

M150 - BIODIAZ

Calcareous nannophytoplankton distribution around the Azores archipelago (Central Atlantic Ocean)



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INTRODUCTION

Coccolithophores, which represent about 10% of the global phytoplankton biomass, are pelagic unicellular haptophytes of the Prymnesiophyceae class and a major component of what is commonly known as calcareous nannophytoplankton. These calcifying organisms are widely and abundantly distributed in the ocean, being one of the major contributors of pelagic carbonate on Earth.

The present work was developed in the context of the BIODIAZ (BIODiversity of the AZores) project, which provided samples from sublittoral to deep-sea stations aiming to incorporate innovative aspects into the study of island and seamount productivity.

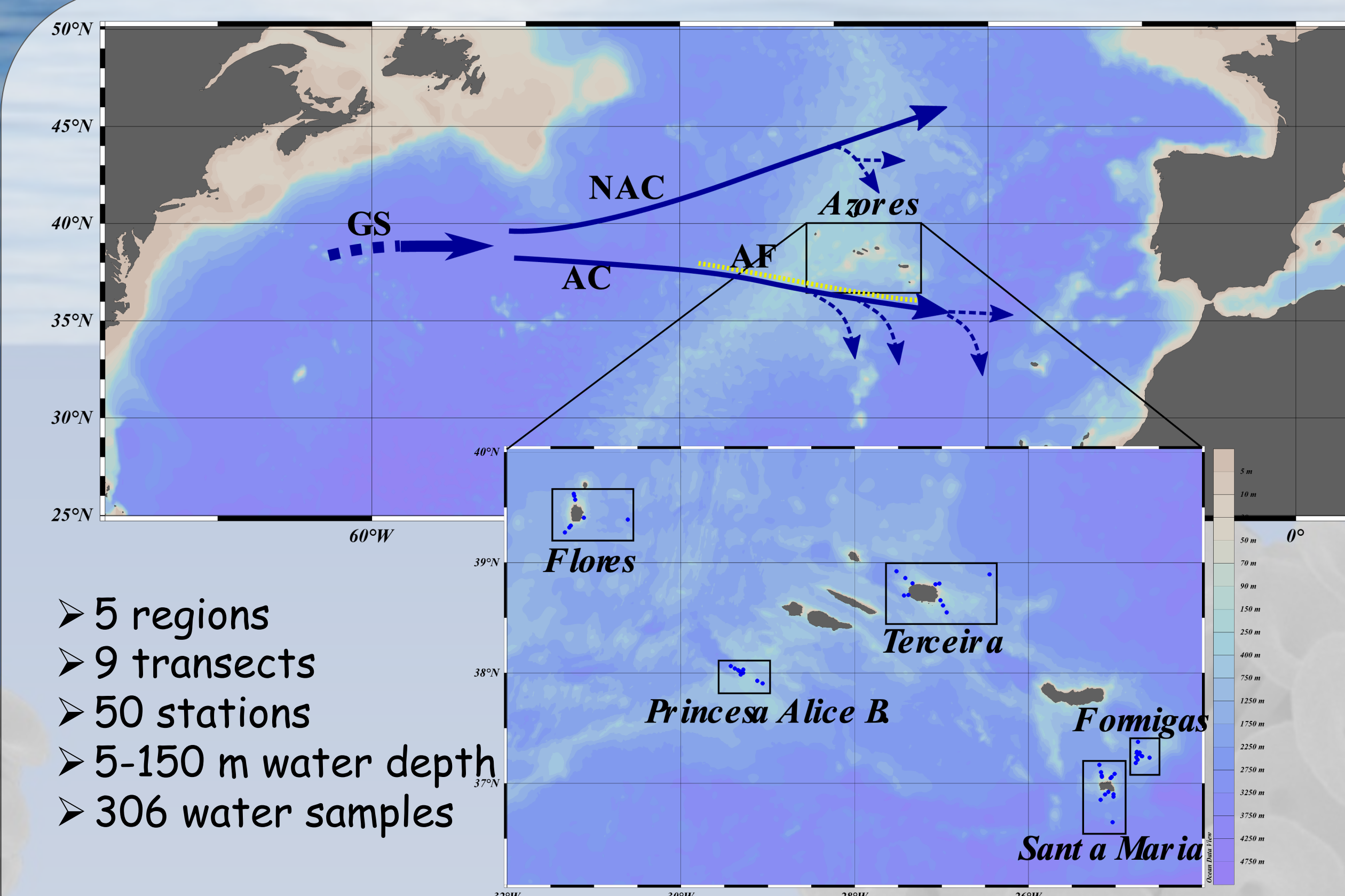
The main goals of the present study are:

