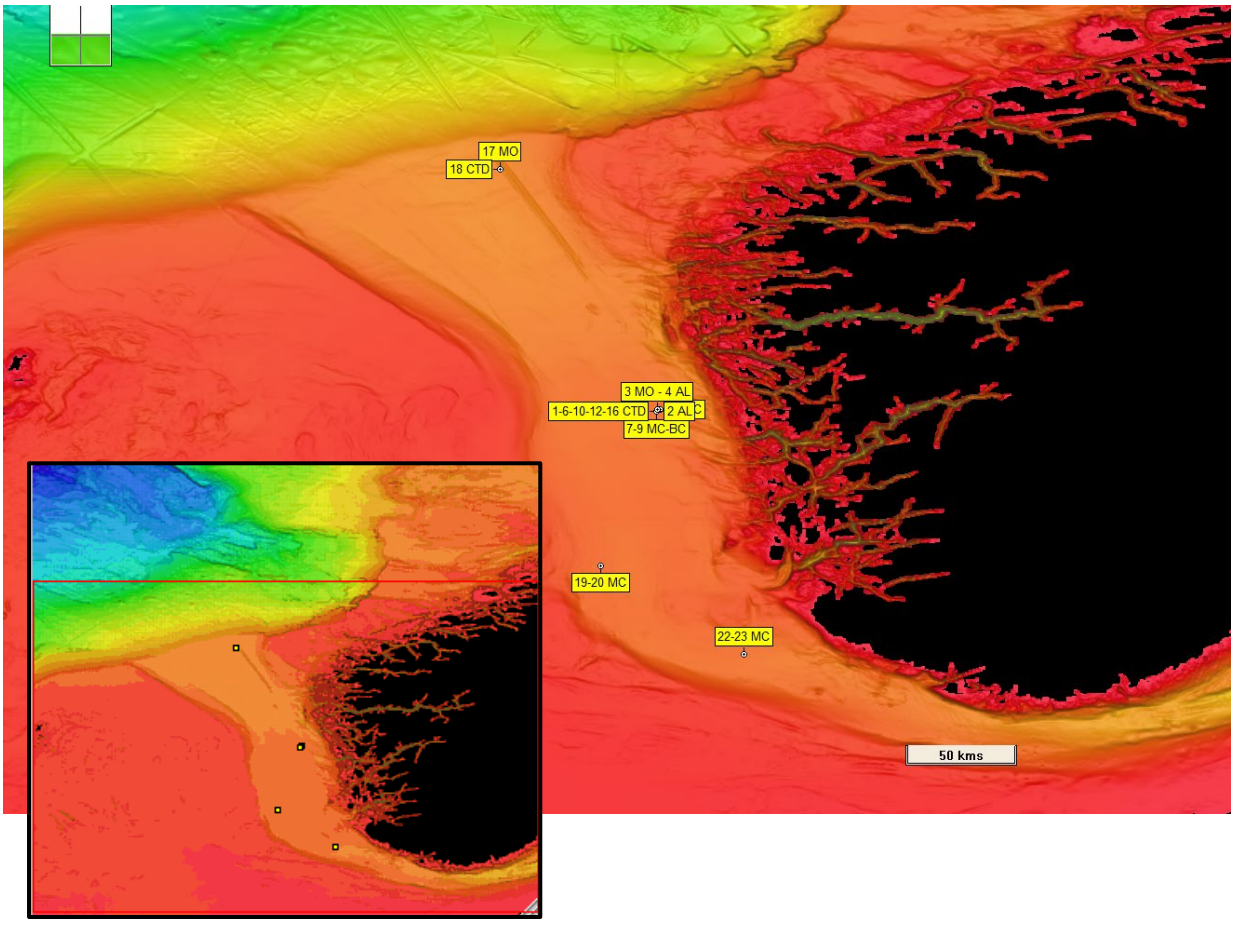
We left Texel in the afternoon of the 9th of July and arrived at the most southern mooring station on the 11th. Here the CTD rosette was deployed to collect water samples and data for a sound velocity profile. Followed by the successful recovery of a benthic lander and mooring. The next day was dedicated to CTD profiling at the mooring site. Every ~3 hours a CTD profile was made and water samples were collected during the upcast. Water samples were taken for suspended particulate (organic matter), pH, oxygen, total alkalinity, DIC, DOC and inorganic nutrients analysis. A video transect was made to characterise the seafloor and two box cores and a multi core were taken to collect sediments. During the afternoon the vessel experienced some technical issues and it was decided that the expedition had to be shortened. During the night we sailed to the second mooring station and the next day this mooring was successfully recovered. After recovery one deployment with the CTD-rosette was done for calibration purposes. After this we set sail to two stations in the southern part of the Norwegian Trench to collect sediment samples for experiments that will be carried

out at NIOZ and testing of a new type of lander system, followed by transit to Texel. In the morning of the 16th of July we arrived in the home port of Texel.

