

## **JC41 (UK DIMES 1) cruise plan**

Vessel: RRS James Cook.

Cruise dates (ports): 5 Dec – 21 Dec 2009 (Punta Arenas to Punta Arenas).

Participant scientists: Flavia Acevedo (Universidad de Concepción), Peggy Courtois (NOC), Helen Johnson (Oxford University), Peter Lazarevich (FSU), Alberto Naveira Garabato (NOC) – PSO, Kevin Speer (FSU).

### Background:

JC41 is the second cruise of the DIMES experiment, and the first conducted in a British vessel. The central goal of the cruise is to deploy 9 moorings in 4 distinct areas. Six of the moorings will be deployed in a cluster of 15 km diameter in northern Drake Passage. Their main purpose is to investigate how the energetic mesoscale eddies of the Antarctic Circumpolar Current (ACC) are dissipated, and how they interact with the regional internal wave field. These issues are important for understanding how water masses mix and up- and downwell in the Southern Ocean, and how the global ocean energy and momentum balances are closed. The remaining 3 moorings contain sound sources that will allow us to track isopycnal RAFOS floats (deployed in the Southeast Pacific during two U.S.-led DIMES cruises) as they flow through the Scotia Sea.

The main deployment area will be near 56.012 S, 57.825 W (Fig. 1, UK site), where we will deploy 6 moorings in a cross-like pattern (Fig. 2) containing 34 current meter / CTD pairs, 2 McLane Moored Profilers and 1 ADCP. This mooring area was chosen because: (1) it lies in a region of strong mean flow (associated with the Subantarctic Front of the ACC) and high (mean + mesoscale eddy) strain, favourable for adiabatic interactions between mesoscale flows and internal waves and for cross-jet lateral mixing; (2) the central moorings (moorings C and M) lie on top of a topographic bump, which is expected to trigger interesting interactions between mesoscale flows and topographic roughness possibly leading to loss of geostrophic balance (e.g., generation of internal lee waves); (3) one of the arms of the cross (SW – NE) lies along an altimeter track, which will allow us to learn about variability in the mesoscale flow at length scales larger than the diameter of the array; (4) the moorings are in the proximity of the WOCE SR1b section, which NOC scientists have repeated quasi-annually since 1993 – this will be a valuable complement to the mooring data analysis (in terms of the internal wave climate, thermohaline interleaving...). David Smeed, Alberto Naveira Garabato, Brian King and Peggy Courtois (NOC) and Kurt Polzin (WHOI) contributed to the choice of location and design of the scientific aspects of the array. Paul Provost and Terry Edwards (NOC) led the technical design of the moorings.

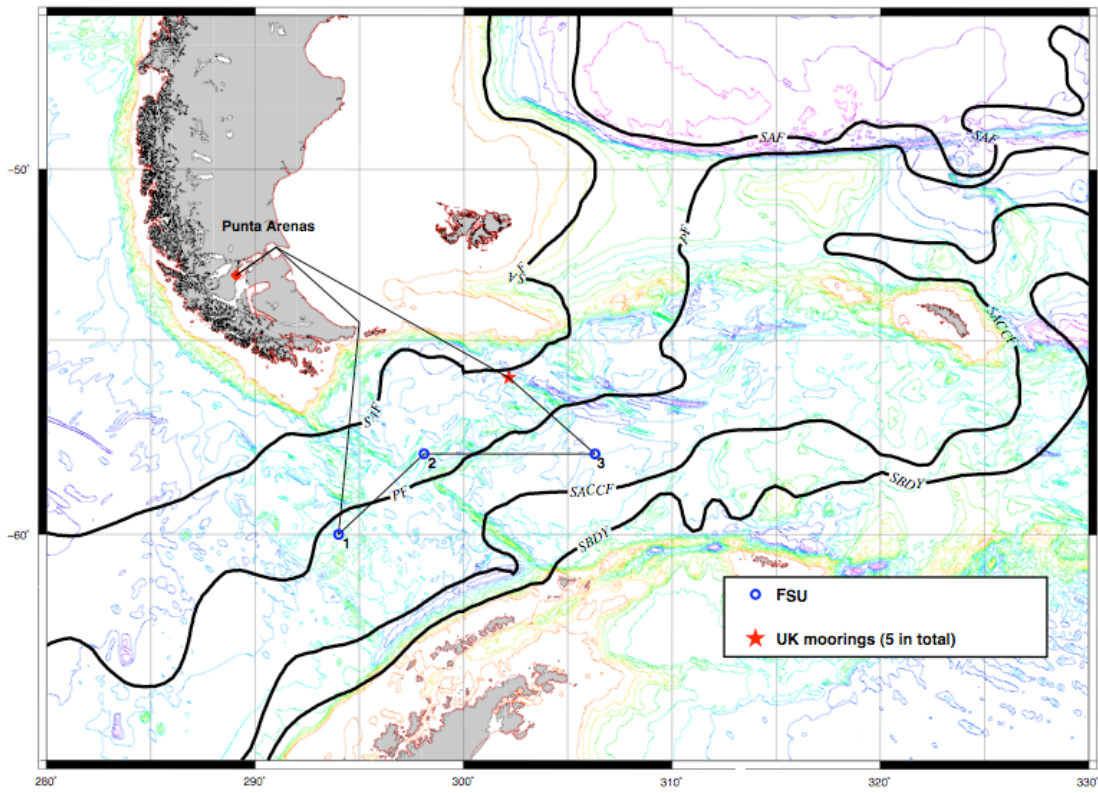
The remaining three sites (FS1, FS2, FS3) will be to deploy sound source moorings to track isopycnal RAFOS floats entering the Scotia Sea. One such sound source will also be mounted on the (UK) SW mooring. We will also deploy two Iridium Argo floats (with acoustics) in the vicinity of FS1.

