

Occurrence and Dynamics of High-Biomass Phytoplankton Blooms in the Northern Antarctic Peninsula

Pedro Moniz

Orientadores: Carlos Rafael Mendes^{1,2}, Afonso Ferreira^{1,2}

¹ Faculdade de Ciências, Universidade de Lisboa (PT), ² MARE – Marine and Environmental Sciences Centre, Faculdade de Ciências, Universidade de Lisboa (PT)

The Antarctic Peninsula is among the fastest-warming regions on Earth, with rising temperatures recorded since the mid-20th century. These environmental changes have put strong pressure on marine ecosystems, including shifts in phytoplankton biomass and bloom phenology. However, the effects of climate change on high-biomass blooms, as well as the mechanisms behind their formation, persistence, and ecological impacts, remain poorly understood.

Objectives:

- Investigate the occurrence of high biomass phytoplankton blooms (1998 - 2026).
- Integrate in-situ phytoplankton observations (GOAL) with ocean color satellite data.
- Evaluate satellite detection of high-biomass bloom events in Antarctica.
- Characterize bloom community composition
- Analyze temporal trends in high-biomass bloom formation.
- Assess contribution to surface carbon uptake in Antarctica.

Tasks:

- Compile and harmonize in-situ and satellite datasets.
- Detect high-biomass phytoplankton blooms using published criteria.
- Perform pixel matchups and validate satellite observations with in-situ data.
- Analyze phytoplankton community composition associated with blooms and temporal trends.
- Estimate surface carbon uptake associated with anomalous blooms.