3. Station List and Activities

Date and time	Latitude	Longitude	Phase name	Device name	Action name	Depth|m
09/07/2025 13:41	52.9788	4.7492	None 0	None	CRUISE START	25
11/07/2025 13:24	60.3262	4.2952	STATION 1	CTD	BEGIN	297
11/07/2025 13:37	60.3262	4.2952	STATION 1	CTD	BOT	297
11/07/2025 13:55	60.3262	4.2952	STATION 1	CTD	END	296
11/07/2025 14:41	60.3628	4.298	STATION 2	Lander ALBEX	REC	296
11/07/2025 15:28	60.3787	4.2988	STATION 3	Mooring	REC	296
11/07/2025 16:44	60.3787	4.2982	STATION 4	Lander ALBEX	DEP	296
11/07/2025 17:25	60.439	4.3747	STATION 5	Multibeam	BEGIN	296
11/07/2025 19:09	60.4392	4.0635	STATION 5	Multibeam	COCH	299
11/07/2025 20:56	60.4312	4.3738	STATION 5	Multibeam	COCH	297
11/07/2025 22:47	60.4235	4.0775	STATION 5	Multibeam	COCH	299
11/07/2025 22:47	60.4235	4.077	STATION 5	Multibeam	COCH	299
12/07/2025 00:44	60.4158	4.3677	STATION 5	Multibeam	COCH	294
12/07/2025 00:44	60.4158	4.3682	STATION 5	Multibeam	COCH	294
12/07/2025 04:07	60.4005	4.3747	STATION 5	Multibeam	COCH	292
12/07/2025 05:19	60.3918	4.1722	STATION 5	Multibeam	END	297
12/07/2025 06:11	60.3708	4.2992	STATION 6	CTD with Samples	BEGIN	291
12/07/2025 06:20	60.371	4.2995	STATION 6	CTD with Samples	BOT	291
12/07/2025 06:50	60.3717	4.2987	STATION 6	CTD with Samples	END	291
12/07/2025 06:58	60.3683	4.2975	STATION 6	None	PHASE END	293
12/07/2025 08:00	60.3623	4.3	STATION 7	Boxcore d=300	BOT	292
12/07/2025 08:23	60.3622	4.3007	STATION 8	Boxcore d=300	BOT	292
12/07/2025 09:03	60.3622	4.2993	STATION 9	Multi Corer	BOT	291
12/07/2025 09:40	60.3713	4.2982	STATION 10	CTD	BEGIN	292
12/07/2025 10:26	60.371	4.3277	STATION 11	Tethered Camera	BEGIN	295
12/07/2025 10:32	60.3712	4.3275	STATION 11	Tethered Camera	START	295
12/07/2025 10:37	60.3715	4.3277	STATION 11	Tethered Camera	BOTTOM	295
12/07/2025 11:48	60.3848	4.3285	STATION 11	Tethered Camera	STOP	293
12/07/2025 11:57	60.385	4.3288	STATION 11	Tethered Camera	END	293
12/07/2025 12:22	60.3713	4.299	STATION 12	CTD with Samples	BEGIN	292
12/07/2025 12:29	60.3713	4.2988	STATION 12	CTD with Samples	BOT	292
12/07/2025 12:52	60.3713	4.299	STATION 12	CTD with Samples	END	292
12/07/2025 13:45	60.362	4.2995	STATION 13	Multi Corer	BOT	292
12/07/2025 14:08	60.3622	4.299	STATION 14	Tethered Camera	BEGIN	292
12/07/2025 14:08	60.3622	4.299	STATION 14	Tethered Camera	START	292
12/07/2025 14:21	60.3597	4.3002	STATION 14	Tethered Camera	STOP	292
12/07/2025 14:21	60.3597	4.3003	STATION 14	Tethered Camera	FAIL	292
12/07/2025 16:58	60.379	4.296	STATION 15	Lander ALBEX	REC	291
12/07/2025 17:12	60.3768	4.2965	STATION 16	CTD	BEGIN	291
12/07/2025 17:20	60.3772	4.2963	STATION 16	CTD	BOT	291

12/07/2025 17:35	60.3773	4.2967	STATION 16	CTD	END	291
13/07/2025 07:13	62.3308	3.0297	STATION 17	Mooring	REC	383
13/07/2025 08:16	62.3298	3.032	STATION 18	CTD with Samples	BEGIN	383
13/07/2025 08:25	62.33	3.0322	STATION 18	CTD with Samples	BOT	383
13/07/2025 09:35	62.3298	3.0325	STATION 18	CTD with Samples	END	385
14/07/2025 06:15	59.1177	3.8435	STATION 19	Multi Corer	BOT	272
14/07/2025 06:50	59.1175	3.844	STATION 20	Multi Corer	BOT	272
14/07/2025 07:20	59.1172	3.8445	STATION 21	Lander MINI	BEGIN	272
14/07/2025 07:30	59.1172	3.8448	STATION 21	Lander MINI	DEP	272
14/07/2025 08:11	59.1172	3.8445	STATION 21	Lander MINI	END	272
14/07/2025 14:35	58.4	5.0102	STATION 22	Multi Corer	BOT	302
14/07/2025 15:11	58.4	5.0098	STATION 23	Multi Corer	BOT	301
14/07/2025 16:33	58.402	5.002	STATION 24	Lander MINI	BEGIN	300
14/07/2025 16:50	58.402	5.0003	STATION 24	Lander MINI	DEP	300
14/07/2025 17:23	58.4018	4.998	STATION 24	Lander MINI	END	300



Map with sampling stations visited during the 64PE546 expedition.

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