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THE STATE UNIVERSITY OF NEW JERSEY

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Tracking krill distributions using a glider in Palmer Deep canyon, a West Antarctic Peninsula penguin and whale foraging hot spot

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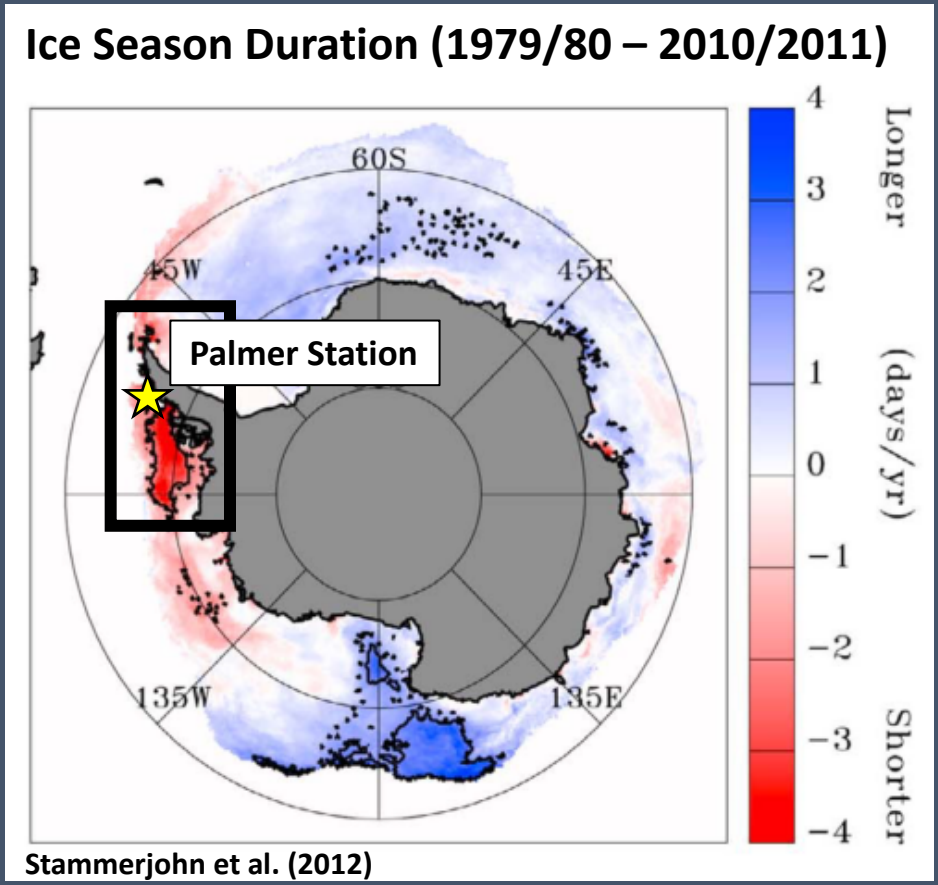
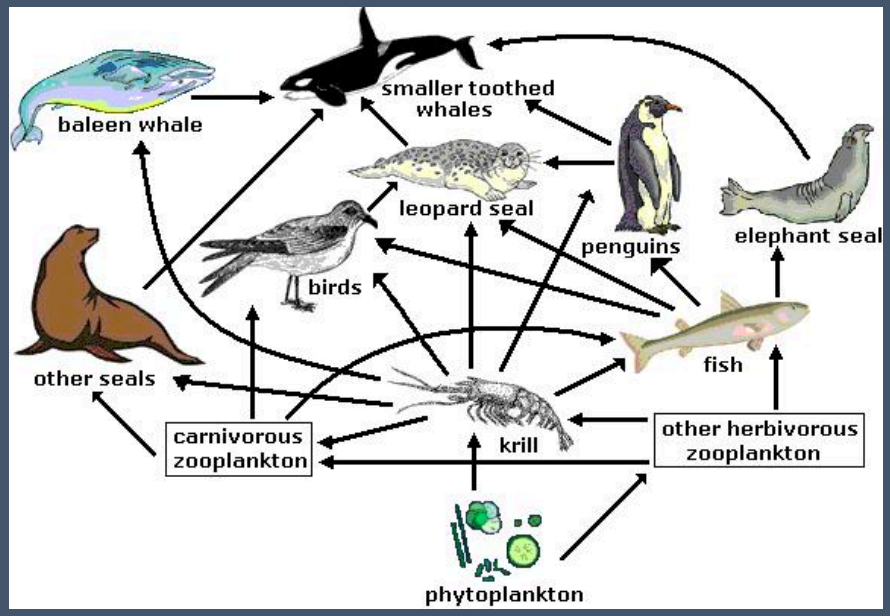
Acknowledgements:

