

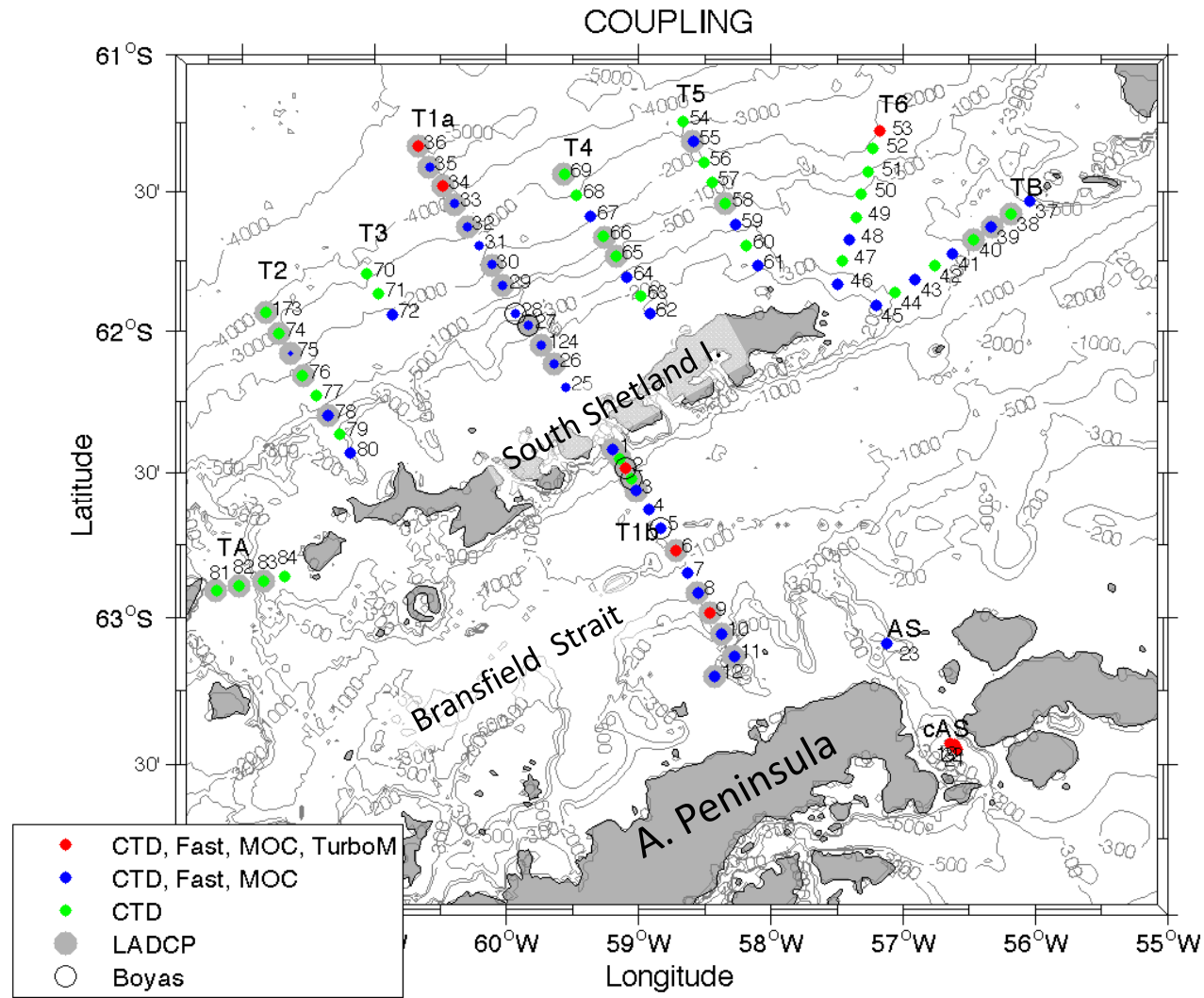
Observations on phytoplankton distribution/size structure modulation by turbulence/dynamical stability and ageostrophic secondary circulation (ASC) in a no nutrient limited environment (Antarctica)

P. Sangrà, C. García-Muñoz, B. Aguiar-González, C. Sobrino, B. Mouriño-Carballido, A. Marrero-Díaz, C. Henríquez-Pastene, A. Rodríguez-Santana, L. M. Lubián, C. M. García, M. Hernández-Arencia, S. Hernández-León, E. Vázquez, S. N. Estrada-Allis

