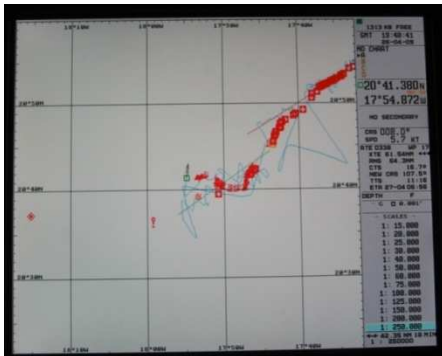


Sunday 26 April 2009 JD 116

This morning's position is 20° 41.85 N 17° 47.00 W, chlorophyll fluorescence is 0.79 $\mu\text{g l}^{-1}$, the water depth is 506m, sea surface temperature is 17.1°C, and salinity is 36.21. Claire Widdicombe (see photo 1) and the underway chlorophyll team have provided a preliminary calibration of the fluorometer connected to the surface seawater supply. Plankton chlorophyll = (fluorescence / 0.122) - 0.1561, which suggests that the chlorophyll concentrations we measured at the first few stations on the shelf and near the source of the upwelled water were as high as 10 $\mu\text{g l}^{-1}$ – about an order of magnitude higher than is usual for temperate North Atlantic waters. The winds are northerly and have increased to 25 knots, with a Force 7 predicted for later today. The drifter buoy turned south during the pre-dawn CTD deployments, seeming to follow the 500m depth contour. The maximum depth at which chlorophyll occurred deepened from 60m during the 03:30 CTD to 100m during the 04:45 CTD suggesting we were drifting across a frontal feature, despite both casts being within the SF₆ patch. By 10:20, the buoy was moving westwards again (see photo 2 – a photo of the navigation display on the bridge – the red markers are the drift of the central buoy, and the blue lines are the track of the ship as we survey around the buoy at night and follow closely alongside it during the day). The SF₆ patch is downstream (southwest) of the buoy and is easily detectable at 154,000 'magical units' against a background of about 6,000 magical units. During the day, our deployments of CTD, nets and turbulence probes mean that we are 'on station' or drifting with the current for 3 hours or more without real time SF₆ measurements to allow us to reposition in the patch between deployments. We therefore positioned the ship downstream of the patch and allowed it to drift towards us, rather than chasing it all day. The prediction of the movement of the patch has been sufficiently accurate today to allow this strategy to work very well, but the oscillating changes in course of the buoy from west to south (and even north on occasion) will mean this will not work every day.



Unfortunately during the night, a power failure led to problems with a number of instruments. The -80°C freezer warmed up by at least 15°C, with the possible loss of all the samples stored so far – including samples for viral abundance and plankton community structure.



An amazing display around the ship by a pod of pilot whales kept everyone entranced this afternoon (see photos 3, 4 and 5 courtesy of Mike Hood).

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Unfortunately this was followed by the realisation that we had lost contact with the wire walker buoy again, and so we cancelled the sunset CTD and went looking for it. Despite several helpers scouring the horizon for the lost buoy, we didn't find it and had to make the difficult decision to stop searching at 21:00 and resume the overnight SF₆ mapping to enable the experiment to continue tomorrow. We held a wake for the wire walker, remembering the excellent data it had provided for us and the old adage that 'if you deploy anything over the side you shouldn't expect to get it back'.

Monday 27 April 2009 JD 117

Today is Rachael's 30th birthday, and the lab was suitably decked out with confetti, balloons, cards, pressies and poster sized birthday greetings for the occasion (see photo 6). Our position is 20° 40.36N 17° 54.21 W, water depth is 677m, surface temperature is 17.2 °C, salinity is 36.23 and surface fluorescence has decreased to around 0.4 ug l⁻¹ (or 3 ug l⁻¹ using the preliminary calibration). Without the wire walker buoy (#7547) as a central marker, we are now following buoy # 2881 which was previously a few km north of buoy #7547, but conveniently crossed the predicted path of #7547 yesterday and so is now our best marker of the SF₆ patch. Buoy #5988 decided yesterday to emulate the London marathon and travelled 40k (about 26.2 miles) due west, and a fourth buoy #2879 is to the south of us. We surveyed as far west as buoy #5988 last night which meant having to travel over 50km each way and reduced the number of north/south transects we could make across the patch, which we believe to be only 3km wide. SF₆



concentrations around the buoy for the first CTDs of the day are around 15,000 magical units, still sufficiently above background, though the thin 'streaky' nature of the patch means that the SF₆ varies at least 10 fold in the vicinity of the buoy.

We completed CTDs at 03:30, 04:36, 09:01 and 12:34, an optics rig deployment at 12:30 from which the 1% light depth was calculated to be 43m, and deployments of nets and the turbulence probe. Carol, Andy, Phil, Tim and Riqui met to assess progress and propose any changes to the sampling strategy, including predicting how long the SF₆ patch would last and what we would do when we could no longer measure it. Possible changes included picking up and redeploying a buoy in the centre of the patch every morning instead of following the same one, reducing 'on station' activities to give more time for mapping e.g. moving the head to wind atmospheric sampling to earlier in the day, and increasing the temporal coverage of SF₆ mapping.

We decided to continue to follow the same buoy to provide the physical context to the experiment, and to investigate ways of reducing 'on station' time and increasing SF₆ mapping time. We also discussed the most appropriate ship movement during turbulence probe deployment. Since the deployment is best achieved moving ahead at 0.5 knots, yet we want to stay within the 3km wide SF₆ patch, we had asked the ship to travel in a circle during the 1 hour deployment. However, this means that

when the ship has the wind on the stern it loses steerage. We therefore proposed to either reposition so that a 1 hr steam would still be within the patch, or to steam in one direction for 30 minutes and steam back for the next 30 minutes. During the meeting we were told that the bridge had found a buoy and thought that it was the lost wire walker. Not believing that our luck could have turned for the better, and that actually this was buoy # 2881, we asked that the ship stay close to the buoy and continued the meeting. Back on deck, after the meeting, we were very pleased (and suitably embarrassed at being so cynical) to see that the wire walker buoy # 7547 had been found and was successfully recovered (see photo 7). We started SF₆ mapping at 17:30 in order to assess the size and shape of the SF₆ patch. Birthday celebrations continued with wine at dinner and a 'glamour' themed party in the bar afterwards.