- 1) to detect the influence of the islands on the abundance, composition and distribution of the coccolithophore community;
- 2) to investigate community differences among islands and between islands and seamounts;
- 3) to compare the difference in abundance and species diversity with depth.

METHODS

- Seawater samples were filtered onboard through polycarbonate membranes.
- Each filter was left to dry in petri dishes at room temperature.
- In the lab, an angular sector of each filter was cut and permanently mounted on a slide
- Under polarized light microscopy (1250x) at least 400 heterococcospheres (HET) were identified and counted, additionally with an independent counting of holococcospheres (HOL).

STUDY SITES



- 5 regions
- 9 transects
- 50 stations
- 5-150 m water depth
- 306 water samples

Figure 1- Location of the Azores archipelago in the North Atlantic Ocean and the five sampled areas. GS- Gulf Stream; NAC- North Atlantic Current; AC- Azores Current; AF- Azores Front.

STUDIED ISLANDS AND SEAMOUNTS

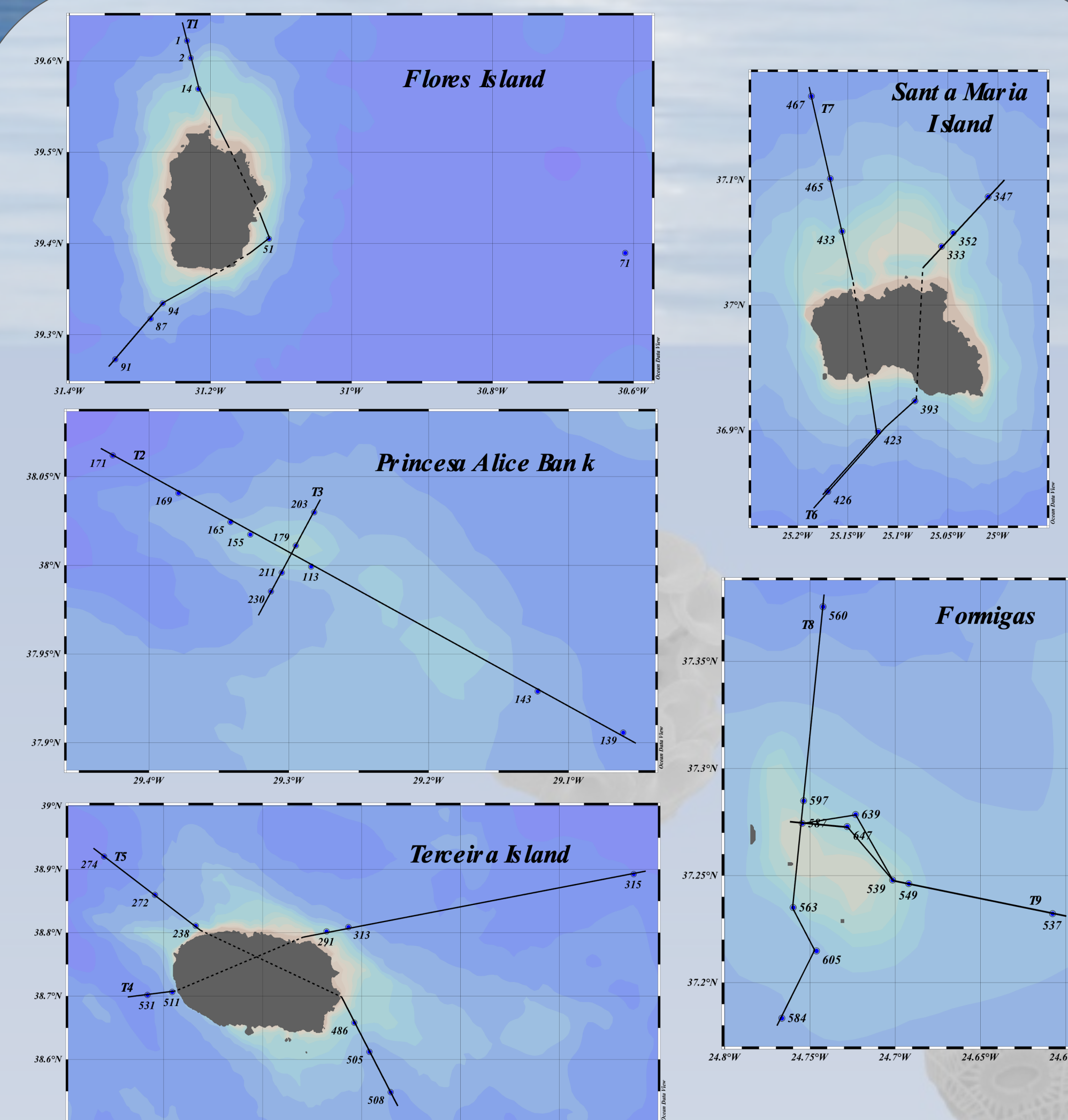


Figure 2- Detailed location of the nine transects (T1-T9) and sampling stations crossing the sampled areas.

RESULTS & DISCUSSION

- 45 different HET taxa identified using polarized light microscopy.
- Dominance: *Emiliania huxleyi* and *Gephyrocapsa ericsonii*, followed by *Umbellosphaera* spp. and/or *Florisphaera profunda*.

Main Results considering outlined goals