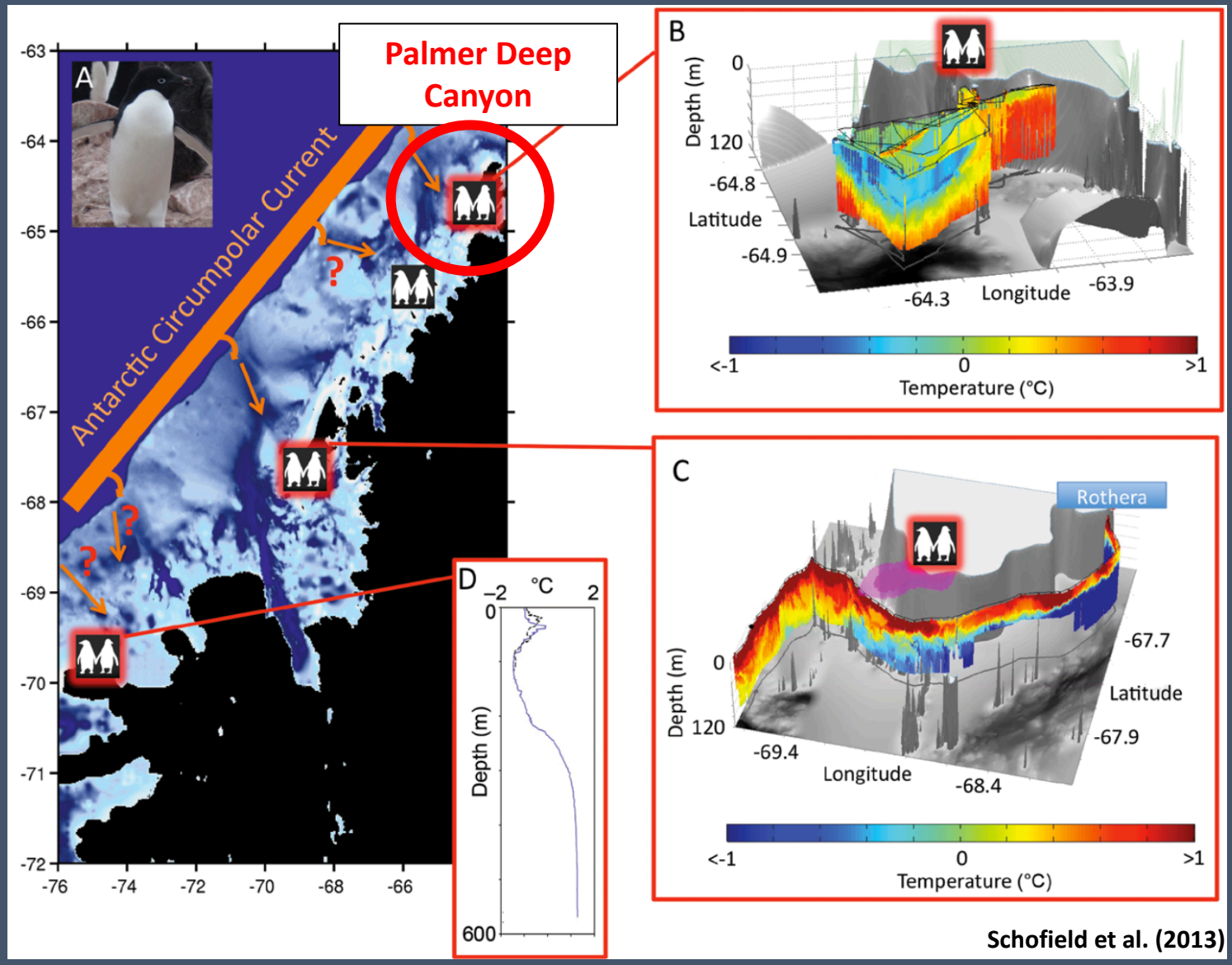
Grace Saba
Josh Kohut
NOAA AMLR Group

West Antarctic Peninsula is experiencing rapid warming, impacting the Antarctic food web



