

## A pristine atmosphere

The Antarctic atmosphere is physically and chemically unique. It allows us to determine global trends of atmospheric trace gases at sites far from direct human activity. NIWA's research is on the role of the atmosphere in global change, its response to that change, and the effect on New Zealand. We also contribute substantially to international global change research through close collaboration with other national institutions investigating the Antarctic atmosphere.

The Arrival Heights laboratory on Ross Island is the centre for our research, which includes work on ozone depletion in spring. When seasonal changes in air circulation bring depleted ozone levels to mid latitudes in summer, UV radiation in New Zealand increases.

Although ozone-destroying chlorine has begun to decline, the speed of ozone recovery will depend on how ozone chemistry responds to a changing, or variable, global climate. For instance, the size and extent of the ozone hole in 2002 was severely restricted by a major warming event, the first ever seen in the Antarctic, and the largest polar stratospheric warming recorded in either hemisphere.



## Life in the sea

The marine environment around Antarctica faces many threats, particularly from climate change, tourism, and fishing. NIWA coastal ecologists initiated an exciting and extensive research programme using strategic NSOF investment, with substantial funding from MFish, and in collaboration with researchers from Italy and the USA.

We are carrying out the first comprehensive comparison of coastal benthic habitats and their associated biodiversity in the Ross Sea. The information from this programme will increase our understanding of the coastal zone in McMurdo Sound and how the life in it might be affected by any changes in the environment.



# Antarctica

*Photosynthetic microbial mats, dominated by cyanobacteria and diatoms, cover the bottom of Lake Vanda to at least 40 m, and here at 18 m form conspicuous pinnacles up to 20 cm high.*

## Life in and under the ice

Even in the extreme environment of inland Antarctica, there are places which support life. NIWA's research here focuses on the microbial communities that dominate those rare places where temperature and sunshine provide liquid water for perhaps only a few weeks each summer. Here, the very existence of life depends on the climate-driven change from solid to liquid. We are examining how the biological communities cope with these extreme conditions and how susceptible they are to natural and human-induced change.

Liquid water does, however, exist throughout the year in some parts of Antarctica. The lakes of the McMurdo Dry Valleys, close to Scott Base, have a cover of ice up to 5 m thick all year, but they have liquid water underneath. Lake Vanda, for example, is 75 m deep and has a 3–4 m thick ice cover. NIWA scientists are involved in an international study of what is one of the world's most extreme catchments, and our focus is to determine the role of the microbial mats that cover much of the lake's bed.

These lakes are very sensitive indicators of climate change. They are mostly in sealed basins, so the level of the lake depends only on the inflow and evaporation. As the climate has changed, so has the level of the lake. Over the last 5000 years, Lake Vanda, for example, has ranged from over 120 m deep to less than 5 m. Such changes have enormous consequences for biological systems, and understanding their responses is a key part of the international research programme.

