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Antarctic coastal ecosystems – extreme vulnerability to climate change?

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Antarctic coastal ecosystems may be extremely vulnerable to future climate change due to a wide range of potentially synergistic environmental disturbances that are occurring or are predicted to occur within the next century. Processes and physical changes likely to cause impacts in coastal ecosystems include: sea ice and its effects on light and water column stability; ice berg scour rates; freshening from meltwater inputs; sedimentation; ocean acidification; increasing water temperatures; stronger winds and wave induced turbulence; stratification and mixing; invasive species; and increasing risk of pollution from shipping, tourism and research stations.

Shallow water coastal habitats are relatively rare, as most coastal areas are deep due to geological depression from the continental ice sheet. Nearshore coastal habitats have high biodiversity, high levels of primary production and support trophic links to pelagic and offshore ecosystems and higher trophic levels. Adjacent terrestrial areas are typically ice-free and provide important coastal oases and habitat for breeding vertebrates, but human activity is also concentrated in these areas.

In combination these threats could lead to a range of ecological impacts including: tipping points resulting in regime shifts in community composition; changes to food web dynamics and trophic links leading to different food quality; and a loss of diversity and potential extinctions, with nowhere for species to migrate to (except deeper waters), unlike other regions.

We will present an overview of the climate change induced threats that will affect coastal Antarctic ecosystems and highlight some of the future research needs and directions that will improve our understanding of these impacts. These include more biodiversity research in unexplored areas; a better understanding of oceanographic processes in coastal areas and the development of regional numerical ice/ocean models; and a better understanding of spatio-temporal variation in physical/chemical parameters such as carbon cycles, salinity, sedimentation, and sea ice.