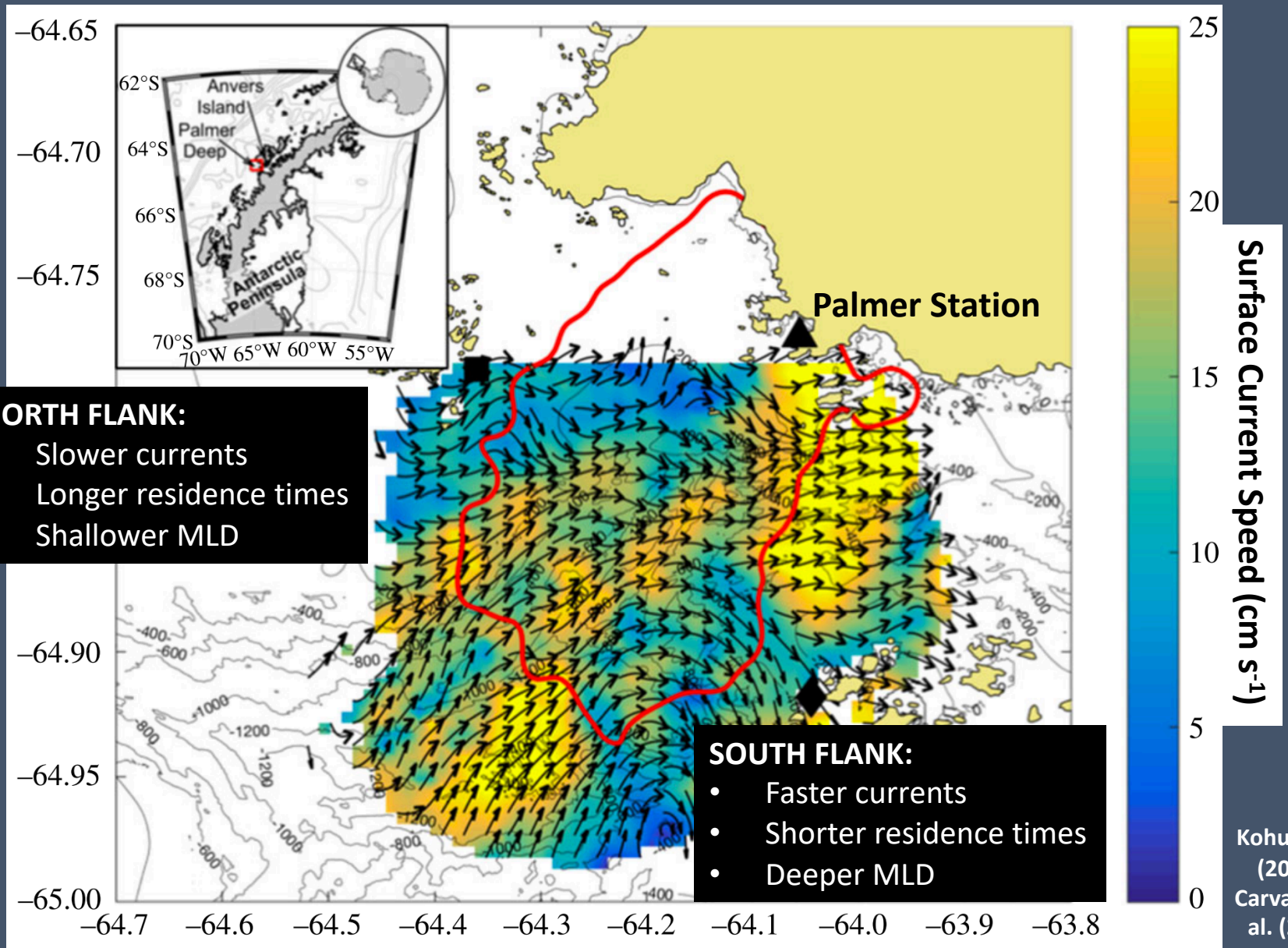


Biological hot spots along the West Antarctic Peninsula



Schofield et al. (2013)

“Conveyor belt” physics transports new phytoplankton production into Palmer Deep Canyon



NORTH FLANK:

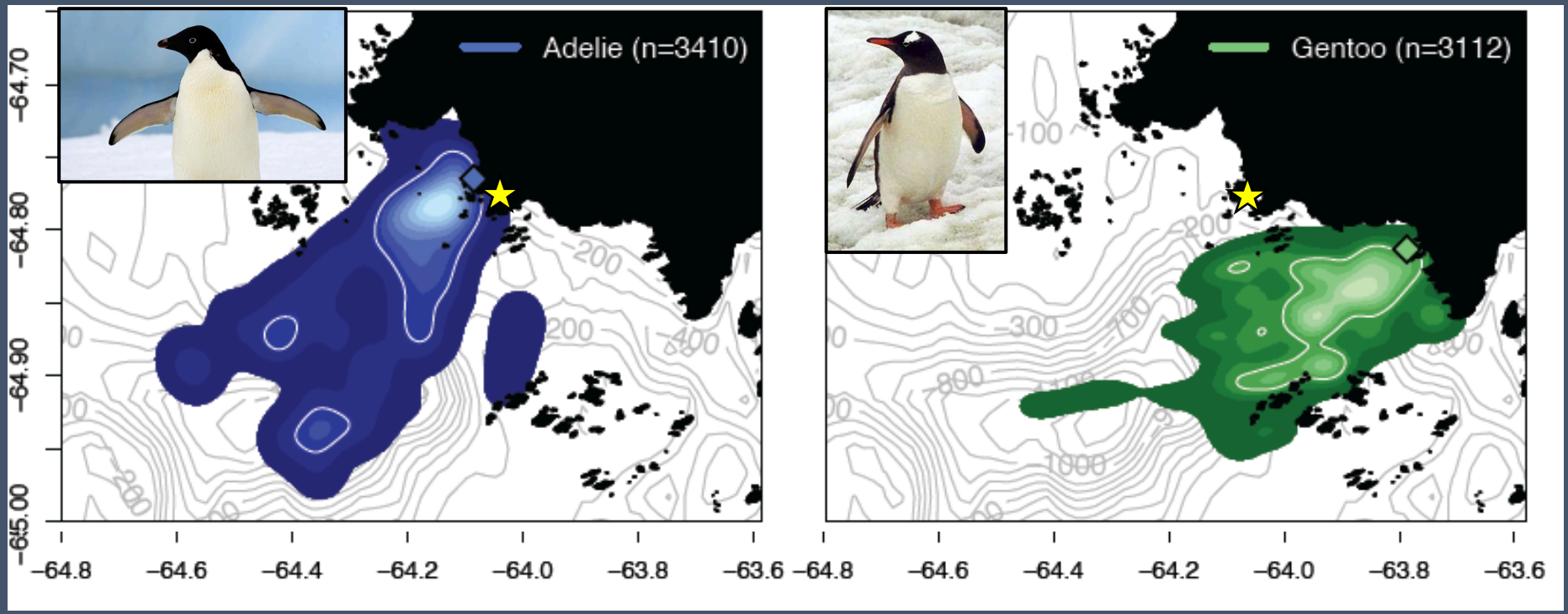
- Slower currents
- Longer residence times
- Shallower MLD

SOUTH FLANK:

- Faster currents
- Shorter residence times
- Deeper MLD

Kohut et al. (2018), Carvalho et al. (2016)

