AlterEco mission #1: Cruise report
RV Princess Royal 5th-6th November 2017

1. Project overview:

An Alternative Framework to Assess Marine Ecosystem Functioning in Shelf Seas (AlterEco)
The overarching aim of AlterEco is to develop a novel monitoring framework to deliver improved spatio-temporal understanding of key shelf sea ecosystem drivers. To achieve this, AlterEco will use marine autonomous vehicles to provide long-term, multi-variable ocean measurements that will help develop greater understanding of the physical and biogeochemical functioning of the continental shelf system. The project will enable a series of missions over a 14-month period with multiple vehicles on a region in the North Sea that undergoes considerable spatial and temporal variability.
The project has the following deliverables:

1. utilise the latest autonomous technology to provide sufficiently high temporal and spatial resolution of meso and sub-mesoscale processes to better understand the impacts of inter-annual variability on the functioning of the shelf sea ecosystem,
2. provide the tools necessary for informing operational forecast models of the stressors on and consequences of the environmental status of shelf seas,
3. provide a modular, integrated framework for an efficient, diagnostic monitoring regime for continental shelf seas that has global transferability.

2. Personnel on board:

Crew: Neil Armstrong (captain), Barry (engineer), Liam Rogerson (CTD support).
Science personnel (affiliation): Matthew Palmer (PSO, NOC), Charlotte Williams (NOC), Steve Woodworth (NOC), Matt Toberman (SAMS), Gareth Lee (UEA), Tom Hull (UEA/CEFAS)

3. Cruise objectives:

This is the first of 8 planned AlterEco deployment/recovery cruises. The cruises play two critical roles within the project,

1. to provide a suitable platform for the deployment and recovery of marine autonomous vehicles as close to the operational area as possible.
2. to enable the collection of supporting data to permit accurate calibration of sensors included on the deployed and recovered vehicles.

Two submarine gliders were to be deployed on this mission, reference numbers SG537 and unit194,

- SG537: Seaglider operated by the University of East Anglia.
    - Planned transect between waypoints WPW (56°12’N 1°30’E) and WPE (56°12’N 2°30’E), which has an approximate distance of 62km.
- Unit194: Slocum Coastal glider operated by the National Oceanography Centre.
    - Planned transect between waypoints WPN (56°24’N 2°0’E) and WPS (55°24’N 2°0’E), which has an approximate distance of 111km.

Transect and waypoint locations are shown in figure 1.

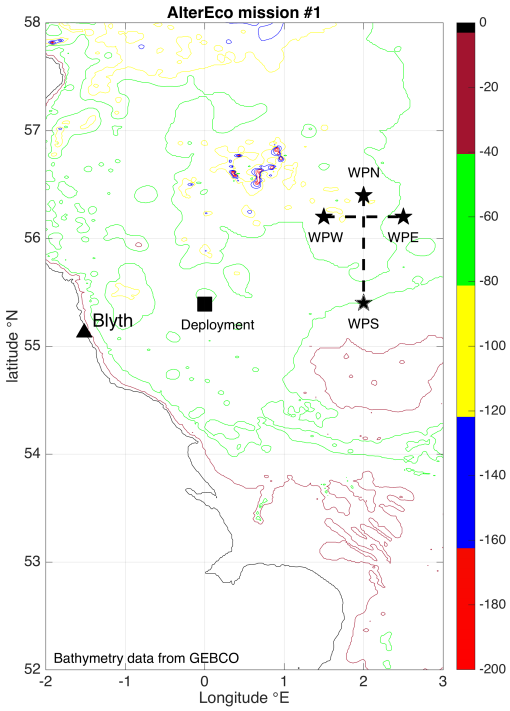

Figure 1: Deployment and waypoint positions. Bathymetry (metres depth) indicates the coastline in black.

4. Cruise narrative (all times GMT):

Sunday 5th November:

The vessel was loaded ready for sailing early Monday. The vessel is moored against a floating pontoon due to there being a high local tidal range, which can be in excess of 5m. The vessel is easily accessible having gated access to the quayside and is secure. Free parking is available at the Marine Station.

Low tide meant the deck HIAB was required for loading the ship. This worked fine with the gliders although some consideration might need to be made to improved use of strops with the Slocum glider trolley, which is poorly suited to this type of lifting. Other equipment was loaded via the HIAB using provided loading bags. This worked well and enabled speedy mobilisation. During low-tide, access to the mooring pontoon is steep and so carrying of equipment is not recommended. With the ease of use of the HIAB crane and availability of loading bags it is suggested loading of all equipment is always managed in this manner.

