Palmer LTER centers on a unifying research question:

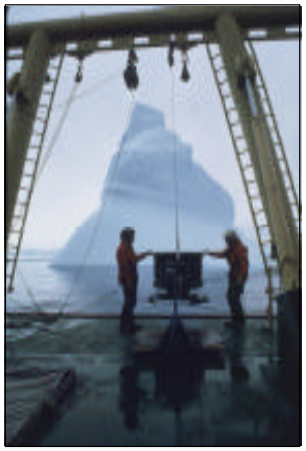
How does changing sea ice cover affect the structure and function of the Antarctic Marine Ecosystem?

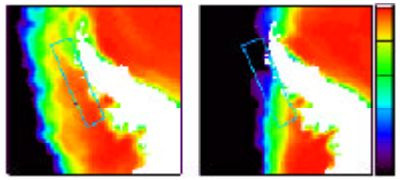
Research in a Large-scale, Natural Laboratory:

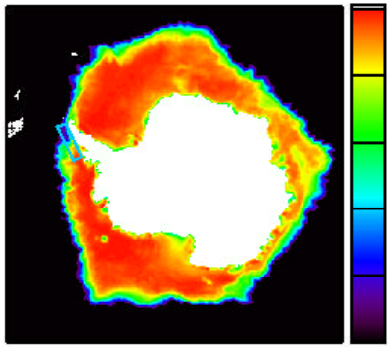
The Antarctic Marine Ecosystem encompasses the plants, animals, ocean and sea ice bounded by Antarctica to the south and an oceanic polar front to the north. Within this ecosystem, Palmer Station provides ideal access to a natural laboratory site that experiences strong climate gradient feedback processes, varying sea-ice coverage and possible amplification of environmental change.

Testable hypotheses link sea ice timing and magnitude to seasonal primary production; carbon and oxygen dynamics; krill abundance, distribution and recruitment; breeding success and survival of apex predators; and large-scale interactions of the atmosphere and ocean.

Ship-board sampling shown with a profiling instrument measuring water column characteristics such as temperature, conductivity, fluorescence and irradiance.



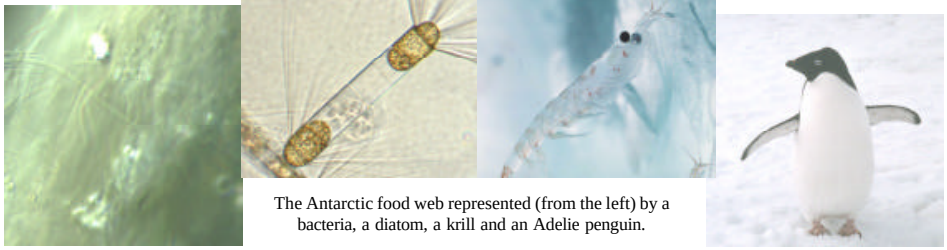




The Southern Ocean and its Antarctic Marine Ecosystem undergoes the largest seasonal surface change on earth (right: Sept 1996 average sea ice) as ice coverage waxes and wanes. Passive microwave satellite imagery (Stammerjohn 1997) shows high ice years (above left; Jul 1987) and low ice years (above right, Sept 1989) differ significantly. The Palmer sampling grid (shown as a blue rectangle) typifies this range of ice cover.

Investigations at LTER Palmer site include:

- Physical forcing (solar radiation, atmospheric, oceanic and sea ice with emphasis on ecological consequences of annual and inter-annual variation
- Life-history parameters of secondary producers (krill) and apex predators (penguins)
- Biological processes with emphasis on community structure and carbon fluxes, including air-sea exhange
- Physical/chemical/biological modeling that links ecosystems processes to environmental variables



The Antarctic food web represented (from the left) by a bacteria, a diatom, a krill and an Adelie penguin.

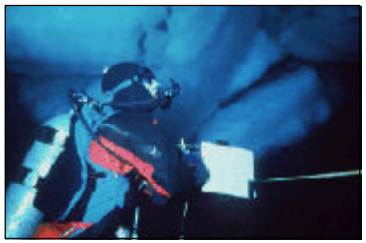
Education and Outreach:

Palmer's outreach program fosters partnerships among classroom teachers, research scientists, information managers, educators by establishing ties with ongoing programs such as the Office of Polar Program's Teachers Experiencing the Antarctic and Arctic, Palmer participants can help teacher's experience inquiry based science and encourage students to explore research processes, base investigations upon scientific methods, and collect and then analyze long-term data.

Data collection: Standard measurements are taken at established stations within a series of embedded grids. The largest grid (shown at left) reflects the regional scale of atmospheric, oceanic, and sea-ice interactions with populations in the marine ecosystem. Smaller embedded grids address local hydrography, near-shore primary and secondary production, and the foraging range of nesting seabirds.

Scientists and technicians cruise on a research vessel each January to take samples of the larger grid and the penguin foraging area. From October through March, smaller inflatable zodiac watercrafts based at Palmer Station sample hydrography, as well as near-shore abundance and distributions. These near-shore data help scientists place data gathered during the January cruise into a sesaonal context of interannual variability. Data from satellite-borne instruments combined with insitu measurements provide significant and reliable long-term data.

A diver examines the under-side of the ice, which provides a unique habitat for krill in chilly Antarctic waters.



Information Management:.

Palmer LTER's information management strategy builds upon existing network structures, develops connectivity, creates a dynamic central hub with distributed, autonomous centers and establishes an accepted data and metadata policy. An electronic hub at the Institute for Computational Earth System Science at the University of California, Santa Barbara provides immediate access and a long-term repository for Palmer LTER data and documentation.

References

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