

OUTLINE FIELD PLAN: 2005/6 Field Season**Project: AFI 6/28****Terminal Cretaceous Climate Change and Biotic Response in Antarctica**

PI: Professor Jane Francis, University of Leeds
Location: Seymour Island
Personnel: Professor Jane Francis, Professor Rob Raiswell and Dr Vanessa Thorn (University of Leeds); Dr Jim Riding (British Geological Survey)
Dates: Late December 2005 – early March 2006

Objectives of project:

This project will investigate the nature of latest Cretaceous-early Tertiary climates in Antarctica. Our specific target is to find geological evidence of glaciation during Maastrichtian times, approximately 71-65 million years ago. Such a discovery will challenge the current view that the Cretaceous greenhouse world was ice-free, implying instead that short term glacial climates punctuated supposedly stable warm climates. Such dramatic environmental change would have also stressed terrestrial and marine biotas and made them particularly susceptible to early extinction related to the global environmental catastrophe at the end of the Cretaceous.

This project will exploit the exceptional sequence of late Cretaceous strata on Seymour Island to obtain high resolution records of palaeontological, sedimentological, and geochemical signals to: a) investigate the nature of latest Cretaceous-early Tertiary climate change at high latitudes, b) to test the hypothesis that ice was present at times and to compare with climate/ice-sheet model outputs, c) to determine the biological response to this environmental change in both terrestrial and marine high latitude ecosystems, and d) to understand the environmental context in which the K/T extinctions occurred.

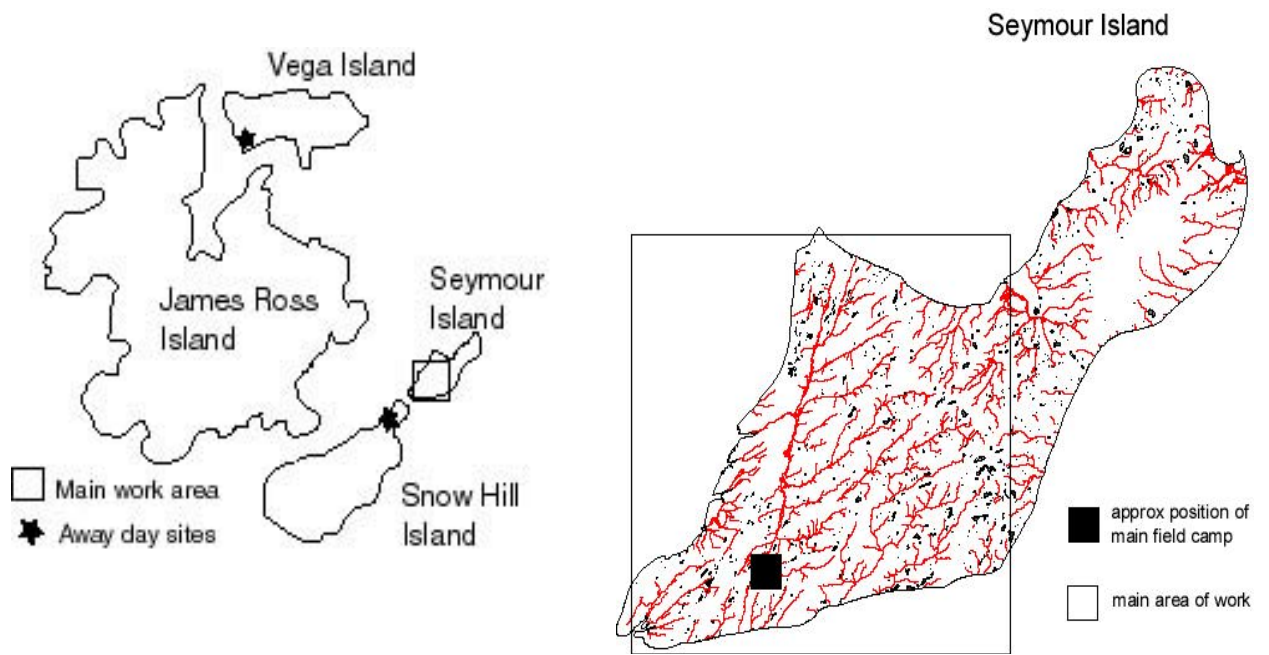
Field area

The main body of field work will be centred on southern Seymour Island. Day trips to Cape Lamb (Vega Island) and northern Snow Hill island are also planned.

Logistics:

- HMS Endurance support, using helicopters, is requested for camp input and uplift.
- Helicopter support is requested for day trips to Cape Lamb, Vega Island, and northern Snow Hill Island (preferably end of season but mid season also OK)
- Normal camping units required plus toilet tent.
- Drinking water supply from HMS Endurance is requested
- ATVs requested for transporting samples on Seymour Island
- Estimated 500-1000kg of rock and fossil samples will be collected – collapsible rock boxes requested.

No SSSIs or SPAs involved.



