

PROPOSAL FOR A SCAR SCIENTIFIC RESEARCH PROGRAMME ON ANTARCTIC CLIMATE EVOLUTION (ACE)

Science Objectives

The ACE programme aims to facilitate research in the broad area of Antarctic climate evolution over a variety of timescales. The programme will link geophysical surveys and geological studies on and around the Antarctic continent (Fig. 1) with ice-sheet and climate modelling experiments. ACE is designed to determine both climate conditions and climatic changes during the recent past (i.e., the Holocene prior to anthropogenic impacts as well as at the last glacial maximum, when temperatures were cooler than at present) and the more distant past (i.e. the pre-Quaternary, when global temperatures were several degrees warmer than today). This new cross-disciplinary approach, involving climate and ice sheet modellers, geologists and geophysicists, will lead to a substantial improvement in the knowledge-base on past Antarctic climate, and our understanding of the factors that have guided its evolution. This in turn will allow us to build hypotheses, examinable through numerical modelling, as to how Antarctic climate is likely to respond to future global change. Equally important, the development of data-driven models for Antarctic climate will allow us to extend our results to the analysis and prediction of global climate variability.

A previous SCAR programme, ANTOSTRAT (ANTarctic Offshore STRATigraphy project), focused principally on developing a stratigraphic framework for the Cainozoic Antarctic margin through seismic stratigraphy and direct sampling through offshore drilling and coring. In addition, the goals of the short-lived SCAR initiative ANTIME (Antarctic Ice Margin Evolution) were transferred to ACE following the termination of GLOCHANT (Antarctic Global Change Program) in 2002. During the lifetime of ANTOSTRAT, significant advances were made to ice sheet and climate models in terms of their ability to replicate the modern environment and to reconstruct former conditions. As yet, there has been no concerted effort to employ such models to determine the Cainozoic climate evolution of Antarctica. The ACE programme will build on the achievements of ANTOSTRAT by focusing on linking palaeoenvironmental records, from current and future drilling and coring, with new ocean-ice sheet-climate modelling efforts in order to provide both constraints and tests for this new generation of models.