Differing foraging strategies of local penguin populations



Polar Adélie penguins forage in north canyon above the mixed layer depth

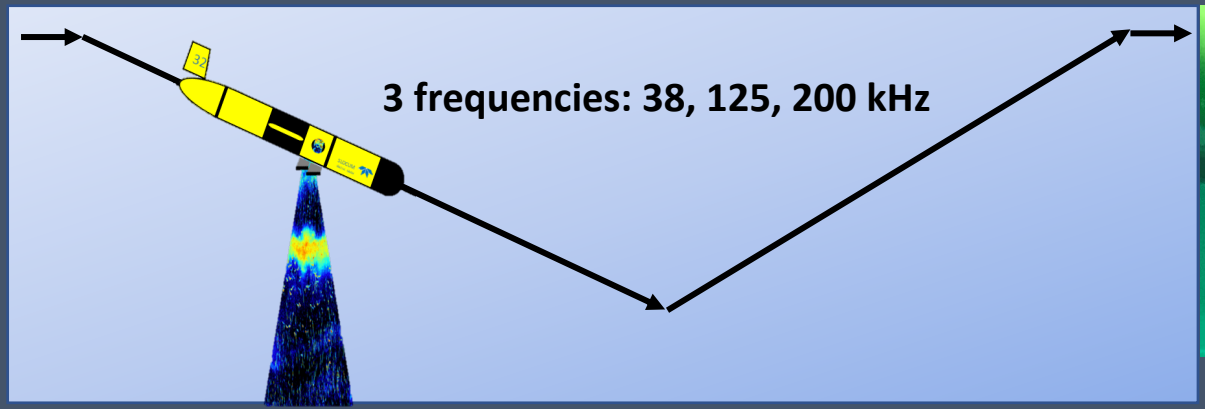
Subpolar Gentoo penguins forage in south canyon down to 150m depths

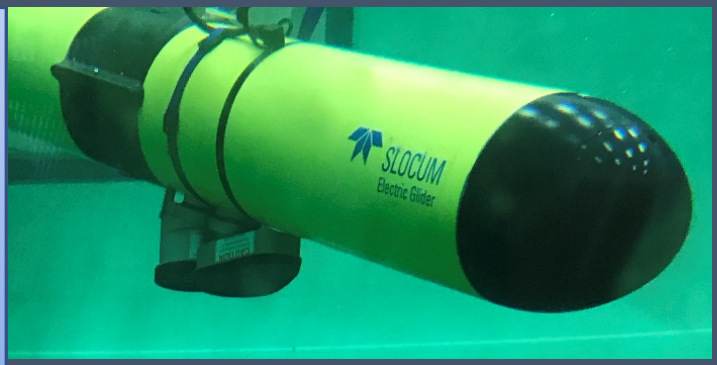
Cimino et al. (2016)

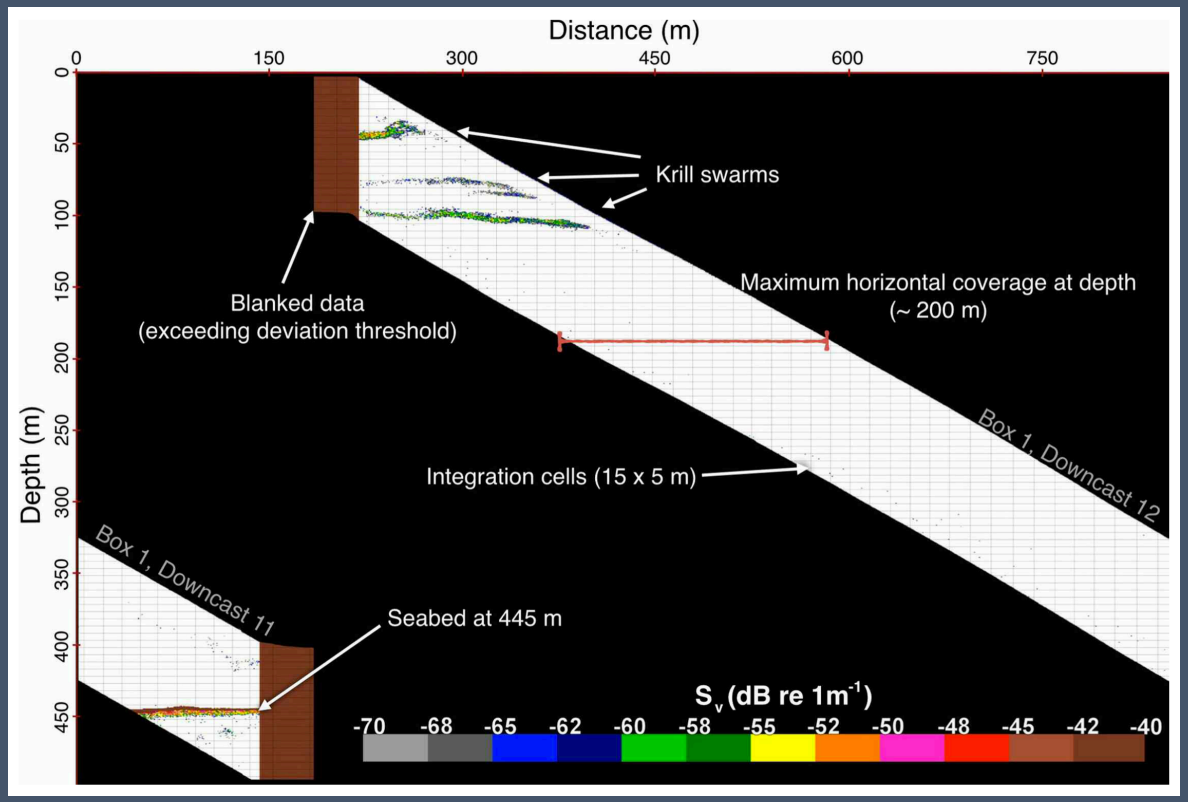
What are the krill doing?

