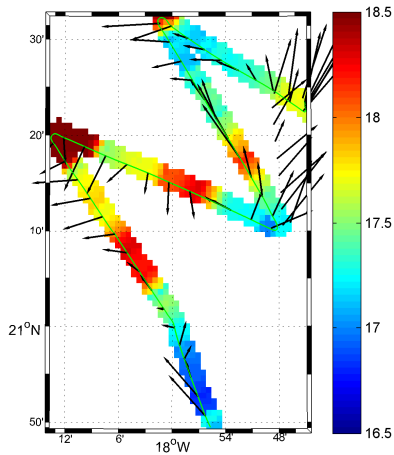


Wednesday 6 May 2009 JD 126



At 08:00 our position was 21° 06.06 N 017° 58.74 W, sea surface temperature was 17.5 °C, air temperature was 17.6 °C, salinity was 36.09, barometric pressure was 1014, water depth was 1654 m and the winds were light and northerly (20 knots). The underway fluorescence was 0.44 fluorescence units (or with the latest calibration [chlorophyll = (fluorescence - 0.1873)/0.1192], 2.1 µg chlorophyll l⁻¹). The ADCP large scale survey continues, and the MVP is being serviced. The measurements of sea surface temperature and water movement calculated from the ADCP during the large scale survey (Figure 1)



reveal the complexity of the water masses around us. Carol, Riqui, Andy, Phil, Tim and Gavin met to discuss the ADCP results at 16:30. The conclusion was that we should survey

further north (around 21° 30.0 N 18° 00.00 W) and delay the SF₆ release until we have more information to guide us in deciding the best place to start the second experiment. We met with everyone after dinner to propose this course of action and it was agreed. During the day the scientists

continued to analyse samples collected during the first Lagrangian experiment (Photos 1 – Susan Kimmance - flow cytometric analysis of plankton community structure and Vas Kitidis – photo-chemical consumption of dissolved oxygen and 2 – Ian Brown - nitrous oxide and methane concentrations in seawater).

In order to aid the search for the SF₆ patch each morning, Phil Nightingale modified the software for the SF₆ gas chromatograph so that it calculates the concentration of SF₆ (in femta moles per litre) in excess of the background concentration (Photo 3).



Thursday 7 May 2009 JD 127

At 08:35 our position was 21° 23.20 N 017° 45.07 W, sea surface temperature was 17.5 °C, air temperature was 17.5 °C, salinity was 36.02, air pressure was 1012, water depth was 680m, fluorescence was 0.3

fluorescence units and the winds were NNE 18 knots. The smaller scale ADCP survey continues to reveal the high variability in sea surface temperature around us – including a 'front' or area where two types of water structure meet, creating a 'line in the sea' where as we cross it, the temperature drops by 1.5 °C. We deployed the MVP at 08:36 with new salinity and oxygen sensors to enable us to determine the variability

in physical and chemical parameters with depth. Martin Bridger (photo 1) set up a system whereby we can monitor the measurements of temperature, salinity, fluorescence and oxygen made by 'in-line' sensors in a surface seawater supply that is continually pumped into the laboratory, alongside the measurements made by the sensors in the MVP and the sensors in the vertical CTD system. This means we can cross calibrate all the

