

NC Support to NERC/NSF programme on Thwaites Glacier / Amundsen Sea



Purpose of Document

The purpose of this document is to provide a summary of the NC tasks planned by scientific teams in the NERC Centres, which would provide underpinning to a collaborative JSR programme focused on constraining the future contribution of Thwaites Glacier, West Antarctica to sea-level rise.

These activities will be delivered under NC funding alone, regardless of any proposals made by BAS/CPOM to JSR or other proposals.

1. Airborne survey of the Amundsen Sea margin of WAIS

BAS will undertake 40 hours of airborne geophysical survey of the coastal margin of the Amundsen Sea sector of West Antarctica in field season 2018/19 (or 2017/18, depending on availability of fuel). This survey, together with existing data (e.g., collected by NASA Icebridge) will provide a valuable geophysical survey of the area up to 30 km inland of the grounding line at km-scale. These data will provide a crucial foundation dataset of sub-glacial (radar) and sub-ice shelf (gravity) topography, for ice-ocean models that will provide decadal projections of change in the ice sheet.

Data will be processed and made available to the wider community within 6 months of collection.

2. Oceanographic monitoring in Amundsen Sea

The recent NERC iSTAR programme for the first time allowed the deployment of moorings to measure oceanographic conditions in the coastal Amundsen Sea – these instruments now provide observations of variations in delivery of oceanic heat towards the ice sheet, the key driver of ice-sheet change in the region. Under an international collaboration, in which BAS participates under NC funding, these important observations will be maintained in future years to provide mechanistic understanding of ocean-induced change, and to provide data for testing oceanographic models of sub-ice processes.

The servicing and replacement of moorings will require deployment of a BAS team onto the Korean ice-breaker, Araon in 2017/18, enabling a further two years of data collection. Data will be lodged with BODC for use by the community.

3. UKESM

As a workpackage within the LTS-M programme UKESM, BAS will undertake software development for the V1.5 release of the UKESM (expected 2019). Specifically, the development will incorporate up-to-date understanding of ice-ocean interactions in sub-ice-shelf cavities into NEMO, effectively coupling NEMO with BISICLES. The task will also involve verification against comparable models and real-world data. This coupled model will provide a valuable tool for ice-sheet projection.

4. Ice-sheet layer chronology for Thwaites Glacier basin



An oversnow traverse between the BAS ice core site on Fletcher Promontory and the US ice core drilling site at WAIS divide site will allow acquisition of dated radar horizons through the Amundsen Sea sector of West Antarctica, and in particular Thwaites Glacier basin. This framework will provide an important new constraint for ice-sheet models, with value in both diagnostic and prognostic modelling.

The activity will require the deployment 2017/18 of an oversnow field-party for an extended field season, using a BAS DELORES radar. Radar layer chronologies will be disseminated to the UK-US community through relevant data centres.

5. Earth Observation foundation data

CPOM leads UK efforts in creating and maintaining fundamental climate data records for Antarctica based on satellite observations. The spatial patterns and decadal variability in these records can be used as starting points for forecasting and projecting future ice-sheet change. Under NC funding, CPOM will develop a bespoke data product to underpin this research program. This will be an ice-velocity map contemporaneous with the project derived from a reanalysis of all available satellite observations within the high-resolution, higher-order BISICLES ice-sheet model. The reanalysis of incomplete satellite observations will ensure that the velocity map will be (i) spatially continuous and will (ii) satisfy mass continuity. This foundation data set will be available to support a broad range of activities including logistical planning, interpretation of radar layers, migration of ice core data, and initialisation of numerical models.