- Replacement of *E. huxleyi* by *G. ericsonii* eastwards: Flores with the highest abundances of *E. huxleyi*, Terceira with similar abundances of *E. huxleyi* and *G. ericsonii*, and Santa Maria with the highest abundances of *G. ericsonii*. Maximum abundances at Fomigas ($79.79 \times 10^3 \text{ cell L}^{-1}$), with the dominance of *G. ericsonii*. Minimum abundances at Flores Island ($0.56 \times 10^3 \text{ cell L}^{-1}$). Mean lowest abundances at Princesa Alice Bank, with the dominance of *Umbellosphaera* spp.
- Higher abundances at the west side of bottom topographies, as well as offshorewards (Figure 3). At Santa Maria this increase is observed at both sides of the island (Figure 3). Tendency to higher concentrations in the southeast Azores, i.e., in the east group (Figure 3). The NW-SE asymmetry of abundances observed throughout the Azores archipelago was due to
 - the dominant eastward flow that converges at Azores archipelago, with origin in the Gulf Stream, responsible for the highest coccolithophore abundances at the west side of the islands and seamount in the west and central groups,
 - the eddies from the Azores Current that affected the east group,
 - the different ability of these islands to capture and retain incoming particles.
- The vertical coccolithophore distribution showed the positioning of the Upper Photic Zone (UPZ) at the first 80 m, and the Lower Photic Zone (LPZ) below this depth. Both, the UPZ and LPZ communities, revealed clear subdivisions:
 - the UPZ into the shallow and intermediate,
 - the LPZ into the deep and the deepest sub-communities (Figure 4).

The highest fluorescence values occurred between 60-80m depth and are strongly correlated with coccolithophore maxima.