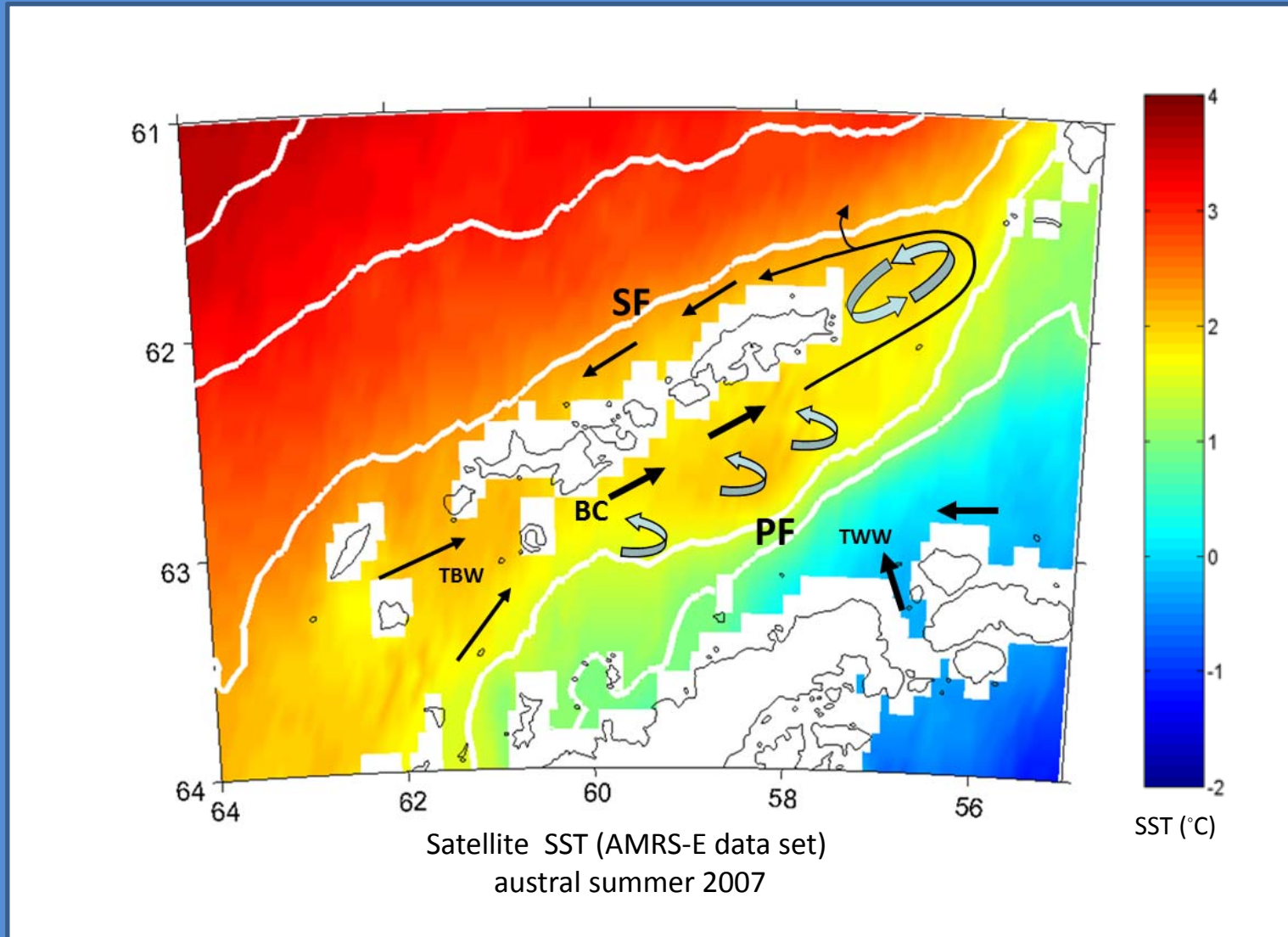
Outline

- 1 New components of the Bransfield Current system
- 2 physical- biological coupling: physical environment
- 3 physical- biological coupling: biological component
- 4 physical- biological coupling: modulation
- 5 Summary