Monday 6th November

0600: left Blyth for designated deployment site 55°40'N 0°0'E, a distance of approximately 60NM. The sea state was moderate with wave heights approaching 1.5m. Progress was good, with the vessel traveling at approximately 17 knots. Due to the catamaran style of the vessel however this made travel uncomfortable. Some work was attempted in preparation ahead of deployment during transit however, in hindsight this was not wise as it contributed to seasickness. For future trips all preparation work that can be done before sailing should be done the day before. Equipment was well secured but less equipment on board would have provided more space, so any equipment or storage boxes not required should stay ashore.

0940 55°40'N 0°0'E On station for deployment.

1028 55°38.099'N 0°0.526'W depth 73.0m. Deployed SG537 using HIAB deck crane. Glider was deployed via the port side and required manual handling to safely deploy. Limited deck space on the port side of the aft deck made this tricky. Suggested method is to run through the pick up and transfer to the side of the vessel prior to lifting. Suggest 4 people to handle the glider in pairs during two stages, one stage lift and one stage over-the-side.
1100 55°37.713'N 0°0.866'W depth 71.4m. Deployed Slocum unit194 using the same procedure as the seaglider. Unfortunately the fastner to the securing pin on the quick release broke and made deployment slightly more difficult than planned but the glider was deployed successfully on the first attempt.
1146 55°38.329'N 0°1.356'W, depth 73.0m. Calibration CTD001 deployed.
1202 CTD001 on deck. Due to not having a deck unit available the CTD was fired using automatic settings. Unfortunately on this occasion the bottles failed to fire.
1217 55°37.803'N 0°1.969'W, depth 73.6m. Calibration CTD002 deployed.
1233 CTD002 on deck. All 6 bottles successfully fired.
1300 Off station
1733 Arrived back in Blyth

Data collected:

Station	1	CTD No	CTD002	Date	6/11/2017
Latitude	55 38.329'N	Event No	6	Time I/W (GMT)	12:17
Longitude	0 01.356'W	Depth	73.6	Time bottom (GMT)	12:22
Filename	AE1_CTD002	Cast Depth	60M	Time O/W (GMT)	12:33

Comments: No on-deck CTD system for real-time firing. Niskin bottles fired by presetting time, exact depth not known so estimated.

Fire Seq	*Rosette Pos^{n}*	*Bot. No.*	*Depth (m)*	*Time (GMT)*	*DO*	*Chl*	*Nuts*	*SPM*	*Sal*	*Lugol's*
1	1	1	~60m	12:35	**yes**	**AE1**	**AE001**		**2351**	**18**
2	2	2	~60m			**AE2**			**2352**	
3	3	3	~60m			**AE3**		**11,13,17**		
4	4	4	~10m		**Yes**	**AE4**	**AE002**		**2353**	**2**
5	5	5	~10m			**AE5**				
6	6	6	~10m			**AE6**		**6,12, 20**		

5. Post cruise debrief:

CTD issues:

- The deck unit had been returned for repair and not yet been returned. Such information needs to be communicated to the PSO as early as possible as solutions are often achievable if suitable time is available. In this instance, the information was received too late to source a replacement unit.
- The CTD rosette and instrumentation is not currently being maintained to an appropriate standard. The CTD itself is not being washed through with distilled water after use and before storage. There is therefore a risk of rapid corrosion of the conductivity cell contacts and likely drift from factory calibration. The Niskin bottles

and firing mechanism is also at risk of failure if maintenance and storage routines aren't improved.

Deployment related issues:

- Longer strops might have made deployment easier by providing greater distance between the crane and gliders. These will be brought along next time.
- A pole for fending the glider off the ships hull would have been useful. MARS to provide a 'man overboard' pole for next cruise.
- As mentioned, the pin release broke. Steve to get some pin rings welded in place for next deployment.
- Conditions would have made recovery difficult. Future missions should include a recovery net for this purpose. MARS to supply.

Other comments:

- Working at the end of the aft deck is difficult due to maximum movement in swell. Rosette to be brought closer to ship's centre for sampling.
- The CTD rosette can tip during sampling. To be tied down before sampling.
- Holding position during sampling seemed most comfortable. PSO to discuss with captain.
- Filtering is not possible whilst underway. With this in mind it is suggested to leave all filtering kits at base for filtering later. Fixing can be managed at sea but was difficult.
- Sea sickness was an issue for a number of people. This is a small vessel and the hull type makes transit very bumpy. Science crew should not expect to do any work during transit and should find a secure and comfortable place to sit to avoid falling.