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Challenger 36/88

16-30 September 1988

Cruise Report

This, the second process study cruise of the North Sea programme, began amid a certain amount of media interest generated by concern about pollution in the North Sea. The ship was visited by journalists from BBC Radio 4 and the BBC world service on 15th September and a film crew from Anglia TV on 16th September.

The scientific programme commenced 20 00hrs GMT on the 16th September with the first of 89 CTD casts which were completed during the course of the cruise. On the following day (17th September) the newly purchased RVS SEASOAR system was deployed for the first time under the supervision of Mr Vince Lawford of Chelsea Instruments. Two SEASOAR legs were successfully completed during the course of Saturday 17th and the early hours of Sunday 18th. These SEASOAR legs afforded the opportunity for Bill Miller and Robin Powell of RVS to be familiarised with the techniques of launching, towing and recovering SEASOAR. On Sunday 18th September, Bill Miller and Vince Lawford were landed at Whitby by boat exchange and Dr. Paul Lindon from the University of Cambridge joined the ship. A film crew from ITN Channel 4 also joined the ship at this time and filmed aboard for about 3 hours. The film crew were shown the launch and recovery of the profiling CTD system, SEASOAR, and Decca recording drifting buoy. Their film has since been shown on channel 4 news. After the film crew left the ship, Challenger proceeded to Mooring station C where an upward looking ADCP mooring was deployed for the Proudmen Oceanographic Laboratory; bad weather had prevented its deployment on the previous survey cruise.

During the course of Monday 19th and Tuesday 20th September a CTD survey was conducted with the aim of broadly mapping the Flamborough Head frontal system. Once the broad survey was complete, a section was singled out for more intensive survey in preparation for the deployment of Decca recording drifting buoys. To this end, on the morning of Wednesday 21st September SEASOAR was launched and sampled a 25 mile long section perpendicular to the front. This was followed in the afternoon by the deployment of 7 drifting buoys staggered across the section with a separation of 5 miles and drogued at 15m depth.

3 Upon successful deployment of the buoys, Challenger proceeded northwards where an intensive SEASOAR/ADCP survey was conducted on a short section about 10 miles north of the buoy deployments. The section was repeated 10 times over a period of 13 hours (one tidal cycle). A site was selected from this section (on the mixed side of the front) and early in the afternoon of Tuesday 22nd September, the first release of rhodamine dye took place. After waiting two hours for the dye patch to disperse the ship steamed through the dye patch mapping its distribution with a fluorometer in the non-toxic flow through system. The vertical distribution of dye in the water was measured using a rhodamine sensitive fluorometer incorporated in the CTD package. A second rhodamine dye release was made early on Friday morning in stratified water and was surveyed with CTD and surface fluorimetry. A third dye release took place at 1400 hrs on the same day but sampling was abandoned at about 1600 amid steadily worsening weather conditions (Gales 8-9).

The ship made slow headway in bad weather overnight to Whitby where a boat transfer had been arranged to land Dr. Paul Lindon. The poor weather, however, prevented the transfer and the opportunity was taken to conduct a CTD survey to map the position of the front near the coast. SEASOAR was deployed later that night and passed through the coastal frontal

region to Whitby where the boat transfer finally took place at 11 a.m. on Sunday.

Challenger steamed from Whitby to the location of a CTD transect through an intended fourth dye release site. On passage we attempted to locate two drifting buoys. These were located using UHF and VHF direction finding (DF) systems although they were not located visually as it was dark and both flashing lights had apparently failed. A third drifting buoy, however, (with flashing lights) was also seen.

On Monday 26th September a CTD section was completed but gales prevented the intended dye release. It was found previously that bubbles introduced into the non-toxic system during rough weather seriously corrupted the rhodamine fluorescence signal. Gales also would make rapid surveying and CTD profiling of the dye patch very difficult. Instead of a dye release, therefore, a 13 hour (tidal cycle) ADCP survey was conducted on a short part of the CTD transect which had just been completed. We also learnt on Monday 26th that one of the drifting buoys had been recovered by the gas rig tender "Putford Guardian" as it was in danger of becoming fouled on the Esmond field gas rig.