Limited by ship time and access to the canyon

Acoustic Zooplankton and Fish Profiler (AZFP)







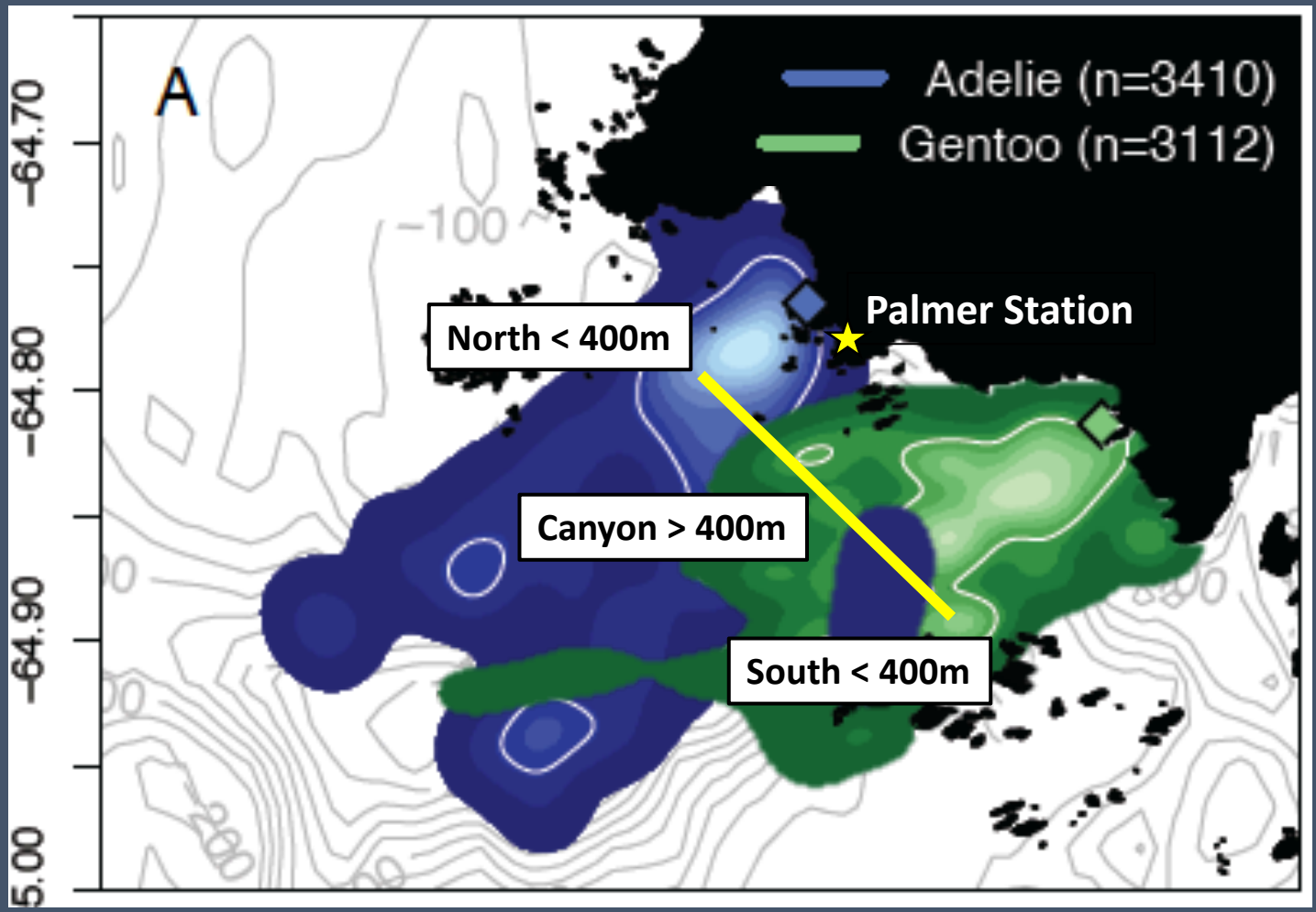
- AZFP sensor integrated into Slocum Webb G2 glider in spring 2017
- Deployed for the first time in the Ross Sea in January 2018