COUPLING Survey: 8-26/01/2010



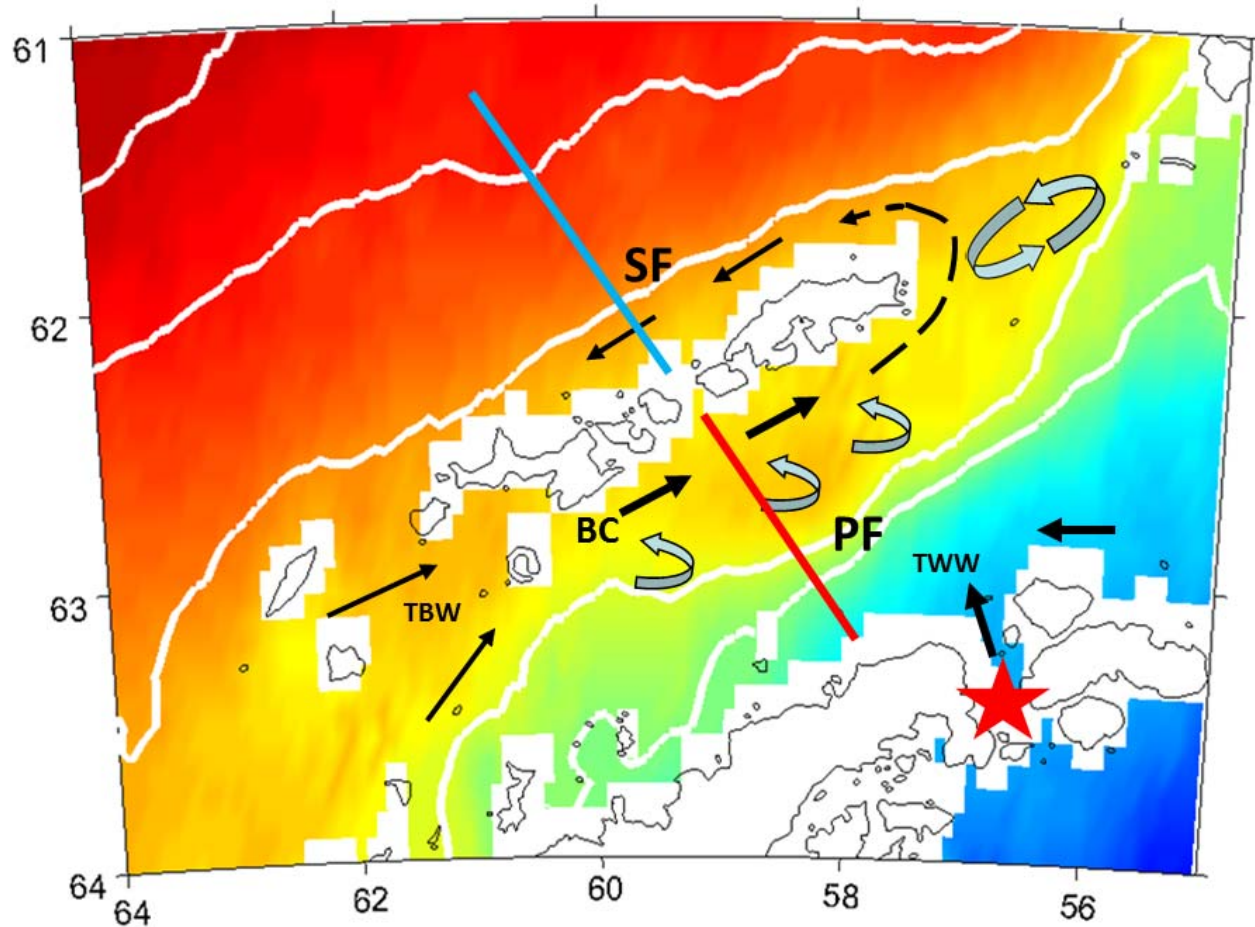
The Bransfield Current System



Adapted from Sangrà et al. (2011), DSR

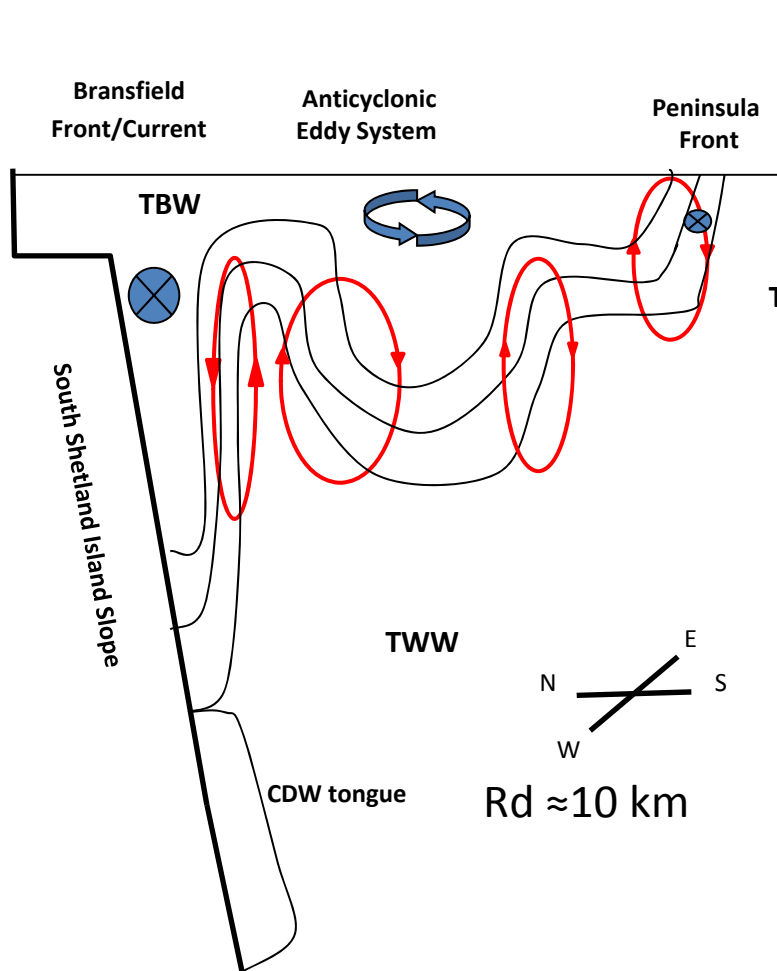
Physical-Biological Coupling

Bransfield Strait transect + A. Sound stations

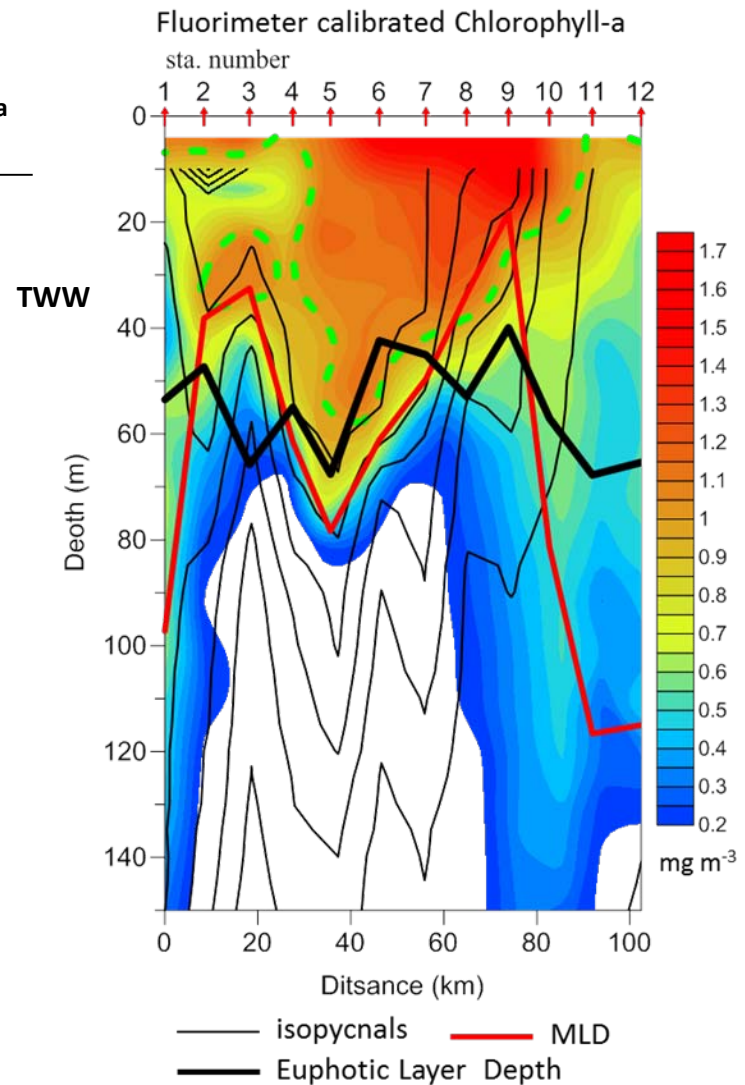


Physical Environment

Ageostrophic Secondary Circulation

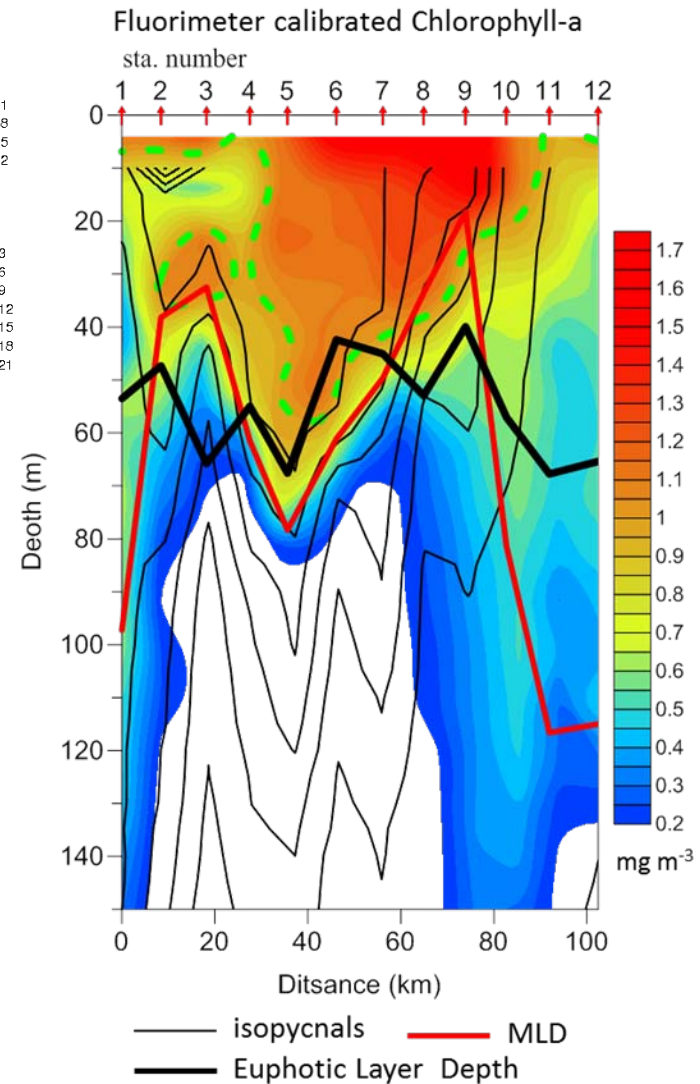
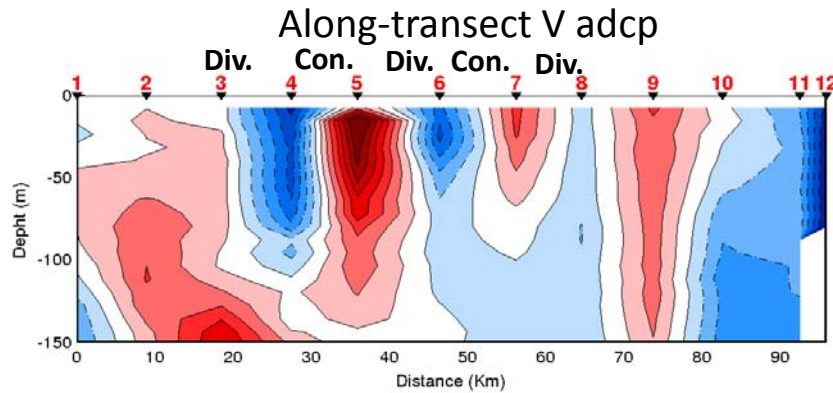