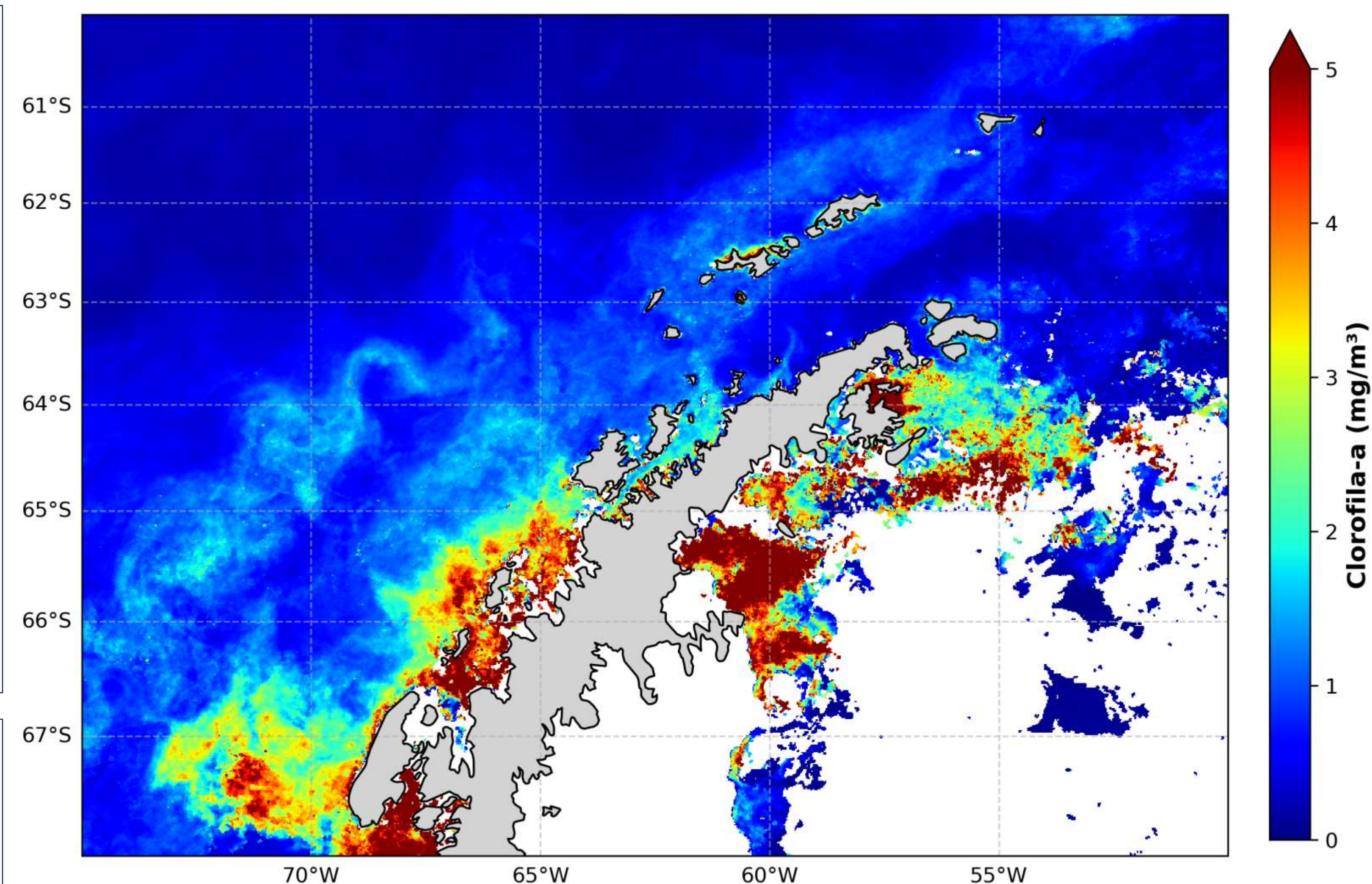


Fig. 1 – Mean satellite-derived chlorophyll-a between September and February 2005 from the OC-CCI product. https://www.oceancolour.org/thredds/catalog-cci.html?dataset=CCI_ALL-v6.0-1km-DAILY

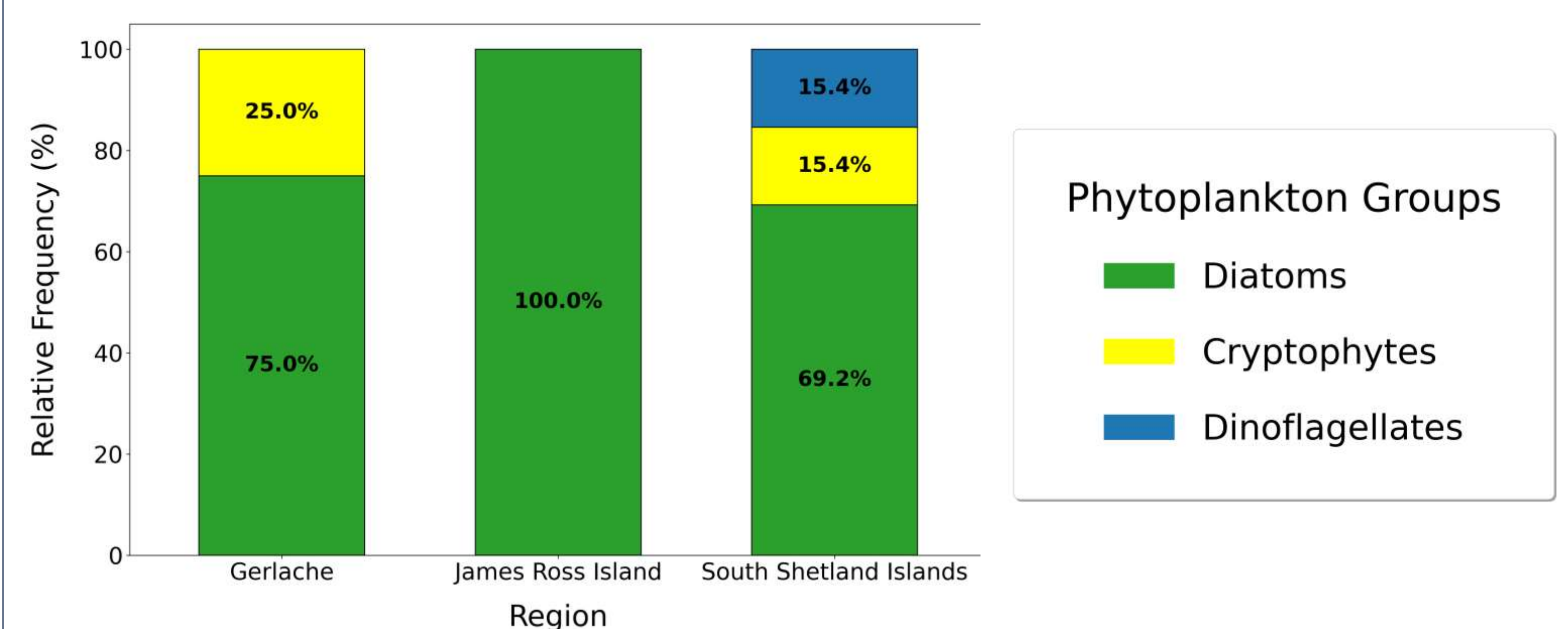


Fig. 3 – Dominant phytoplankton group associated with high-biomass blooms observed between 2008 and 2019, divided by region.