Location of main field site on Seymour Island and sites for day trips to Vega Island (Cape Lamb) and Snow Hill Island

**OUTLINE FIELD PLAN: 2005/6 Field Season
PROJECT: AFI5/03**

**Timing and rates of ice sheet thinning in the Ellsworth Mountains, Weddell Sea
embayment: constraints on West Antarctic ice sheet dynamics**

PI: Dr Mike Bentley, *Dept of Geography, University of Durham*
Location: Ellsworth Mountains
Field Personnel: Mike Bentley, PDRA, 2 FGAs
Dates: Nov 2005 to Jan/Feb 2006

Overall aim of the project:

The overall aim is to establish the timing and rate of thinning of the West Antarctic Ice Sheet (WAIS) from its maximum extent in an area inland of the Weddell Sea embayment. The specific objectives are (a) to date geomorphological evidence of ice sheet thinning in the Ellsworth Mountains using *in situ* cosmogenic nuclides and (b) to infer WAIS dynamics (specifically grounding line and ice volume changes) in the Weddell Sea embayment through high-resolution glaciological modelling, constrained against the geomorphological record of elevation change through time. The importance of the project is that the past dynamics of the WAIS have implications for its future behaviour, and thus global sea level.

Fieldwork objectives:

Our aim is to map and sample the glacial geomorphology of the Ellsworth Mountains, with a view to understanding the deglacial history. Throughout our emphasis is on taking samples that will allow us to date any changes in ice altitude/extent. We will visit a series of sites in turn (Fig 1. plus see below) and at each one we will carry out the following activities:

- geomorphological mapping – from satellite imagery and aerial photography, ground truthing, small amount of sediment sampling, surveying and GPS traverses.
- sample erratics, bedrock and sediment from altitudinal transects: sampling will consist of hammer and chisel, petrol-powered rock saw (in a few instances), and pits dug into glacial sediments. Pits will be backfilled after excavation to minimize scarring of landscape.

Personnel and scientific equipment:

We will have a field party of four: two scientists and two FGAs. This will entail two full field units plus 3-4 sledge-sized Zarges for field kit (150-200kg max). We will sample up to 150 kg of rocks.

Sites:

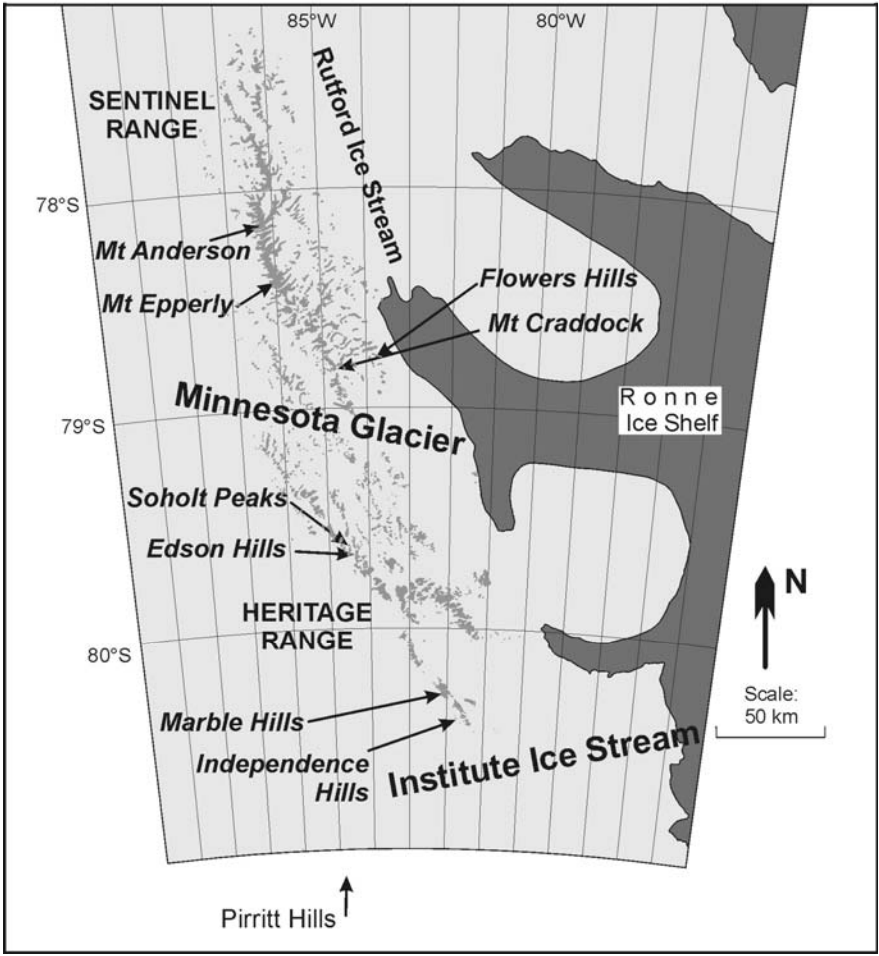
- (i) Flowers Hills (78.4 °S, 84.1667 °W), OR Mt Craddock (78.6337 °S, 85.2 °W). Precise area of interest will depend on what geomorphology I map on USGS photography during summer 2005.
- (ii) Escarpment forming W side of Sentinel Range, e.g. Mt Anderson (78.15°S, 96.2167°W) to Mt Epperly (78.4333°S, 85.8833°W). Our skidoo-based traverse would also take in Edson Hills (79.8337°S, 80°W) and Marble Hills (80.2833°S, 82.0833°W).
- (iii) W flank of Heritage Range (Soholt Peaks (79.7167°S, 84.2°W) and south to Independence Hills (80.4167°S, 81.55°W)
- (iv) Pirrit Hills (81.2833°S, 85.35°W).