ASL Environmental Sciences

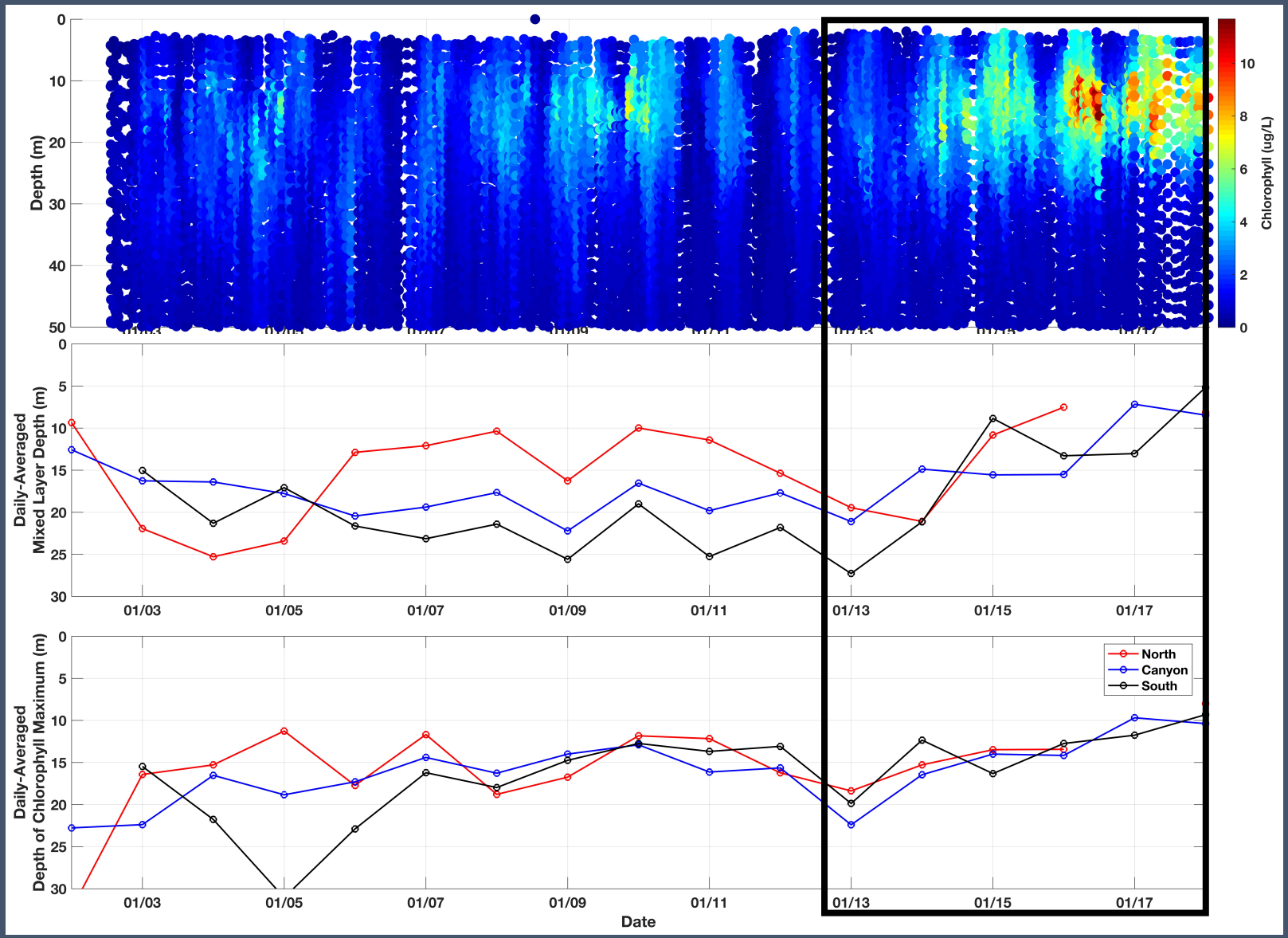
Guihen et al. (2014)

17-day cross-canyon mission sampling in both Adélie and Gentoo foraging regions

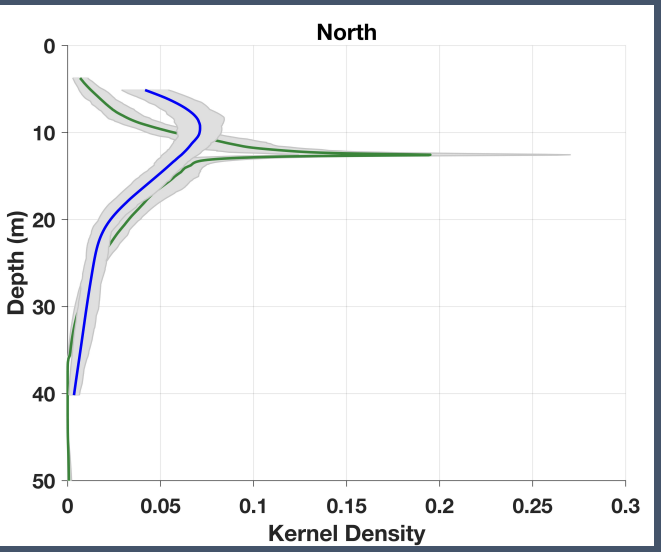
January 2-18, 2019

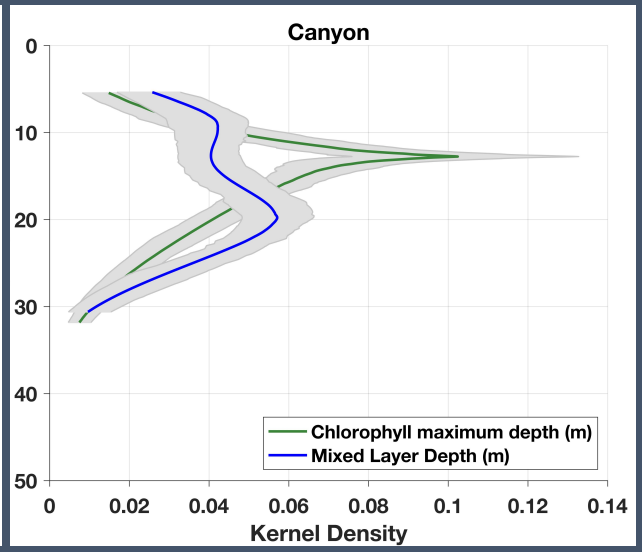


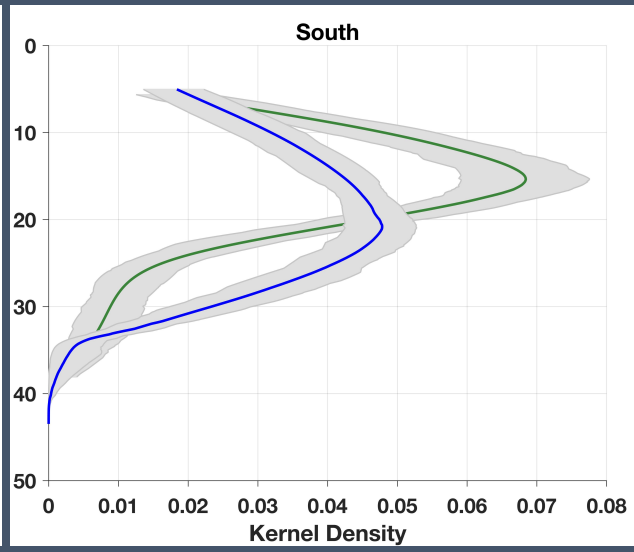
Captured a large phytoplankton bloom, concurrent with shallowing chlorophyll maximum and mixed layer depth

