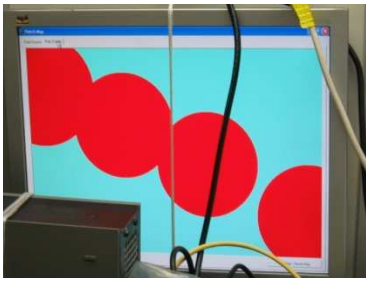
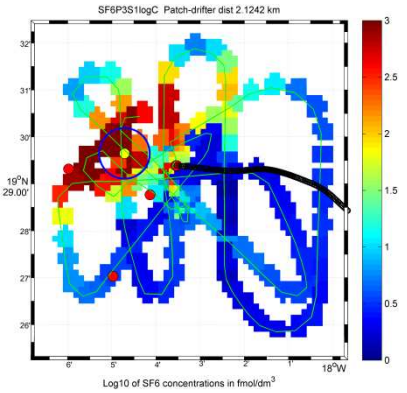
Friday 15 May 2009 JD 135

The SF_6 deployment continued until 05:30, and we deployed the Carioca buoy # 5990 at 05:42, the ADCP buoy # 2881 at 06:52, the drifter buoy # 2880 at 07:19 and the drifter buoy # 2988 at 07:56 at the four corners of the 2 km^2 SF_6 patch. At 05:23 our position was 19° 25.78 N 017° 52.91 W, sea surface temperature was 18.1 °C, air temperature was 17.7 °C, salinity was 35.62, barometric pressure was 1011, water depth was 2198 m and the winds were northeasterly 20 knots. The morning began hazily (photo 1) with the sun still blanketed with an orange dust haze at 07:00 as we watched Fin whales glide past on the port side (photo 2 – courtesy Malcolm Woodward). We moved back to the patch centre (buoy # 2879) for CTD # 66 at 09:05 in waters with an SF_6 concentration of 2753 fmol l^{-1} (too high for one of the analysers to measure). The optics rig was deployed (OPT 013) at 09:08 (photo 3) and an Apstein net (NET 21) at 10:23. CTD # 67 was deployed at 11:54, and the ship drifted out of the SF_6 patch during the 2.5 hours it took to sample to 2240m (surface SF_6 concentrations at the end of the cast were 6 fmol l^{-1}). The 1% light level calculated from data collected during the optics rig deployment (OPT 014) was 31m. We carried out turbulence probe deployments between 14:22 and 15:43 when the optics rig (OPT 015) was deployed again. The overnight MVP and SF_6 mapping survey began at 17:06. The SF_6 data is presented in near real time as red circles along the ship's track. The size of the circles on this so-called 'bubble' plot is representative of the concentration of SF_6 measured, and the software automatically scales the size of each 'bubble' relative to the previous SF_6 data collected. So, in the search for the highest SF_6 concentration before each CTD, we hope for large red SF_6 data points, surrounded by smaller SF_6 data points, which indicate where the edges of the patch are. Since this was the first mapping exercise since the SF_6 deployment this morning, the data points are huge, and worth recording here (photo 4) as, as the SF_6 mixes and dilutes, we won't see such large data points again. During the evening, Riqui found a flying fish flapping around on deck. We photographed it for posterity (photo 5 – flying fish alongside an A4 sheet of paper for scale) before returning it to the sea. At midnight, the MVP developed a fault and was recovered for repair.