Sangrà et al. (2011), DSR



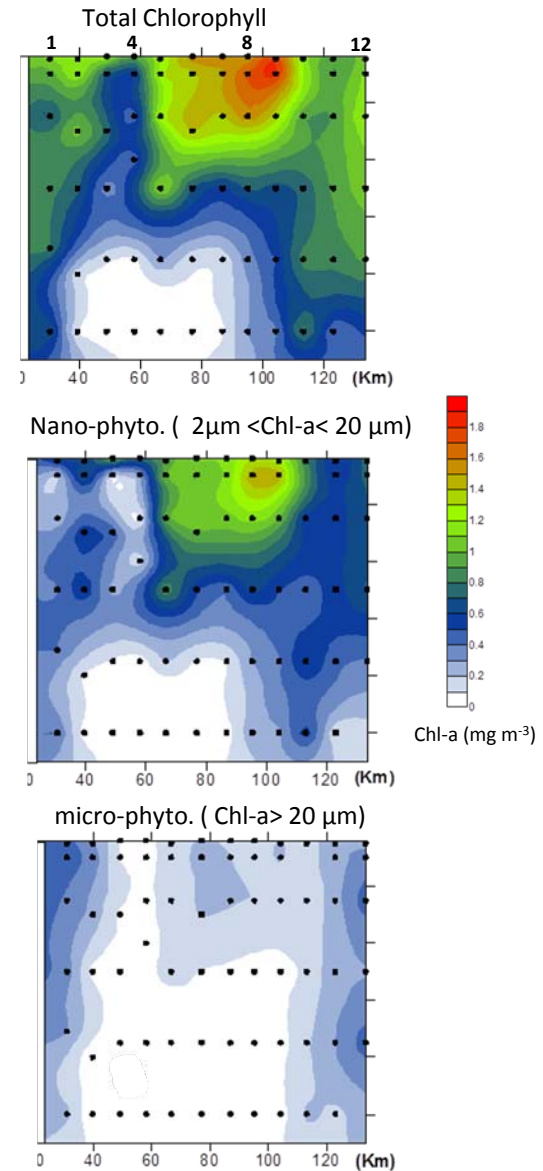
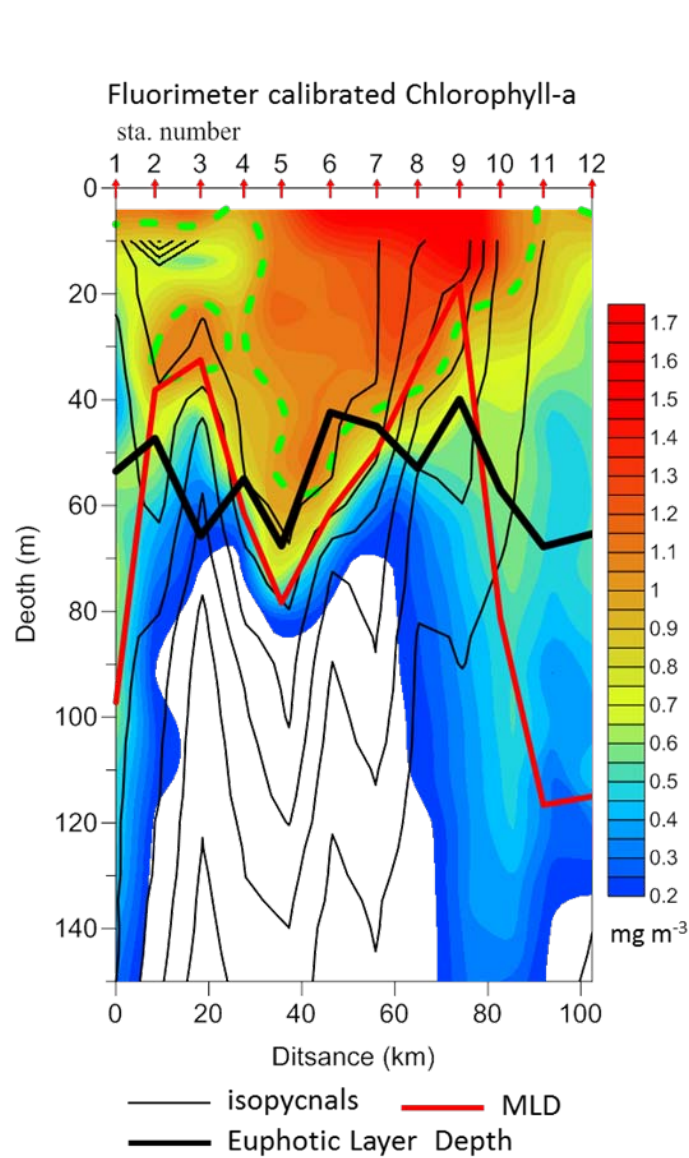
Physical Environment