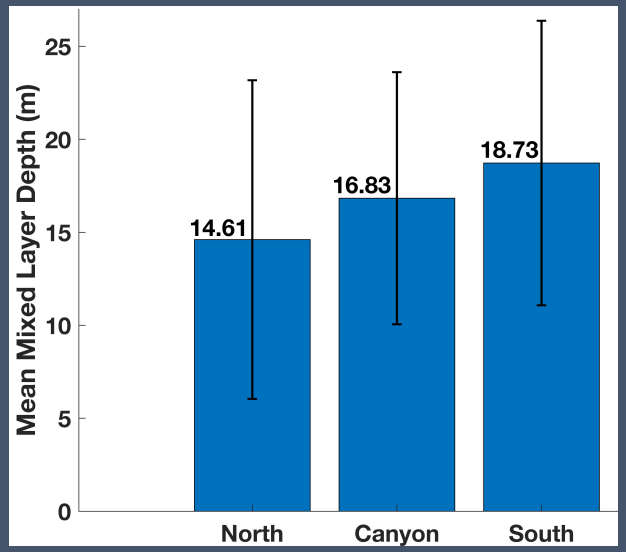


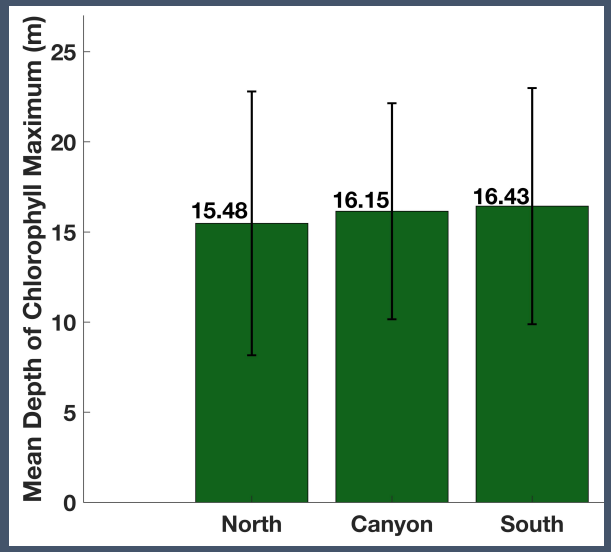
Mixed layer depth and chlorophyll maximum are shallowest on the northern flank and deepest on the southern flank