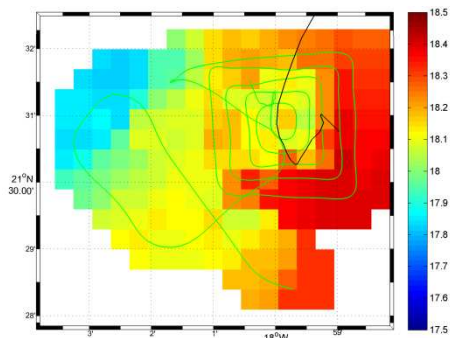


sensors against one another and against chemical measurements of the water collected by the CTD + bottle rosette. Ian Sarginson and Steve Duncan (photo 2) continued to clean and brighten the ship up with a new lick of paint. At 15:00 Andy, Phil, Riqui, Carol and Tim met to assess the latest satellite images of sea surface temperature and ocean colour (an indicator of the amount of phytoplankton present) in order to select an area of relatively low chlorophyll, and low spatial variability in temperature where we could deploy the next patch of SF₆. The physics team (Bea Barreiro and Thomas Meunier, photo 3) continue to process the ADCP and MVP data to help us choose a site with relatively consistent water flow. We wanted to make measurements in a region which was in the path of the major offshore filament, away from the abrupt changes in temperature which caused problems for the first patch (water masses with different temperatures tend to move at different rates, and so when we inadvertently deployed the first patch of SF₆ across a 3 km x 3 km area which included water at two distinct temperatures, these two water masses moved at different speeds, producing 'streaks' of filament and so SF₆). Using the satellite images to guide us, we were aiming to place the ship in waters with chlorophyll concentrations similar to those measured at the end of the first patch experiment. Since the satellite images were taken two days ago, the chlorophyll features shown in them will not be in exactly the same geographic position now, so we cannot simply move the ship to a specific latitude and longitude. However, we assumed that the area of water we were aiming for would be in the same position relative to other chlorophyll and temperature features seen in the images. So we headed west until we measured the abrupt change in temperature and chlorophyll which in the satellite image was north of the area we wished to sample, and then turned perpendicular to the angle of the front and aimed to stop after travelling about 7 miles. The MVP was recovered at 19:16. Recording the temperature, salinity and fluorescence from the underway sensors every 10 minutes, we chose an area that seemed far enough away from the front and in stable temperature and chlorophyll conditions. Tim Smyth delayed his birthday celebrations to deploy the ADCP + GPS buoy #2881 at 21:00 at 21° 25.2 N 017° 54.7 W. The MVP was re-deployed at 21:34 to undertake a 4 km x 4 km survey around the proposed patch area prior to the pre-dawn CTDs at 04:00 tomorrow.



Friday 8 May 2009 JD 128

We recovered the MVP at 03:35 and deployed CTDs #52 and 53 at 04:04 and 05:02 respectively. At 06:39 our position was 21° 26.21 N 017° 57.07 W, sea surface temperature was 17.7 °C, air temperature was 18.1 °C, salinity was 36.02, barometric pressure was 1011, water depth was 1159m and the winds were from the north



(NNE 15 knots). The underway fluorescence was 0.26 fluorescence units (or 0.6 µg chlorophyll l⁻¹). We repeated the 4 km x 4 km MVP / ADCP survey until 11:00, when the ADCP data from the previous survey was collated to help choose the position of the next SF₆ patch. Using the underway temperature and fluorescence data we chose a relatively stable region in the northwest of the survey box to deploy the wire walker buoy #2879 and begin the SF₆ deployment at 14:00. Conscious that we are in a period of relatively low winds, and that higher winds should cause the offshore filaments to be more pronounced and easier to track with SF₆, we decided to only

deploy 25% of the SF₆ tank. This should be enough for a 4 day Lagrangian study (i.e. long enough to see some biological temporal change) so that if/when the wind and upwelling strength increases we have sufficient time (and SF₆) left to survey, deploy and undertake another 8 day Lagrangian study at a location that may be more suitable to track than where we are now. This was fortuitous, as when we analysed the underway temperature data collected during the SF₆ deployment (see 'expanding spiral' ship track Figure 1) we found that the area that had 3 hours previously had a uniform temperature of 17.5 °C now included a front between waters with a surface temperature of 18.5°C and waters with a surface temperature of 18.1 °C. On completion of the SF₆ release, we deployed the Carioca buoy #5990 (20:34) which contains instrumentation to measure carbon dioxide in seawater and then the MVP at 21:00. We continued mapping with the MVP overnight until the 04:00 CTDs. In between oxygen titrations and buoy deployments, Vas and Tim found time to play a few competitive games of chess (score is currently two games all).