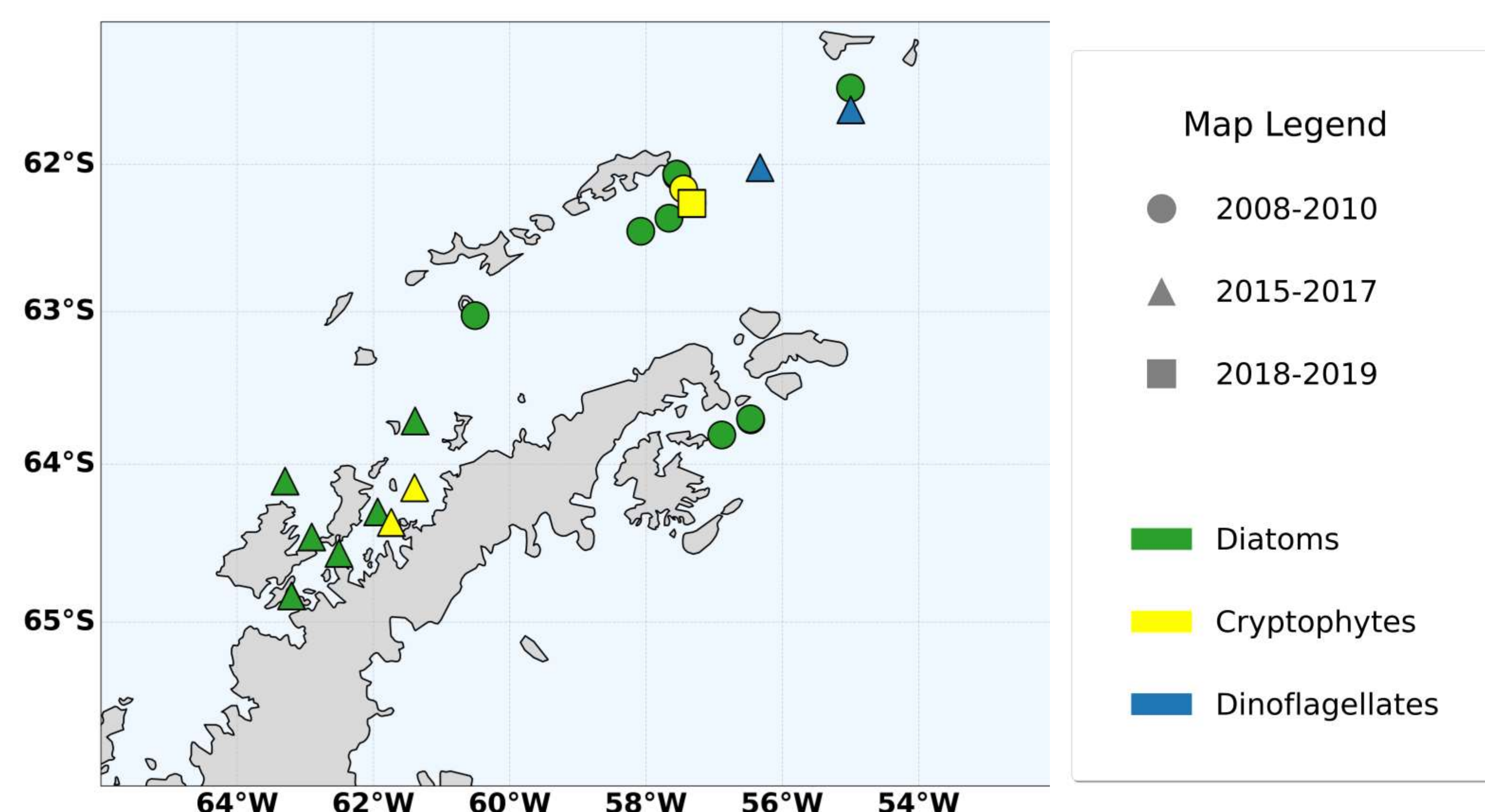


Fig. 4 – High-biomass blooms identified between 2008-2019, colored by dominant phytoplankton group.