Ageostrophic Secondary Circulation

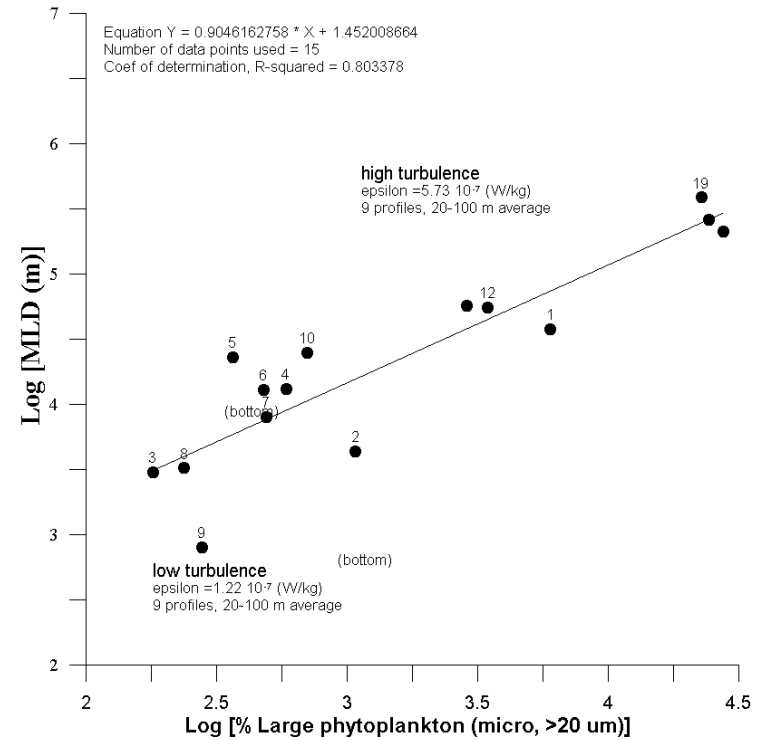
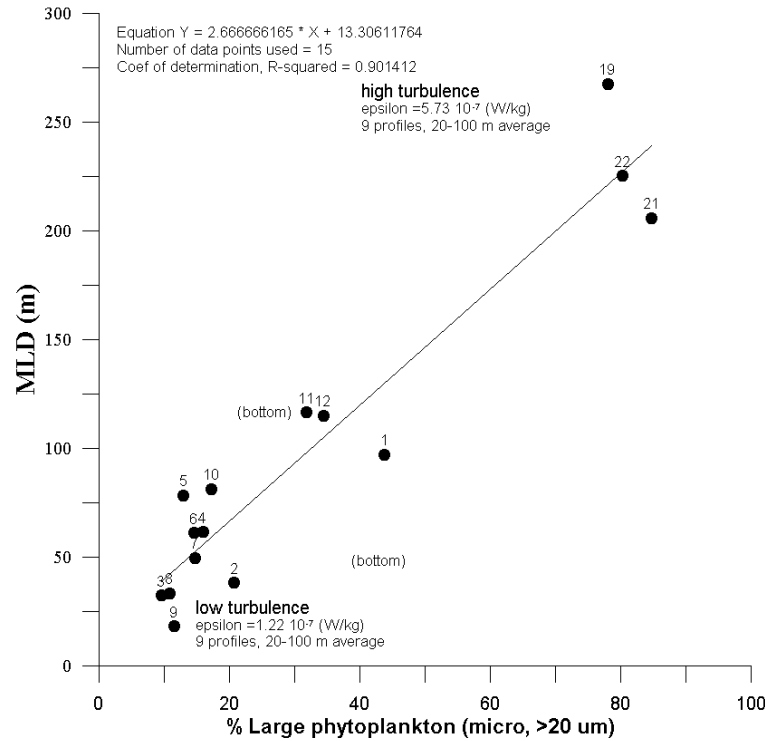


Biological Component

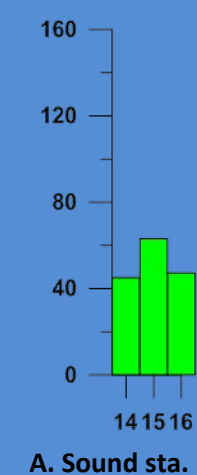
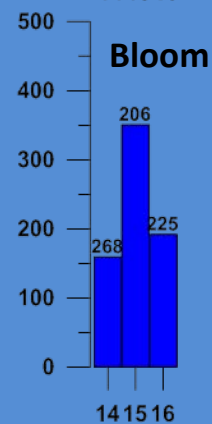
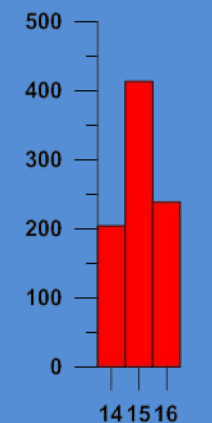
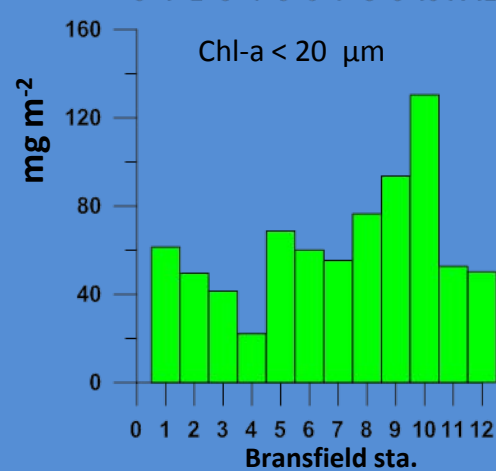
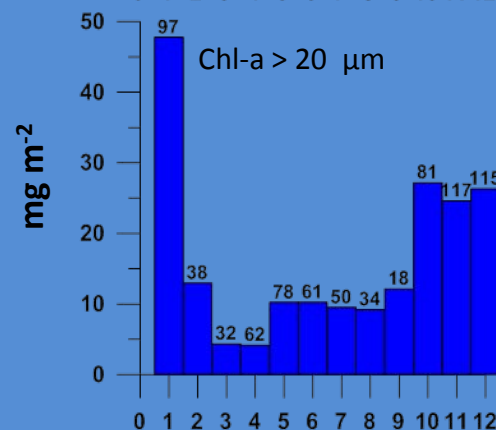
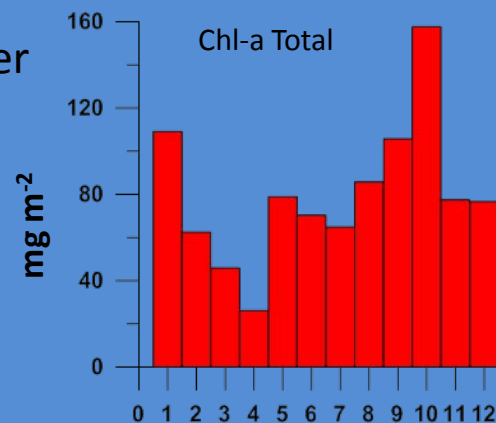
Size-fractionated chlorophyll-a