Schedule:

In consultation with BAS Field Operations staff, the likely schedule will be:

- (i) Aircraft input to Flowers Hills, possibly one unit at a time, depending on other activities at RABID etc. This will be round about 3rd week of November (approx.). Few days work here.
- (ii) Aircraft move to Pirritt Hills - possibly simultaneous (or soon after) put in petrol cache near Heritage Range;
- (iii) Field party to then move oversnow through all Heritage Range sites (see below), picking up petrol cache where appropriate. Cross Minnesota Glacier ourselves, probably some distance to west. Finish our work along W side of Sentinel Range, as far N as Mt Anderson.
- (iv) a/c pick up from W side of Sentinel Range, return to Rothera. This to be about 3rd week of January (approx.).

Fig. 1
Location of proposed field sites. Consultation with Field Operations staff suggests that aircraft will be used for input to Flowers Hills/Mt Craddock, then on to Pirritt Hills, followed by a northwards skidoo traverse of all other sites with eventual aircraft pick-up near Mt Anderson.



OUTLINE FIELD PLAN: 2005/05 Field Season
PROJECT: AFI5/32

Dissolved organic nitrogen cycling in the Antarctic

PI: Dr Davey Jones, University of Wales, Bangor
Location: Signy island
Field Personnel: Dr Paula Roberts (University of Wales, Bangor)
Dates: Early December 2005 – early March 2006
(both RRS *Ernest Shackleton*)

Objectives of project:

1. Inventory on Signy Island:

The survey on Signy Island will include the assessment of soil nitrogen status under each of the island's main vegetation zones. The regions to be covered will include vascular plant sites (e.g. *Deschampsia antarctica*, *Colobanthus quitensis*), moss dominated sites (e.g. *Andreaea*, *Dicranoweisia*) and predominantly bare or lichen-covered soil sites. Locations will also be selected based upon access, ornithogenic inputs and human disturbance.

The likely list of sites to be evaluated is as follows:

Bare (or lichen-covered) sites: Robin Peak plateau, Jane Peak Ridge and Changing Col.

Moss sites: Moss Braes, Backslope and Foca Cove.

Higher plant sites: Berntsen Point, Knife Point, Foca Cove and just south of Moss Braes.

Ornithogenic sites (penguins and giant petrels): North Point, Foca Cove, Gourlay Peninsula.

Human disturbance: in vicinity of Signy station.

2. Quantification of soluble nitrogen pool sizes at each site:

Soil solutions will be collected by two independent methods. The first will use the non-destructive 'Rhizon OM' samplers where the solutions will be recovered from the same location on five occasions during the growing season. We expect to collect *c.* 375 samples for analysis. The second soil solution sampling technique will remove small amounts of soil (*c.* 50 cm³) and extract soil solution by centrifugal-drainage in the laboratory, again yielding *c.* 375 soil solution samples. To estimate the exchangeable N pool, samples collected for the centrifugal extraction will also be subjected to extraction by 0.5 M K₂SO₄ at selected sampling times. We expect this will yield *c.* 150 extracts for analysis. Soil solutions and extracts will be frozen for shipment to the UK.

3. Organic C and N turnover:

Protein and amino acid turnover will be determined by the addition of ¹⁴C glucose, ¹⁴C-labelled plant protein (purified from ¹⁴C-labelled algal cells) or ¹⁴C-labelled amino acids to the soil at a range of concentrations and then measuring ¹⁴CO₂ production by respirometry in the laboratory. Isotopes of ¹⁵N will also be applied to the soil and plant ¹⁵N uptake determined. Measurements of soil and soil water pH and electrical conductivity will also be made in the laboratory.

Logistics:

The project will be based at Signy station. Sampling will be carried out by day trips around Signy island. Overnight stays in huts are not anticipated. Specific GA support is not required for the project but some accompanied trips around the island may be necessary.

Facilities required on base:

Analytical laboratory space, 1.5m²;

Laboratory bench space, 2 m²;

Fume hood;

-20°C freezer storage, 1m³.