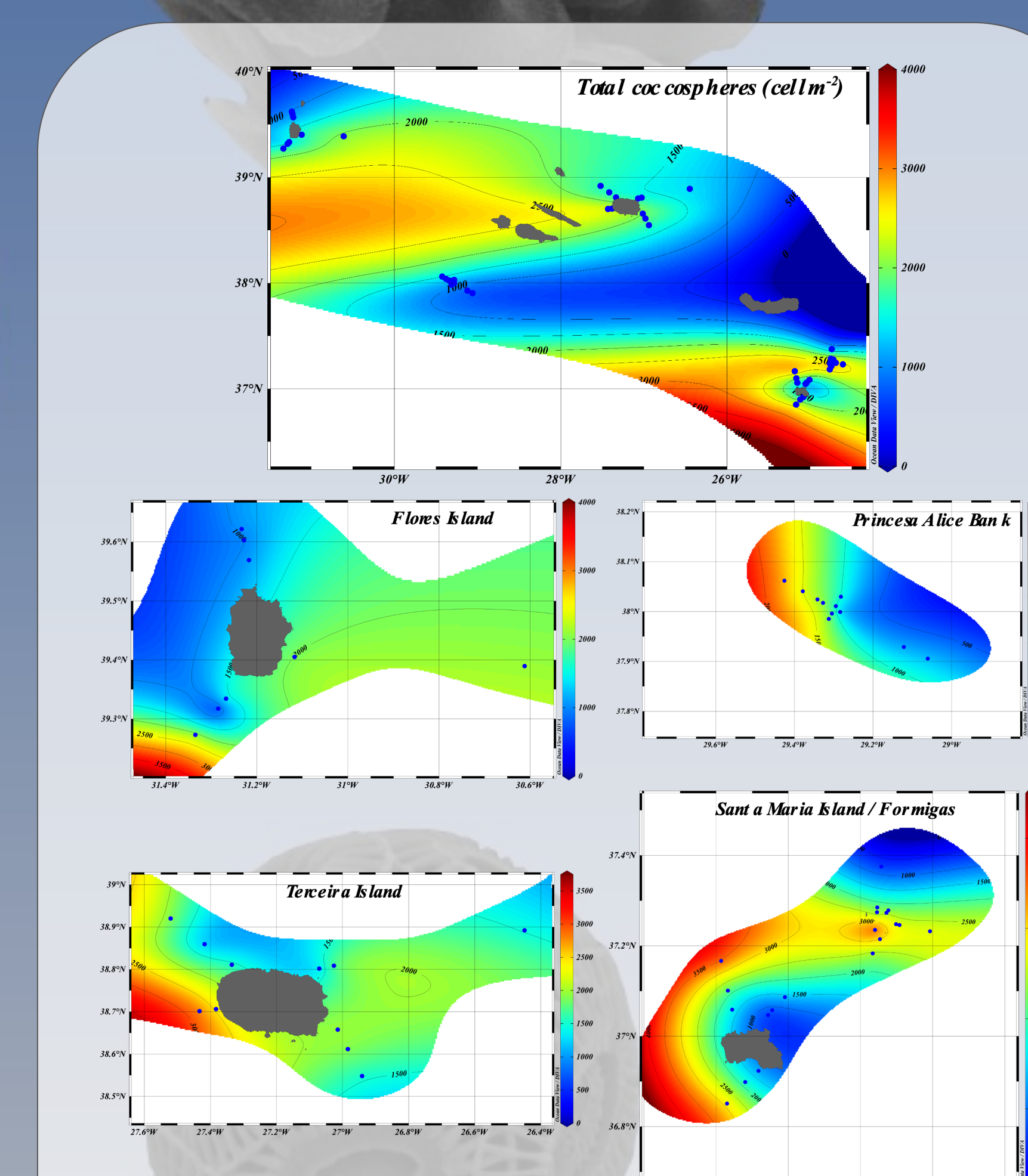


Figure 3- Spatial distribution of the coccolithophore densities based on its integrated data

	Group Typical depth (m)	Typical taxa
Upper photic zone	5-50 Shallow	<i>Umbellosphaera</i> spp. <i>Discosphaera tubifera</i>
	60-80 Intermediate	<i>Gephyrocapsa ericsonii</i> <i>Emiliania huxleyi</i>
Lower photic zone	80-100 Deep	<i>Florisphaera profunda</i> <i>Algirosphaera robusta</i>
	~>100 The deepest	<i>Gladiolithus flabellatus</i> <i>Syracosphaera lamina</i>

Figure 4- Depth-related groups from Aores Archipelago based on Canonical Correspondence Analysis.

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DATA: The datasets generated during the current study are available in the PANGAEA. Narciso et al., submitted. Calcareous nannoplankton abundances during Meteor cruise M150. PANGAEA, <https://doi.org/10.1594/PANGAEA.923929>