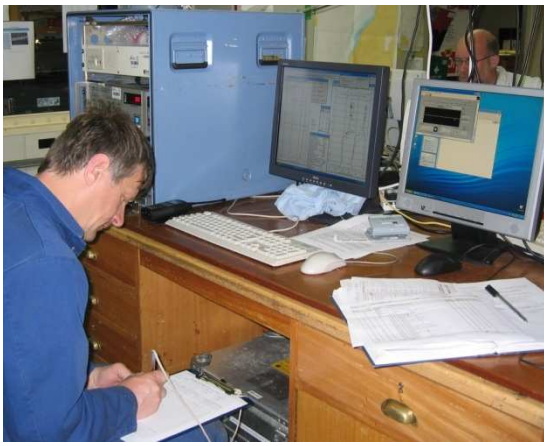
Friday 24 April 2009 JD 114

We're beginning to adapt (as much as one ever does) to the routine of working very 'unsociable' hours. Arriving in the laboratory at 02:30, I prepare for the two CTD casts, checking that the weather isn't too rough to deploy anything over the side, that the ship is in an area of high SF_6 concentration, that we are less than



3km from the nearest drifter buoy which is sending its GPS position to the ship, and that the scientists who have requested it, have an early morning wake up call. John Wynar and the CTD team prepare the sensors and water bottles on the CTD, check with the bridge that it is safe to deploy, and monitor the computer display of the measurements made by the CTD sensors – temperature, salinity, dissolved oxygen, light transmission (an indication of the amount of particles in the water) and fluorescence (an indicator of plankton biomass), which are plotted in real time as the CTD package descends in the water (see photo 1). The scientists arrive in the laboratory in time to prepare for sampling or to calibrate their instruments prior to sampling. Some arrive in a fanfare of hyperactive excitement, while others quietly prepare themselves for the melee that will occur once the CTD is on board. Our position is 21^{o} 00.59 N 17^{o} 27.91 W. The water depth is 88m, sea surface temperature is 16.8^{o}C, air temperature is 17^{o}C, salinity is 36.17, and the chlorophyll fluorescence is 0.83 ugl^{-1}. The 1% light depth is approximately 40m and winds are light (15 knots) and from the north. We're following the buoys and SF_6 patch as they move in a south westerly direction, at a speed of approximately 0.5 knots. Today we successfully completed 2 CTDs before 04:00, one at 09:00, one at 12:55, and one at 19:16 as well as deployments of the optics rig, turbulence probe and plankton nets. Together, we are addressing three major scientific objectives, and each of these requires sampling at a particular time of the day, or with a particular type of instrumentation. The mid day CTD will be the time when we collect the deepest water, that with the highest concentrations of the climate relevant gases produced by bacteria such as nitrous oxide and methane. These bacteria thrive in low oxygen so we monitor the oxygen concentration measured the CTD as it is lowered through the water column depths to sample with the water bottles where Once back on board, Andy Rees and Ian Brown

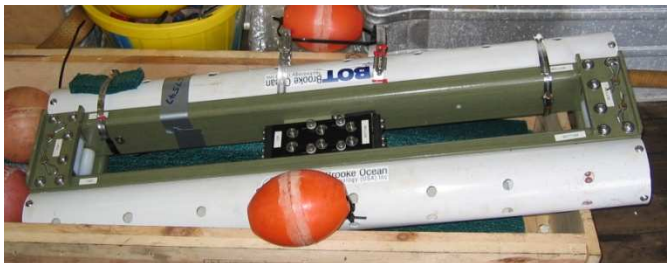
conditions, and by the sensor on and choose the oxygen is low. carefully siphon the water into sample bottles and analyse it using a gas chromatograph with flame ionisation and electron capture detectors (see photos 2 and 3).

Saturday 25 April 2009 JD 115

Day 3 of Lagrangian sampling in the SF_6 patch. Our position is 20^{o} 52.08 N 017^{o} 37.06 W, sea surface temperature is 17.2 ^{o}C, air temperature is 18 ^{o}C, chlorophyll fluorescence has increased to 0.63 ugl^{-1} and winds are light (15 knots) and from the north. Slight delay to the CTDs this morning, as despite surveying the SF_6 concentrations overnight, and monitoring the drift of the buoy in relation to the drift of the SF_6 patch, we

found that the drift of the buoy and the patch had diverged. When we returned to the buoy for the start of the CTDs at 03:00 we found there was no measureable SF_6. We began a circular search for SF_6 around the buoy and found some to the north of the buoy where we deployed the pre-dawn CTDs. 'Finding the patch' has become my nightmare horror movie, as the pressure to interpret the movement of the boat in relation to the buoy in relation to the SF_6 patch over the previous 8 hours quickly enough to predict where the ship should be at 03:30 and have it there by 03:30 is quite intense and involves a substantial dose of luck and magical power.

On completion of the early CTDs, we realised that the buoy that supports the wire walker was diverging in its path from the other buoys and the patch. We predicted that if we didn't recover this buoy during the daylight hours of today, we may not have sufficient time to diverge from the experimental path long enough to recover it at all. So, we planned to search for the wire walker buoy, recover it at first light, and return to the SF_6 patch in time for the 09:00 CTD. Easier said than done ! First we had to predict where it might have travelled since the last time it communicated its position to us – and since it had diverged from the path of the other buoys, we couldn't use these as indicators of the speed and direction of its travel. Of course, these things always happen at the dead of night. To get the latest Argo position of the buoy, we had to wake Dan Comben for access to a satellite phone card, and Des Barton in Vigo to access the Argo website (apologies to the Barton family for our very early Saturday morning wake up call), and to plan and prepare for the recovery of the wire walker buoy we had to wake the boat and NMF-SS teams. With a great deal of help, especially from John Leask (Chief Officer), we found and recovered the buoy and wire walker (see photo 4) and dashed back to the SF_6 patch. However, inevitably, we were later than planned and we delayed the 09:00 CTD by 2 hours. This was unfortunate as it disrupted people's shift length and sleep patterns, and in the time between the early morning CTD and this one, we had crossed the 100m contour and were now in 380m water. In addition, the buoy and SF_6 patch were still disconnected and so searching for high enough SF_6 concentrations close enough to the buoy for the bridge to stay a specific distance and direction off it for the rest of the day with the increased pressure of time was problematic.



We caught up some time by cancelling a turbulence probe deployment and the nets, but still completed four turbulence probe deployments (see photo 5), and an optics rig deployment before redeploying the wire walker and commencing the overnight SF_6 survey at 19:48.