



## **ANTARCTICA NEW ZEALAND INFORMATION SHEET**

# **ANTARCTICA AS A GLOBAL BAROMETER**

Antarctica and the Southern Ocean are regulators of global climate. Together they comprise about a tenth of the Earth's surface. Antarctica contains 90% of the world's fresh water and is surrounded by a broad and deep ocean. The Southern Ocean connects the other three major oceans, transferring mass and energy between them. A seasonally varying blanket of sea ice covers much of the Southern Ocean, complicating the interaction with the other oceans and the atmosphere. The science performed on the Antarctic continent and the Southern Ocean is paramount to our understanding of global climate and our ability to predict global change.

New Zealand has made a commitment to contributing to the world's knowledge of climate change causes and effects. The importance of this work is easily seen by projected consequences of global warming. Experts have stated, "The sea level would rise by 50 to 60 meters if the entire ice cap were to melt into the ocean. If the West Antarctic ice sheet melted away, the sea would rise by approximately 6 meters." This would be enough to inundate many coastal cities greatly changing the world in which we live. Understanding the existing ecosystems is the first step in predicting future impacts.

Antarctica is used for much of this research because, environmental impacts from climate change are generally more pronounced in the polar regions due to the delicate balance of their ecosystems. Calculations show that temperature changes at the poles will be twice that predicted in more temperate areas. To predict what could happen in the future, New Zealand scientists are looking back at the past.

Ice core studies provide a rich archive of temperature, precipitation, and atmospheric gas concentration going back 400,000 years. These changes were accompanied by variations in ice volume of around 10-20 meters of sea level equivalent from the Antarctic ice sheet alone and these variations can be traced back in time as a 40,000 year cycle for the past 5 million years. Investigations continue into the response of the Antarctic ice sheet to both past and projected warm periods. The most recent retreat of the Wilkins and Larsen B ice shelves during March of 1999 shows a clear response to warming trends in the Antarctic Peninsula region.

The sea-ice cover in the Southern Ocean undergoes a five- to six-fold variation in extent between its annual maximum and minimum. Associated ice growth and decay affects the ocean salinity and density structure and deep-water formation. There are also irregular decadal and long-term fluctuations that are poorly defined and understood. Sea ice is a major component of the albedo feedback process, which is largely responsible for the projected amplification of global warming at high latitudes. Ice also largely isolates the atmosphere from the underlying ocean heat and moisture fluxes. All of these attributes influence the global heat, freshwater, ocean currents and CO<sub>2</sub> budgets as well as sea level changes. They are still poorly understood in relation to their impact on global climate change models.