AFI7/05 - "Microbial Diversity in Antarctic Soils"

Field Science Report - Austral summer 2008-2009

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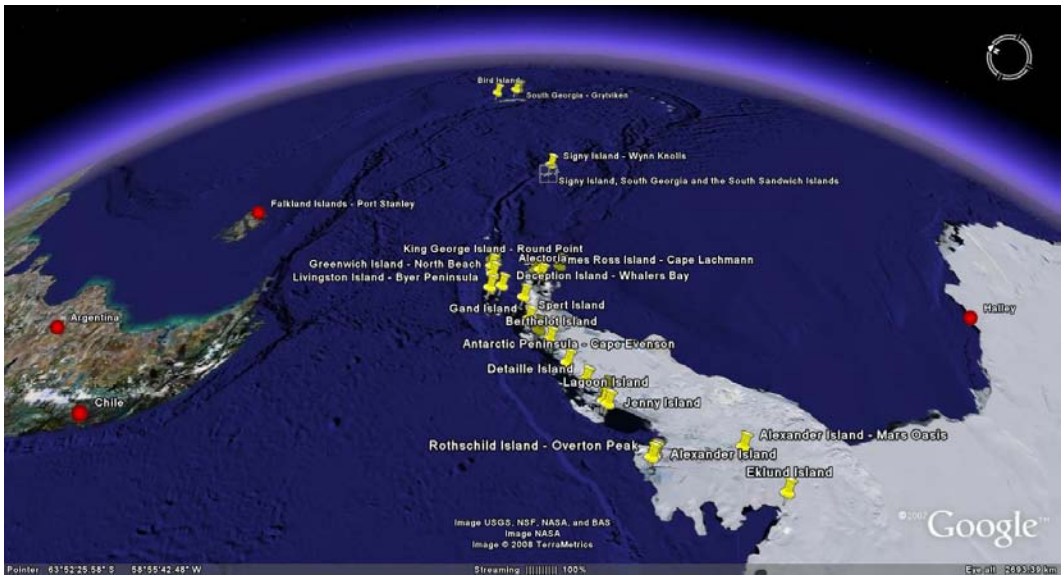
The aim of this project is to understand how Antarctic soil microbial communities will respond to a warming climate. During the austral summer of 2007-2008 approximately 70 soils were sampled from different locations along the Antarctic Peninsula (Fig. 1).



Above: Sites at which soils were collected 2007-08

Detailed chemical, biological and physical analyses have been conducted on these samples and a computer model is under construction to link habitat types with microbial community structure. Model predictions of microbial communities under different climate regimes will be compared with field perturbation experiments in which soils have been irrigated, amended with nutrients, and artificially warmed using open topped chambers (OTCs; passive warming devices commonly used in polar environments). These experiments were installed during the 2007-2008 season at Mars Oasis on Alexander Island and at Wynn Knolls on Signy Island, and were revisited during the 2008-2009 austral summer.

Above: field experiment at Mars Oasis

At these experimental sites we conducted the following: soil sampling, retrieval of temperature loggers, repairs to the OTCs at Mars Oasis and removal of the experiment at Signy Island. Soil respiration was not measured at Mars Oasis because the concentration of CO_2 collected during four hours in the 2007-2008 season was below the level of detection of our gas chromatograph. Laboratory incubation experiments with Mars Oasis and Signy Island soils revealed that the gas collection period would need to be increased from four hours to one week, assuming a soil temperature of approximately $1^{o}C$, which was not possible in the time available at Mars Oasis. At Signy Island, however, a full set of respiration samples were collected.

Work on the soils collected from the 2007-2008 season is now nearing completion and the model is underway. The data that we will collect when we receive this season's samples can therefore be used immediately to test the validity of model predictions of microbial community responses to climate change. Importantly these community responses will be linked with the productivity of ecosystem services such as decomposition, and nitrogen cycling. By adopting this approach we will be able to predict how the 'health' of Antarctic ecosystems will be influenced by climate change and relate this knowledge to other ecological systems further north.