A multidisciplinary research team dedicated to studying the marine ecology of the Southern Ocean along the western Antarctic peninsula, located -64.7° S, -64.05° W. The PAL study site is one of the most rapidly warming places on the planet (see below), and the ecosystem is responding to the rapid climate warming. Observations of the Antarctic marine food web since the 1970s indicate the development of a more complex food web with new types of grazers and increased microbial activity. Restricted food supplies, such as krill, are being replaced by species such as salps, which would have important repercussions for the diet of larger predators.

A technique called inverse modeling has helped scientists incorporate their observations into food web models that yield estimates of key ecosystem processes like photosynthesis, feeding, respirations and growth rates of krill, seals, penguins and bacteria. Changes they are seeing in the Antarctic penguin population are due to global warming.

PAL scientists have documented a 40 percent reduction in Adélie penguin populations along the western Antartica Ice Sheet since 1974 (Figure 4). These records provide some of the earliest evidence that regional climate warming is negatively impacting the marine ecosystem.

A true polar species, the Adélie penguin is dependent on the availability of sea ice which acts as a critical platform from which they forage for food. Without sea ice, their prey already perished and winter survival becomes even more challenging. The gradual disappearance of sea ice is causing more evaporation to the atmosphere, increased cloud cover and above freezing sunny skies. The temperature is warmer and the ocean is less salty. Increased oxygen low at the height of the Adéle breeding season floods nesting sites and can have devastating effects on egg and chick mortality.

A new marine, subpolar regime is displacing the existing polar climate along the WAP, allowing new species to immigrate and shifting our penguin research to the Gentoo species as the Adélie declines.

Remotely operated underwater vehicles and animal-attached sensors provide new information and create new visualizations of the Antarctic seas. Slocum gliders are now being used to overcome the under-sampling of the Antarctic Peninsula region. These 2-meter long, torpedo-shaped, winged gliders maneuver through the ocean at a speed of 23 kilometers per day in a sunward trajectory through buoyancy changes and steering with a tail rudder. They are outfitted with a variety of sensors measuring ocean physics, chemistry, optics and acoustics. This gives glider scientists the ability to study ecosystem processes spanning from the tiniest plankton to penguins braving cold ectopy.

Since 2007, Palmer gliders have flown 20 missions mapping the Antarctic seas. Sleek Slocum gliders are now being used to overcome the under-sampling of the Antarctic Peninsula region. These 2-meter long torpedo-shaped, winged gliders maneuver through the ocean at a speed of 23 kilometers per day in a sunward trajectory through buoyancy changes and steering with a tail rudder. They are outfitted with a variety of sensors measuring ocean physics, chemistry, optics and acoustics. This gives glider scientists the ability to study ecosystem processes spanning from the tiniest plankton to penguins braving cold ectopy.

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