### Basic cruise plan:

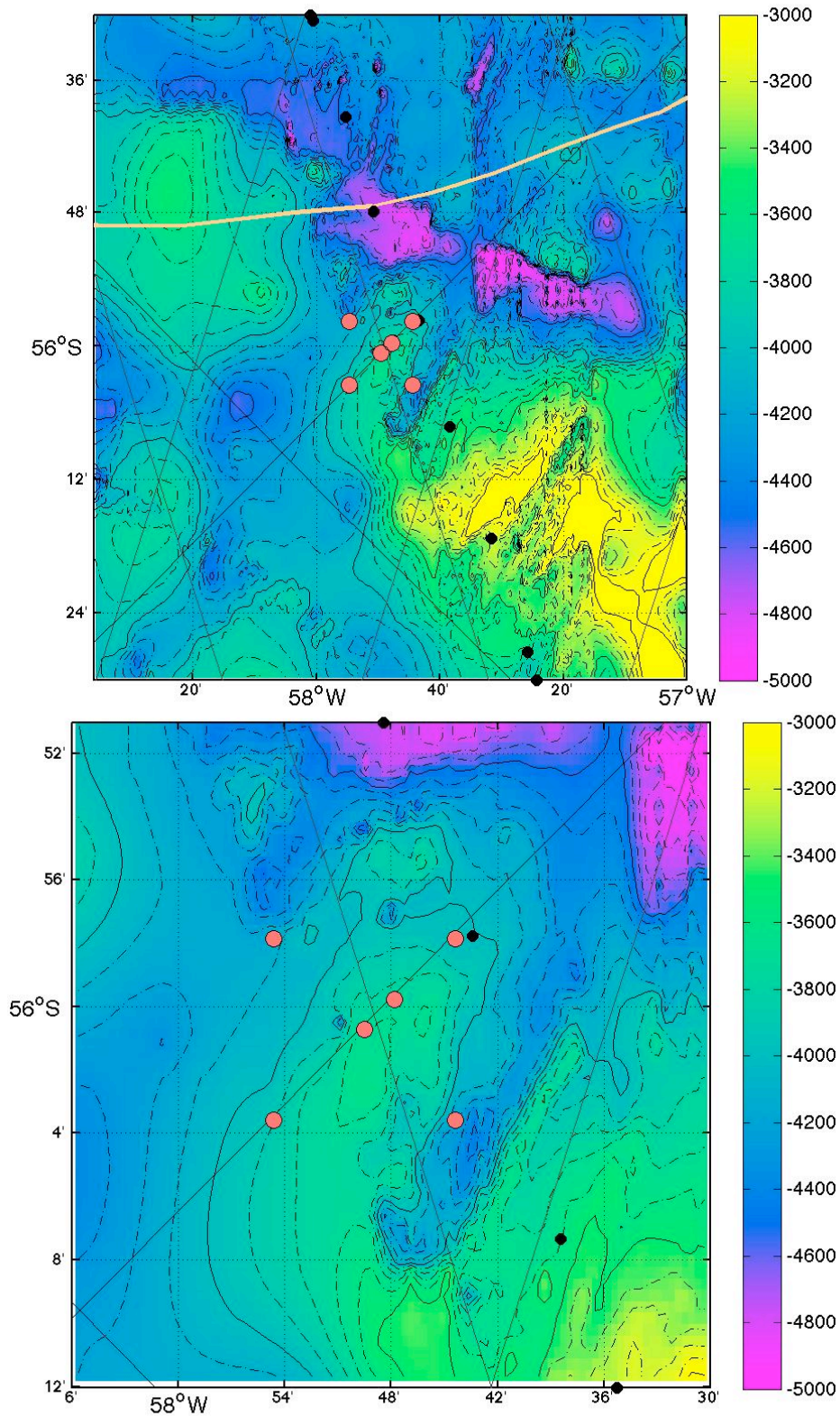
We will depart from Punta Arenas in the morning of 5 Dec and head for the main deployment area (Fig. 1), at which we anticipate to arrive around the evening of 7 Dec. The SADCPC keels

will be retracted during the entire cruise for the sake of ship speed, but we will collect SADCP data and check their accuracy in any case. In the first day, we will do a test CTD station to get the CTD / LADCP going and test the mooring releases. We will then do a cursory swath survey of the UK mooring deployment site to verify the accuracy of the topographic data with which we planned our array design. After that, we will proceed with the deployment of each mooring in the UK site as and when advised by the mooring technicians and captain. We will triangulate the mooring position following each deployment. This will occupy many of the daylight hours. At night, we will do one CTD next to each of the moorings for moored instrument calibration purposes. The whole UK site deployment is anticipated to take 6 days (until 13 Dec), including contingency time. On completion of this deployment, we will steam to sites FS1, FS2 and FS3 and deploy each of the sound source moorings by 15, 17 and 19 Dec, respectively. We will do a CTD next to each FSU mooring, time permitting, and deploy two Iridium Argo floats near FS1. We will then return to Punta Arenas.

