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Symposium,

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PF

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S. Cunningham and M.

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= 15 cm/s) between the two legs.


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East of DP, the South Sandwich Islands act as a barrier to the ACC, forcing it to deviate to the north and to proceed through narrow sills

The major topographic features in DP are:

- the West Scotia Ridge (WSR) oriented east-west at mid-distance between the tip of South America and the Antarctic Peninsula
- the Phoenix Antarctic Ridge (PAR) and the Shackleton Fracture Zone (SFZ) that rise to nearly 1500m

These ridges delimit the Yaghan Basin (YB) to the northeast and the Ona Basin (OB) to the southeast.

2- Experimental program: DRAKE 2006-2009

In January-February 2006, an expedition across Drake Passage (ANT-XIII/3) took place on board Polarstern.

A mooring array (red dots) was deployed below the track 104 of the altimetric satellite JASON-1 and two high-resolution full depth hydrological sections (CTD and LADCP) were carried out along this track within three weeks.

We use satellite data (ocean color, sea surface temperature, albedo) to examine the mesoscale activity during the cruise. Then, we carry out a Jason-1 data validation along track 104 comparing in situ data with the altimeter data. Finally, we evaluate the Rio50 Mean Dynamic Topography along the satellite track.

1- Drake Passage

The Antarctic Circumpolar Current (ACC), the world’s largest current in terms of volume and mass transport, is constricted to its narrowest extent (about 700 km) at Drake Passage (DP).

The ACC is closely associated with three deep-reaching frontal oceanic systems, from north to south:

- the Subantarctic Front (SAF)
- the Polar Front (PF)
- the Southern ACC Front (SACCF)

The Antarctic Polar Frontal Zone (APFZ) is the region located between the SAF and PF.

The mean location of these deep-reaching fronts, from Orsi et al. (1995), reflects the bottom topography.

- East of DP, bathymetry is deep and flat (> 5000m).
- At DP, the seafloor rises (near 3700m) and is crossed by a number of fracture zones and ridges that delimit small basins often featured with abyssal LRs on depressions.
- West of DP, the South Sandwich Islands act as a barrier to the ACC, forcing it to deviate to the north and to proceed through narrow sills

4- SLA along JASON-1 track and dynamic height from CTD

SLA is highly variable showing topographic step (as large as 40 cm in 10 days).

As example, in the Antarctic Polar Frontal Zone (APFZ):

- High positive anomaly (~20cm) at 57.5°S corresponds to an anticyclonic eddy (visible the 25/01 and 04/02).
- The eddy disappears 10 days later and is replaced by a high negative anomaly (~30cm).
- South to the PF:

  - High positive anomaly (~20cm) at 58.9°S corresponds to an anticyclonic eddy along the SFZ (visible the 25/01 and 04/02).

A comparison between the dynamic height anomalies (bottom panel) and the SLA shows:

- High negative anomaly (~20cm) at 56.7°S corresponds to a cyclonic eddy in the APFZ (2) the leg which is not represented in SLA.
- An eddy is also documented. However, the dynamic height anomaly localizes it further south than the SLA.
- A branch of the PF mesoscale flows (57°S).

In situ data was gathered over 21 days whereas satellite flow in a few seconds over the track three times (15 Jan, 25 Jan and 04 Feb). Thus, these differences illustrate an aliasing.

5- Evaluation of Rio50 Mean Dynamic Topography

Rio50 Mean Dynamic Topography is a combined product based on GRACE mission, altimetry and in situ data (hydrology and drifters data) over 7 years (1993-1999).

Dynamic height is computed from the CTD data (fig. 8) with two references pressures: one at 200db, the other at a depth of isopycnal 27.86 (neutral density).

Surface geostrophic velocity fields show seaward flows that can be attributed to the presence of mesoscale eddies. Deep penetrating cyclonic eddies from the south enters the YB as illustrated by the 1st leg between stations 7 and 10.4. (Fig. 6).

The ACC is closely associated with three deep-reaching oceanic systems, from north to south:

- the Subantarctic Front (SAF),
- the Polar Front (PF),
- the Southern ACC Front (SACCF).

* 2- Experimental program: DRAKE 2006-2009

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A mooring array (red dots) was deployed below the track 104 of the altimetric satellite JASON-1 and two high-resolution full depth hydrological sections (CTD and LADCP) were carried out along this track within three weeks.

We use satellite data (ocean color, sea surface temperature, albedo) to examine the mesoscale activity during the cruise. Then, we carry out a Jason-1 data validation along track 104 comparing in situ data with the altimeter data. Finally, we evaluate the Rio50 Mean Dynamic Topography along the satellite track.

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**References:**


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**OSTST Meeting – GODEA Final Symposium, Nice, 10-15 November 2008**

**Perspectives...**

- Using the ADCPs from the mooring, three year time series will be available to conduct a fine validation the JASON-1 data along its track #104. Also these data could help to bring a correction of the Mean Sea along the section. It will give a more precise absolute dynamic topography and consequently, more accurate geostrophic velocities.
- In addition, an estimation of the ACC surface transport along the JASON-1 track could be done using a complete data set of satellite data , 3-year series of ADCP (mooring) and hydrological sections (2005, 2008)
- Finally, we could explore the possible relationship between the SAM index, SST field and basin trapped modes (Barré et al., 2008) in Drake Passage.

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**Abstract:**

The Southern Ocean, the only ocean that circles the globe without being blocked by land, is home to the largest of the world’s ocean currents, the Antarctic Circumpolar Current (ACC). It is the ACC that is the major inter-ocean link, our understanding of the variability of the ACC and the impact of such variability on the climate system is rudimentary. Monitoring the ACC transport is essential for understanding the coupling of this major current with climate change. It is not an easy matter since the current is concentrated in highly variable narrow bands of swift currents and since energetic eddies of all sizes are numerous.

Our experimental set up is designed to use the complementarity between satellite altimetry and in situ observations. In January 2006, six currentmeter moorings were deployed in the Drake Passage below track 104 of the altimetric satellite JASON-1 and two high-resolution full depth hydrological sections (CTD and LADCP) were carried out along this track within three weeks.

We use satellite data (ocean color, sea surface temperature, albedo) to examine the mesoscale activity during the cruise. Then, we carry out a Jason-1 data validation along track 104 comparing in situ data with the altimeter data. Finally, we evaluate the Rio50 Mean Dynamic Topography along the satellite track.