Modelling the Physical and Chemical Dynamics of Antarctic Subglacial Lakes

M.J. Siegert[1], P.D. Bates[1], M Tranter[1], J.C. Ellis-Evans[2]

[1]Bristol Glaciology Centre, School of Geographical Sciences, University of Bristol, England, BS8 1SS.
[2] Biosciences Division, British Antarctic Survey, Madingley Road, Cambridge, England, CB3 0ET.

The physical dynamics and chemistry of Antarctic subglacial lakes will be determined from a series of measurements and numerical models. Work will initially concentrate on the largest and best known Subglacial lake, Lake Vostok. Datasets from Lake Vostok include airborne radar (for ice thickness and sub-ice conditions), ice core information (for the thickness of refrozen ice above Lake Vostok), ERS-1 altimetry (for the ice-surface elevation) and interferometric SAR (for the ice-surface velocity). Combination of this data has been shown to reveal the rates of subglacial melting and freezing over Lake Vostok. These measurements will form boundary conditions for thermo-fluid dynamics models of water circulation and chemistry within the lake cavities. By adjusting the ice-sheet conditions (such as that occurring over glacial-interglacial cycles) the model results will indicate how the lakes have responded to past changes. Our work will be fundamental to (1) determining the habitat of the lake's biota (2) future exploration of subglacial lakes and (3) the planned exploration of Europa, the Jovian moon, where a Lake Vostok analogy is expected.

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Contact Details:

Dr Martin Siegert Tel: +44-(0)1179-288902, Fax: +44-(0)1179-287878
E-mail : m.j.siegert@bristol.ac.uk.

Dr Paul Bates Tel: +44-(0)1179-289108, Fax: +44-(0)1179-287878
E-mail : paul.bates@bristol.ac.uk.

Prof. M Tranter Tel: +44-(0)179-288307, Fax: +44-(0)1179-287878
E-mail : m.tranter@bristol.ac.uk.

Dr J C Ellis-Evans Tel: +44-(0)1223-221555, Fax: +44-(0)1223-362616
E-mail : jcel@bas.ac.uk.