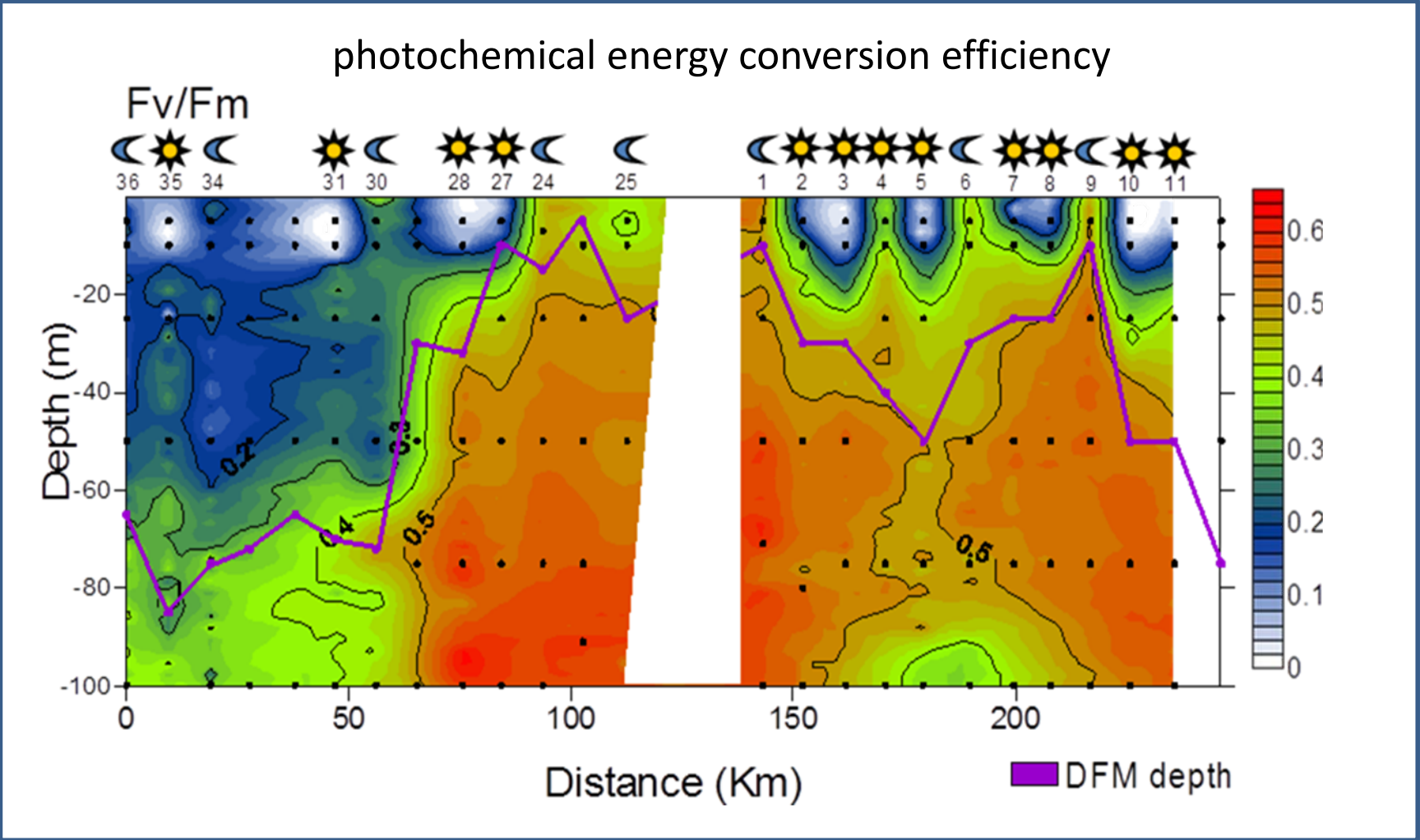
Mixed Layer Depths vs. large phytoplankton (micro, diatoms) size fraction



Integrated sampled Chl-a + Fluorimeter
Chl-a for depth>100 m



Working hypothesis: Large phytoplankton (micro, diatoms) is more susceptible to photoinhibition forming blooms only when MLD/turbulence is deep/high.

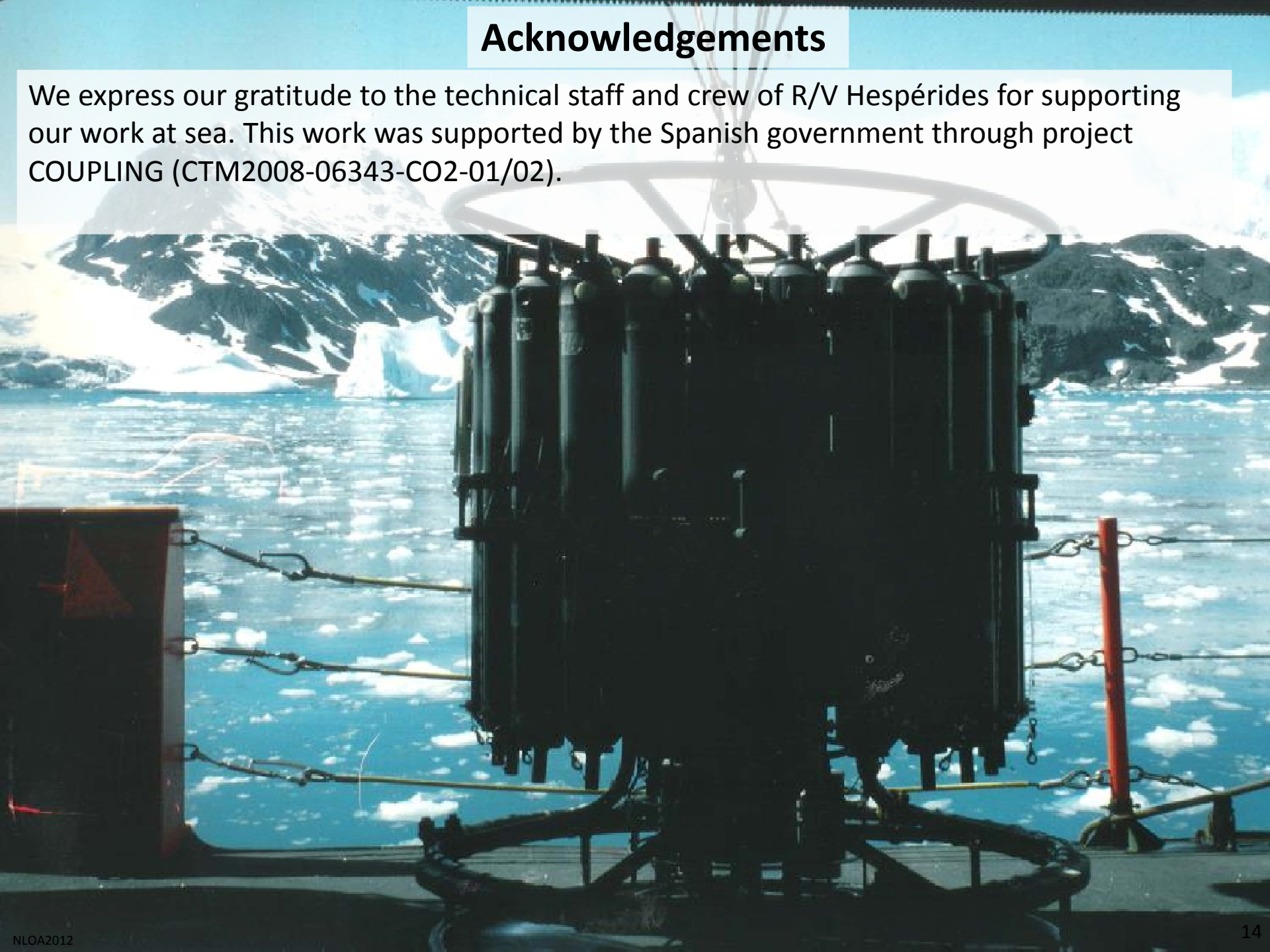


Summary

- 1 New components of the Bransfield Current System: recirculating eddy +Shetland Front.
- 2 Evidences of ASC vertical cell related to frontal regions at the Bransfield transect.
- 3 MLD, controlled by mesoscale variability and related ASC, modulates phytoplankton distribution and size structure.
- 4 Large phytoplankton blooms for large MLD/high turbulent environment. Integrated small Phytoplankton abundance not modulated by the MLD/degree of turbulence.