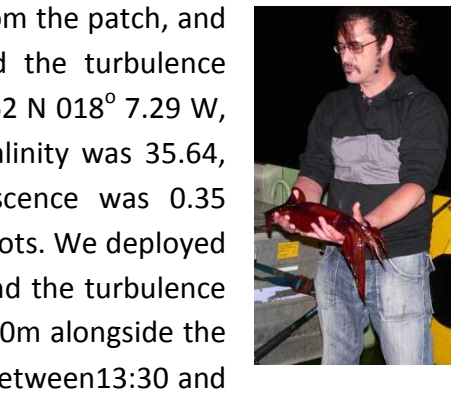


Saturday 16 May 2009 JD 136

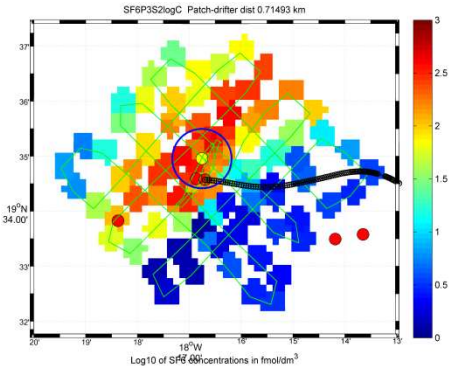
The SF_6 mapping survey continued until 03:30, when Riqui analysed the data to predict where the highest concentrations of SF_6 were, and directed the ship to the patch centre in preparation for the pre-dawn CTD casts. Figure 1 shows the concentration of SF_6 mapped along the ship's track (highest concentrations are in red, lowest in blue, on a logarithmic scale), the trajectory of the central buoy in black, the position of all the buoys as red circles, and the predicted patch centre as a yellow circle surrounded by a 2km area blue circle.



CTD #68 was deployed at 04:00, and CTD #69 at 04:54 in waters with surface concentrations of SF_6 of about 1200 fmol l^{-1}. The ships' lights directed at the CTD in the water attracted several large squid to the surface, and Riqui set about catching some for lunch (photo 6). At 06:52 we recovered drifter buoy # 2880 which was heading south away from the patch, and between 07:30 and 08:30 we deployed the turbulence probe. At 07:32 our position was 19° 30.62 N 018° 7.29 W, sea surface temperature was 18.0 °C, salinity was 35.64, barometric pressure was 1011, fluorescence was 0.35 fluorescence units, water depth was 2403 m and the winds were NNE 21 knots. We deployed CTD #70 at 09:03, optics rig OPT 016 at 09:10, Apstein net #22 at 10:11 and the turbulence probe between 10:35 and 11:25. The mid-day CTD #71 was deployed to 500m alongside the optics rig (OPT 017), and was followed by turbulence probe deployments between13:30 and 19:00. We deployed drifter #2880 in the SF_6 patch at 19:37 and CTD #72 at 20:07. One aim of these sunset CTDs is to measure the decrease in seawater oxygen concentration overnight due to plankton respiration. This depends on the sunset CTD and following pre-dawn CTD being unequivocally in the same water mass (difficult to do unless SF_6 is used), and the rate of plankton respiration being high enough to measure over a 7 hour night period. We're hoping to be the first scientists to make these measurements of in water respiration. Mapping of the SF_6 patch (without the MVP which is under repair) began at 21:40 and will continue until 02:00. We haven't had an Argo fix on the Carioca buoy for several days, and so sent out the following Met Warning / Safety Call to all ships : 125/09 CAP BLANC. CARIOCA BUOY ADRIFT VICINITY 19 34N 018 14W AT 16/1800. SHIPS IN AREA THAT SPOT IT SHOULD REPORT TO DISCOVERY FOR THE ATTENTION OF RICKI OR RETURN TO SENDER.



Sunday 17 May 2009 JD 137



The SF_6 mapping survey continued until 03:30, when Riqui analysed the data to predict the position of the highest SF_6 concentration (figure 2), where we could re-locate to deploy the pre-dawn casts. CTD #73 was deployed at 04:03, CTD #74 at 05:31 and the turbulence probe was deployed between 06:44 and 08:25. Atmospheric sampling of oxidized volatile organic compounds took place between 04:00 and 06:00. At 07:47 our position was 19° 35.92 N 018° 17.97 W, sea surface temperature was 18.1 °C, salinity was 35.65, fluorescence was 0.49 fluorescence units (2.5 µgl^{-1} Chl), barometric pressure was 1013, water depth was 2450 m and the winds were NNE 23 knots. The optics rig (OPT 018) was deployed at 09:08, CTD #75 at 09:10 and nets 23, 24 and 25 (Apstein, Bongo and 700µm) between 10:24 and 11:25. CTD #76 was deployed at 12:05 in waters with an SF_6 concentration of between 117 and 125 fmol l^{-1} alongside the optics rig (OPT 019). We deployed a drifter in the SF_6 patch at 13:03 and deployed the turbulence probe between 13:14 and 16:15. We recovered and redeployed the ADCP buoy # 2881 and the wire walker buoy # 2879. The Carioca buoy has re-started transmitting via Argo and we started the overnight SF_6 mapping (without the MVP as it is being repaired) at 20:50.