In view of poor weather forecasts for the remainder of the week, a fine weather window on Tuesday 27th September was used to recover drifting buoys. Of these, 5 were successfully recovered. The search for buoy 4, for which there had not been a recent Argos Fix, was rather more protracted however. It was finally located using the DF systems late on Tuesday night. Challenger stood by overnight and the buoy was recovered at first light the following morning (Wednesday). A further 13 hour SEASOAR/ADCP survey of the front began on Wednesday morning but SEASOAR had to be recovered after only limited sampling due to deteriorating weather (force 8 gale). The ADCP part of the survey continued, however and as poor weather prevented any further overside operations the ADCP legs continued for a period of 26 hours (two tidal cycles). When the weather finally abated a CTD section was undertaken across the region of the previous ADCP transect on Thursday afternoon, scientific work ceased and the ship made passage to Great Yarmouth arriving at midday on Friday.

In spite of problems with the weather the cruise achieved most of the scientific goals to some degree. A notable success was the extensive use made of SEASOAR in the shallow waters of the North Sea. This instrument has enabled us to obtain very detailed pictures of the structure of the Flamborough front and we have been able to study temporal variability of the system because of the rapid survey coverage that this instrument makes possible. The assistance of Robin Powell in running SEASOAR (particularly after his rather limited period of familiarisation with use of the system during the early part of the cruise) is gratefully acknowledged. The confidence of those of us who used the system greatly increased during the course of cruise 36 and I regard it now as an essential item for my future cruise to Flamborough front. Despite the utterances of a good many prophets of doom the system can be used to obtain excellent data in the shallow waters of the North Sea provided that suitable care and precautions are taken.

The decca recording drifting buoy systems also proved themselves admirably on this cruise. All recovered buoys had successfully recorded decca data. The feasibility of recovering a large number of buoys has been demonstrated.

The dye release experiments were also very successful, limited though

they were. Despite our early reservations, rhodamine patches can be satisfactorily surveyed from a vessel the size of Challenger given suitable weather conditions. The use of a rhodamine sensitive fluorometer in the CTD package is also a particularly promising technique for measuring vertical mixing rates. It was however, extremely frustrating that poor weather limited rhodamine work to only three releases. It is equally frustrating that more use could not be made of SEASOAR during the second week of the cruise because of bad weather. Throughout the periods of poor weather the ship continued to work on some of our lower priority experiments so that little scientific time was actually lost during cruise 36. It is fair to say, however that some of our highest priority work (rhodamine and SEASOAR) was rather badly hampered by poor weather.

On the whole the equipment used during cruise 36 performed well although there were some difficulties. It should be noted that the CTD wire out repeater in the main lab still does not function.

The most disturbing problem encountered was noisy data resulting from air bubbles in the non-toxic flow through system. Although we initially attributed this to rough weather the problem seems to have persisted.

Early difficulties with repeated crashes of the ADCP system were eventually accounted for by a software problem in connection with the use of high ping rates necessary for increased accuracy in shallow water.

Two drifting buoys (6 and 4) gave reduced argos fixes. These appear to result from problems with argos PTT's in these buoys and arrangements have been made for both to be examined by John French at Lowestoft. In all three flashing lights failed on the drifting buoy system; one due to a bulb failure, one to a reduced voltage battery and the third light leaked. The transmissometer on the CTD package failed two days before the end of the cruise but this was not a primary parameter for the present study.

The logging and processing of data by the ships computer was satisfactory. There were, however, a small number of crashes of the level B part of the system; this did not, however, cause undue difficulty. There was one more serious breakdown of the level B on Wednesday 28th which lasted several hours. During this time, however, the ship was engaged in an ADCP survey and we were not attempting to log CTD or SEASOAR data so this downtime did not significantly affect the scientific programme. Kay Batten is to be commended for keeping on top of producing contour plots of the large amounts of SEASOAR data that was generated.

In conclusion I would like to express my thanks to Captain Long and his crew for their excellent service during the cruise. Thanks also go to the support staff from RVS, Bill Miller, Robin Powell and Kay Batten as well as to members of the Menai Bridge and Cambridge teams that made this such a profitable cruise.

AE Hill