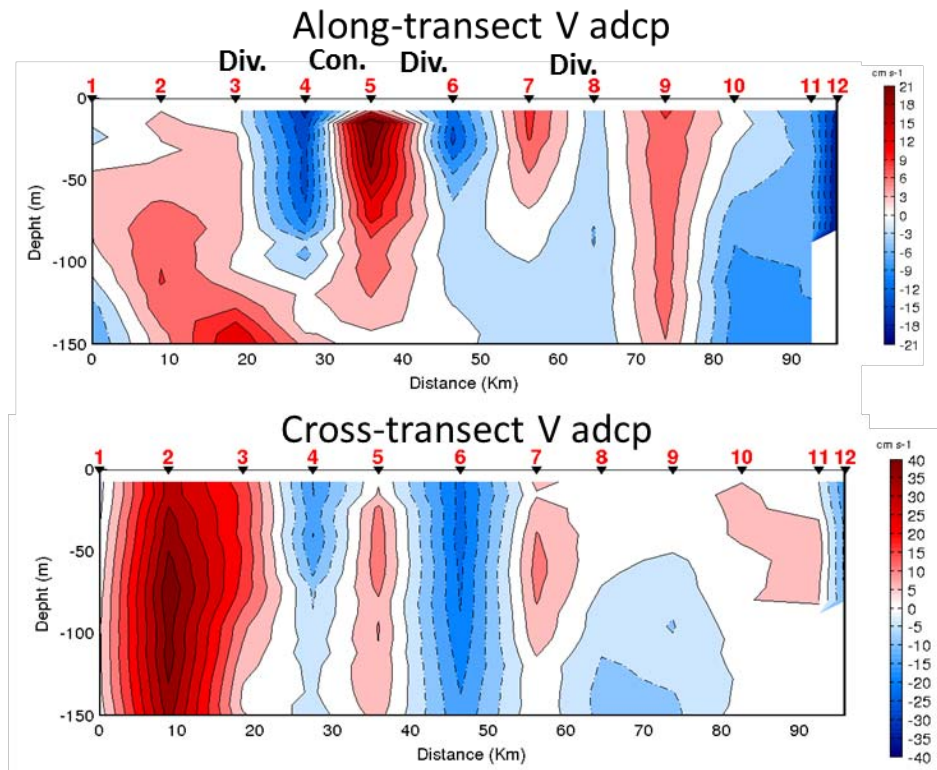
Acknowledgements

We express our gratitude to the technical staff and crew of R/V Hespérides for supporting our work at sea. This work was supported by the Spanish government through project COUPLING (CTM2008-06343-CO2-01/02).