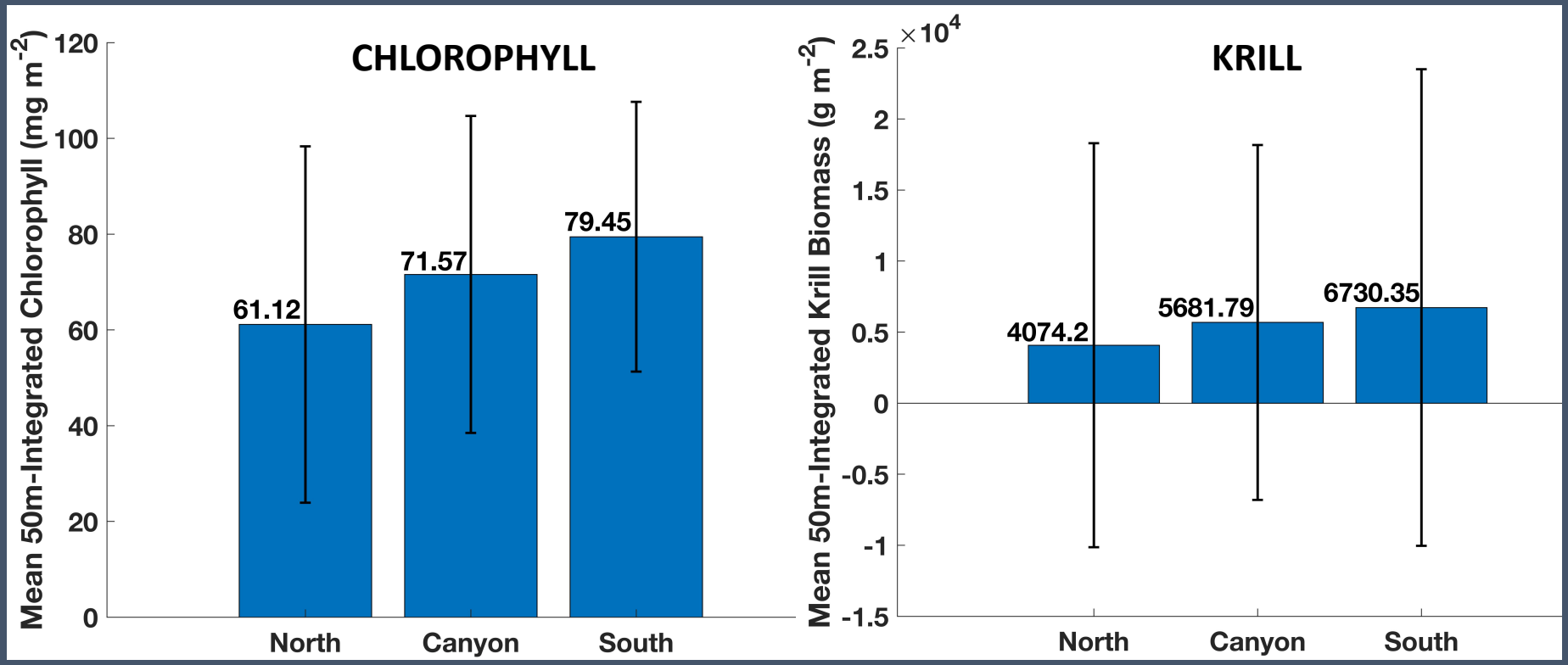








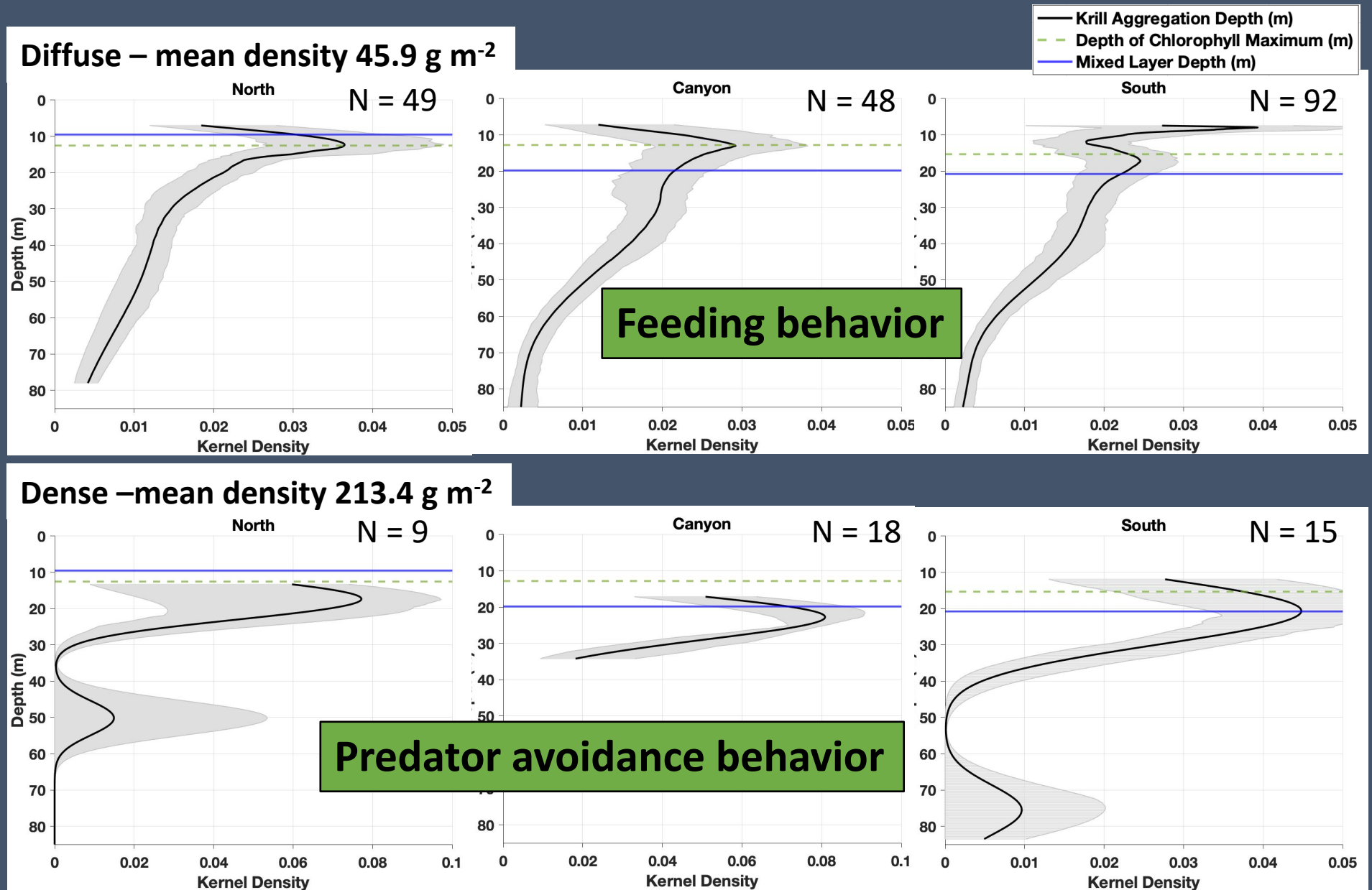
Chlorophyll and krill biomass are highest over the southern flank



Lots of offshore production funneled in through conveyor belt in the south?

Deeper mixed layer depth allowing more room for production?

Small diffuse krill aggregations found at the chlorophyll maximum
Large dense krill aggregations found just below mixed layer depth



Conclusions

- Gliders with integrated acoustics offer HUGE potential to gain a better understanding of the bottom of the Antarctic food web

- Next steps in the analysis include:
  - Determining drivers of krill aggregation dynamics
  - Tying in data from tagged penguins
  - Incorporating water sample data to look at differences in phytoplankton community composition

- Project SWARM 2019/2020 Antarctic summer field season looking at Palmer Deep dynamics with 3 acoustic gliders