Pathways to Impact: Shared frameworks for next-generation ice sheet modelling

1. INTRODUCTION

Impact pathways are at the centre of this proposal. Sea level rise is a major concern among policy makers and the general public, and this project will make a substantial contribution to the timely and accurate estimation of expected sea level change, through the provision of a robust, flexible framework for ice sheet modelling and ice-climate coupled modelling. Because of the technical nature of the work, we expect the main direct impact of the project to be within the scientific community. Nevertheless, the open-source nature of the software tools and the public interest in the field mean that the project will have impact beyond academic research, which the activities outlined below will facilitate.

2. BENEFICIARIES

The primary beneficiaries of this work will be within academic communities. The principal output from the work is directly targeted for use by climate modellers and the developers of ice sheet models. These beneficiaries work within universities and other public sector scientific bodies such as climate research centres. We expect the outputs of the project to be of international importance, and we will consequently direct our communication efforts towards an international audience. We will engage these scientific communities in the design and development of the modelling framework through the workshops described in the Case for Support. The resulting framework will be disseminated through training events (see Case for Support), articles and documentation on the project website, relevant conferences, and through appropriate scholarly publications. In this last respect, we will continue our strong publication record (see Track Record) in appropriate high-impact journals. All project members will make themselves available for seminars in relevant institutions, and for participation in international summer schools, although funding for these events is not directly sought as part of this proposal.

A secondary impact pathway will be through the development of a user-friendly graphical interface to Glimmer-CISM for educational and wider community use. This is most likely to be of interest to those teaching glaciology or climate science at undergraduate and postgraduate levels. The availability of this, accessing a version of the model through this new front-end, will be publicised through the project website, training events and appropriate publications in the scholarly and other literature (for example, EOS).

3. IMPACT ACTIVITIES

Framework Development workshops. The structure and purpose of these events is described in detail in the Case for Support: they are a primary means for the project to engage with members of the ice sheet and climate modelling communities. Two workshops will take place. All UK project members, Project Partners and Supporters will participate in each workshop.

Training Events. Three training events will be run by the project. These are described in detail in the Case for Support. The training will be aimed at academic and professional users of the ice sheet model, encompassing glaciologists and climate scientists, particularly research postgraduate students. All project members will be expected to contribute to training events during the life of the project, but each event will only involve two instructors. The PI and Co-Is have substantial experience in delivering this kind of instruction (see Track Record). Printed and web-based training materials will be provided to participants.

Project website. We will revitalise on our existing website to provide a comprehensive portal for stakeholders to access project activities, and strengthen the international community of Glimmer-CISM users. Training materials and model documentation will be provided, along with information and reports on Framework Development Workshops.

Publications and conferences. Although the focus of this project is not the generation of scientific results, our activities will nevertheless result in scholarly publications in relevant, specialist journals (for example, *Geoscientific Model Development* and *Computers in Geosciences*). We know from experience that, even for more technical activities, peer-review publications are an important means of raising awareness of modelling work within the scientific community. Likewise, we will attend major international conferences (EGU General Assembly, AGU Fall Meeting) to promote engagement with the climate modelling and glaciological communities. In particular we will convene a special session at both EGU, and AGU in the final year of the project on Ice-Sheet Climate coupling, with the hope that all our project partners will attend one or other session. There we will take the opportunity to report our findings, to widen interest in the API and in the longer-term network

User-friendly wrapper for Glimmer-CISM. The Glimmer-CISM ice sheet model has a track record as a teaching tool in glaciology: Rutt and Hulton have used it every year since 2006 on a postgraduate level course at the University Centre in Svalbard (UNIS). Nevertheless, the model is not easy to build and deploy on Windows PCs, and the lack of easy-to-use NetCDF visualisation software for Windows adds barriers to learning. We will develop a graphical user interface (GUI) for Glimmer-CISM, which will allow easy configuration of the model and visualisation of the output. The PI and Co-Is will contribute to the design of the GUI; its implementation will be carried out by a graduate programmer employed at Swansea for the purpose.

MILESTONES AND MEASURES OF SUCCESS

The most important impact milestones mirror those of the project as a whole: the Framework Development workshops are central to the evolution of a useful modelling and coupling framework, and their outcomes will be key to assessing the impact of the project. Nevertheless, the deeper impact of the project will be seen when the coupling framework is adopted by climate and ice sheet modelling groups internationally. This is likely to be seen towards the end of the project and in the years following. We will foster this through the establishment of a longer-term network to provide continued development of the API within the climate model community, and guided by its needs.

The development of a GUI for Glimmer-CISM is an important impact milestone. The completion of the GUI will be known when it is ready for use in a classroom context: the PI and Co-Is will do this at the earliest opportunity, and advocate such usage by others.

SUMMARY OF RESOURCES

The resources required for the Framework Development Workshops and Training Events are justified in the main proposal. For the project website, we request £4000 for professional website design, based on existing hosting and content management software (Joomla). Website content will be written by the PI and Co-Is. We request publication costs for two papers (£2000), and for attendance by project investigators at international conferences on ten occasions (£1500 each; £15000 in total). For the development of the Glimmer-CISM GUI, we request four months employment of a graduate programmer (£11615).