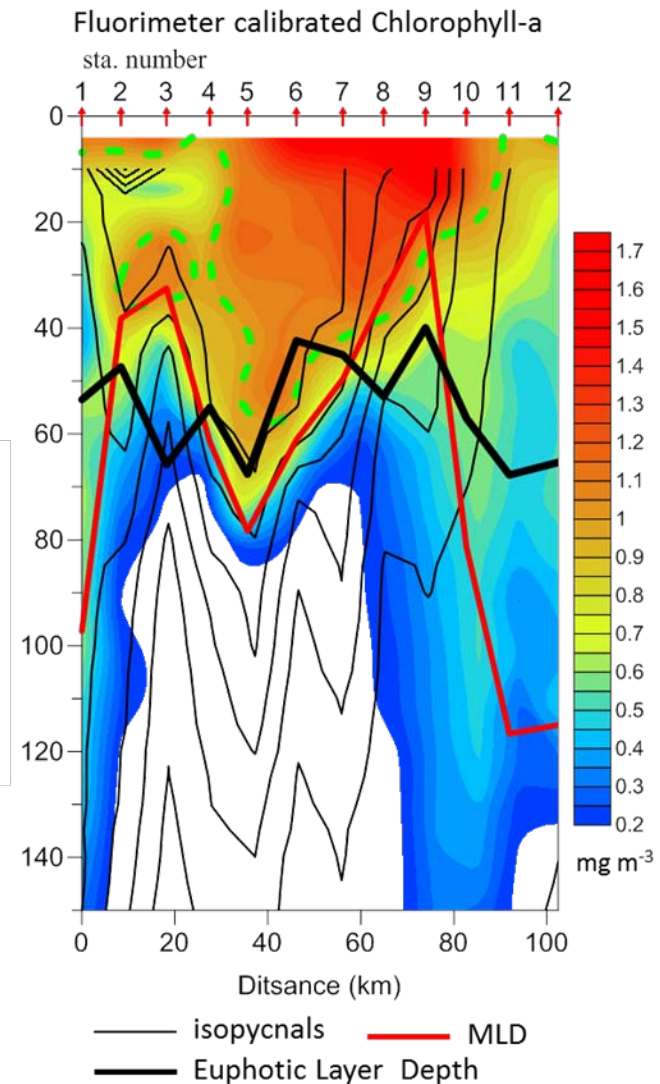


Physical Environment

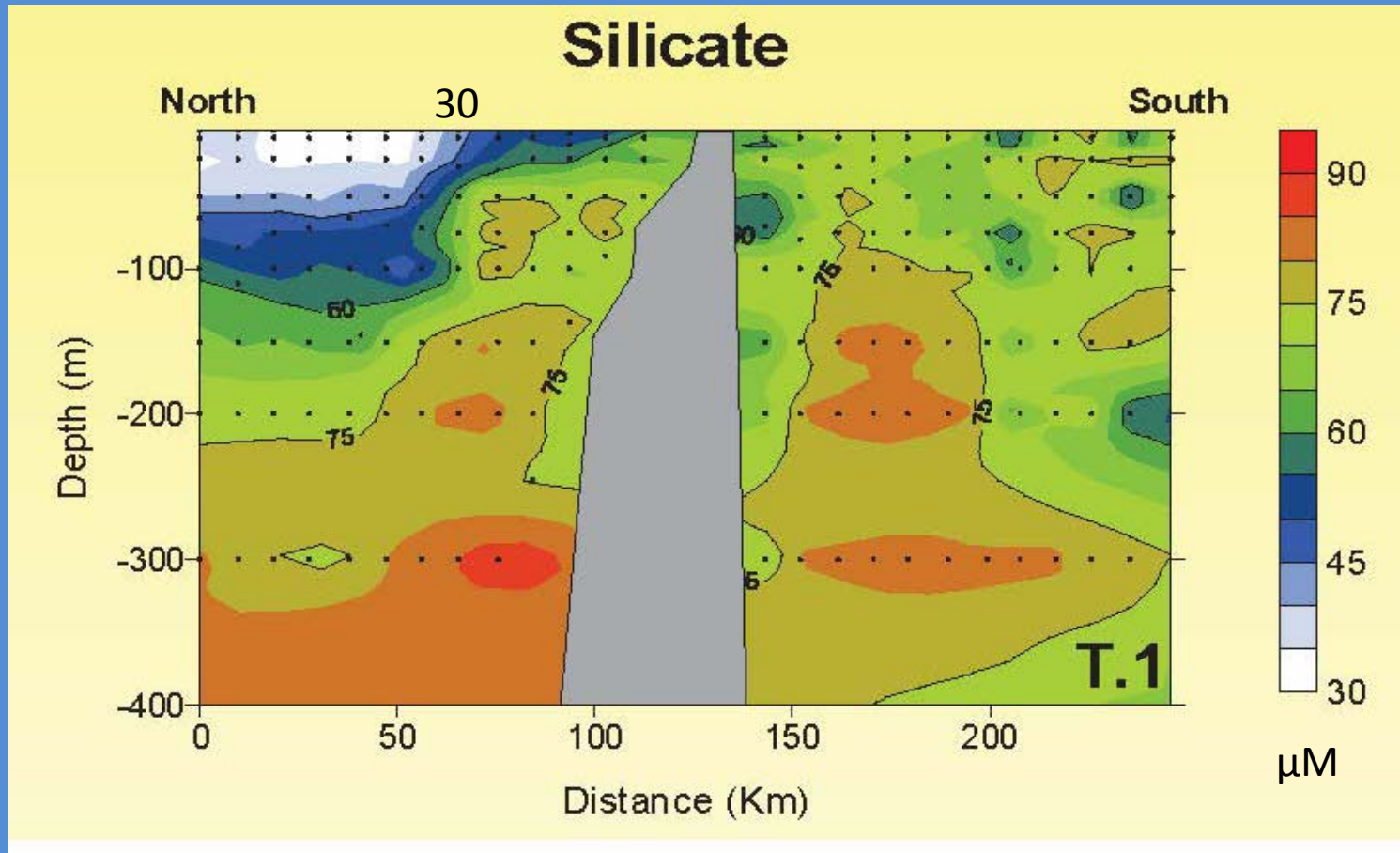
Ageostrophic Secondary Circulation



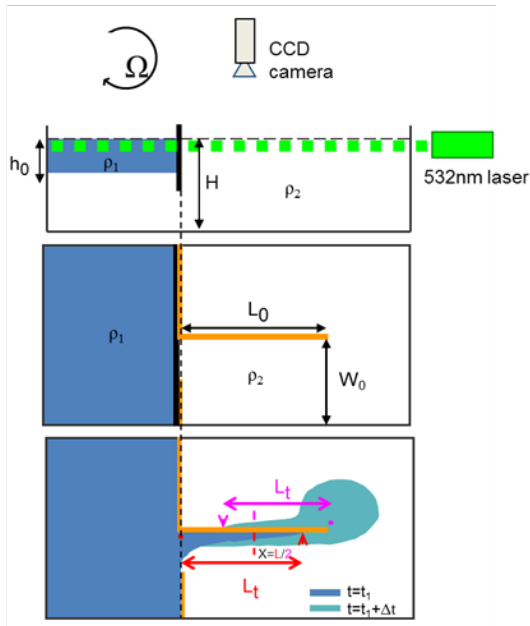
$$V_{geo} \sim \frac{1}{f} \frac{\Delta P}{\Delta n}$$



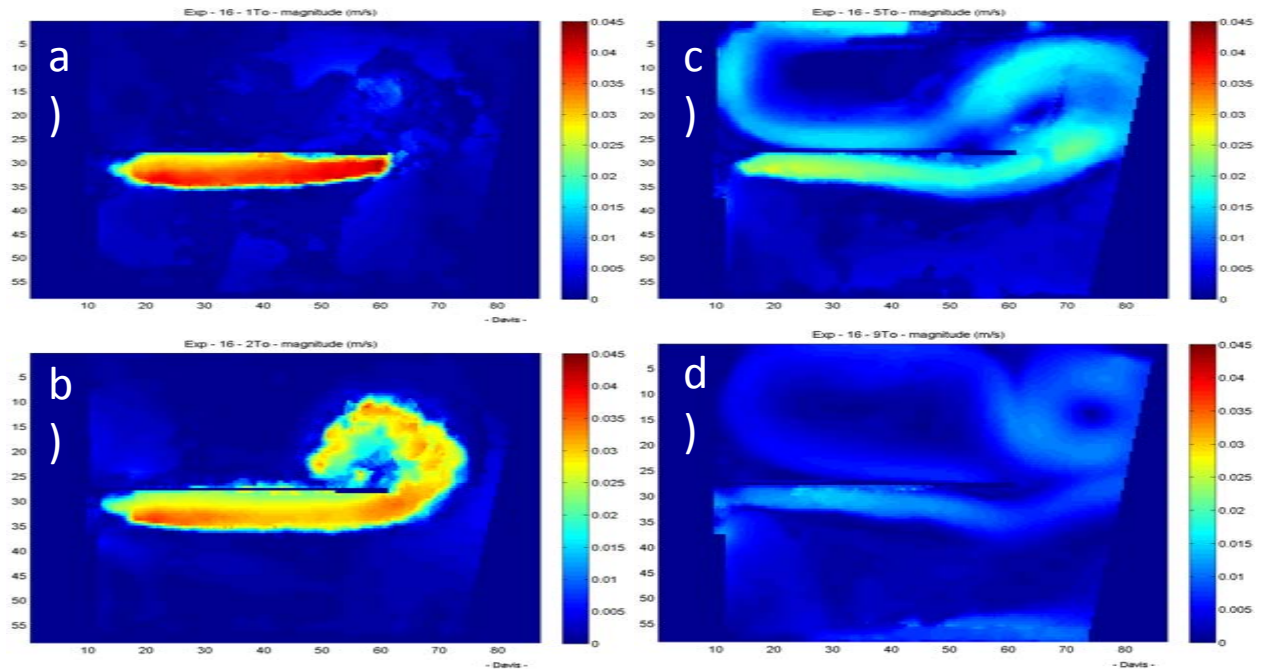
Biological Component no nutrient limited environment



The Bransfield Current behaves as a discharge gravity current: laboratory experiments



Laboratory set up



Surface velocity for different times