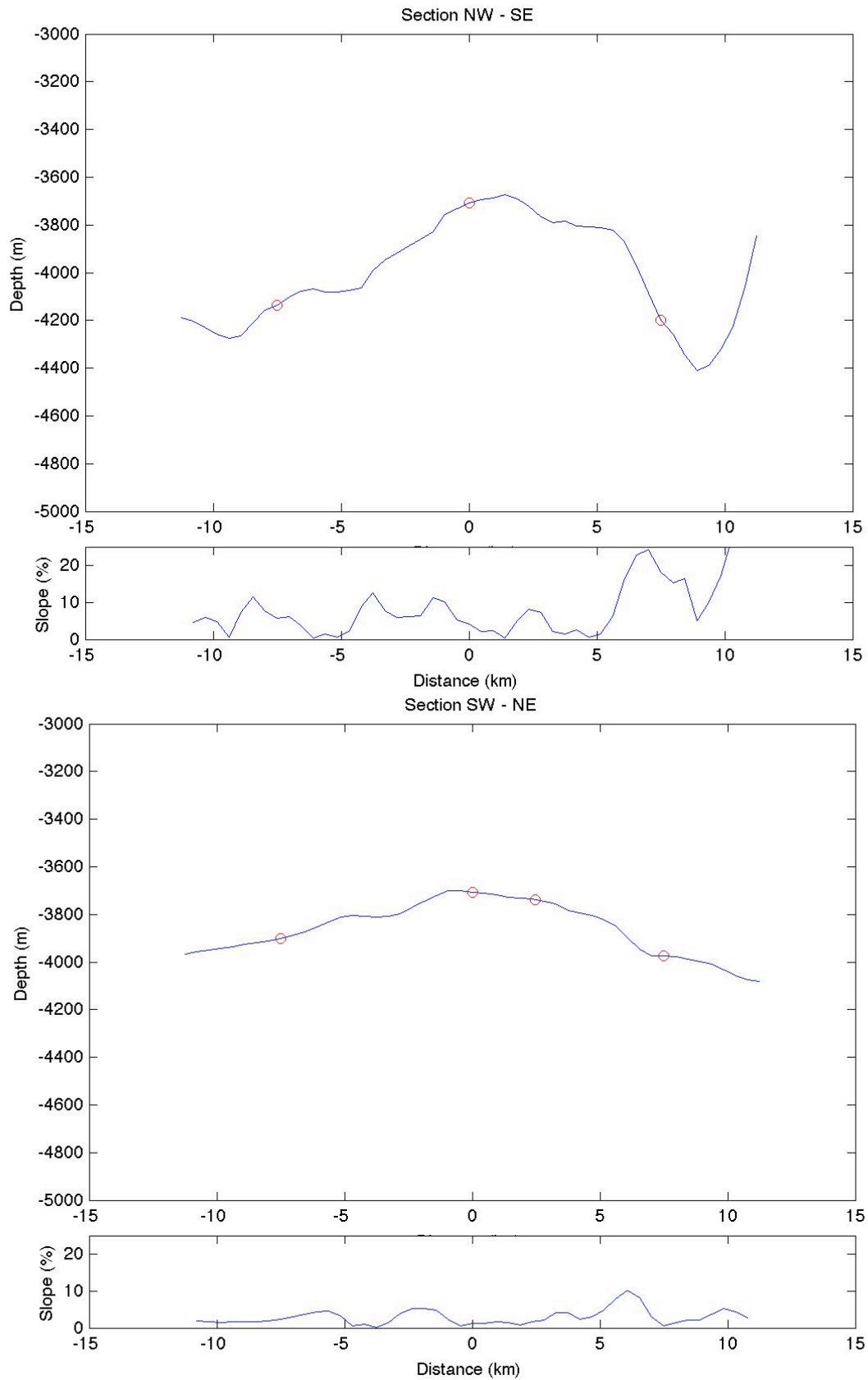
Between the first and last mooring deployments, we will run two 12-hour watches per day, with breaks during transits longer than 12 h.



**Figure 1.** Cruise track and mooring positions. Moorings FS1, FS2 and FS3 are given by blue circles, from west to east.



**Figure 2.** Two maps of the UK mooring array. Moorings are shown by the red circles. WOCE SR1b stations (from 1997) are indicated by the black circles. Altimeter tracks are shown by the black lines. Bathymetry is multibeam data collected by Roy Livermore (BAS). The climatological position of the SAF is shown by the yellow contour.



**Figure 3.** (Above) NW – SE and (Below) SW – NE sections of bottom depth and slope for the UK mooring array.