

**Bathymetric influences on Antarctic ice-shelf melt rates**

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## Introduction

Output datasets are generated from the output of the MITgcm ocean model and its adjoint, in NETCDF format; there are two separate data files, one for our idealised ISOMIP-bump Experiment and one for our realistic Dotson-Crosson ice shelves experiment. The data was created in July and August of 2019.

Processing methodology is described in our main text.

## Additional Supporting Information (Files uploaded separately)

### Dataset S01.nc

This dataset contains model output from the ISOMIP-bump experiment of Section 3 of the paper, in netcdf format. The file contains the following dimensions and fields:

#### Dimensions:

- |         |                             |
|---------|-----------------------------|
| • lon   | longitude, size 50          |
| • lat   | latitude, size 100          |
| • depth | vertical elevation, size 30 |

#### Fields:

- |                            |   |
|----------------------------|---|
| • double lon(lon);         | longitude values                            |
| • double lat(lat);         | latitude values                             |
| • double depth(depth);     | depth values (m)                            |
| • double temp(depth, lat); | zonally averaged temperature (deg C)        |
| • double melt(lon, lat);   | ice shelf melt rates (kg/m <sup>2</sup> /s) |
| • double topo(lon, lat);   | ice shelf topography (m)                    |

- `double strmfunc(lon, lat);` depth averaged stream function (Sv)
- `double strmfuncR4(lon, lat);` region 4 perturbed stream function
- `double strmfuncR1(lon, lat);` region 4 perturbed stream function
- `double strmfuncR2(lon, lat);` region 4 perturbed stream function
- `double strmfuncR3(lon, lat);` region 4 perturbed stream function
- `double sensitivity(lon, lat);` bathymetric adjoint sensitivity (kg/m-y)

### Dataset S02.nc

This dataset contains relevant model output from the Dotson-Crosson experiment of Section 3 of the paper, in netcdf format. The file contains the following dimensions and fields:

#### Dimensions:

- `X` longitude, size 50
- `Y` latitude, size 100
- `depth` vertical elevation, size 30
- `n_front` index of points across Dotson ice front
- `time` time in months (1 to 12)

#### Fields:

- `double X(X);` X values (m)
- `double Y(Y);` Y values (m)
- `double depth(depth);` depth values (m)
- `double x_front(n_front);` x values along dotson front (m)
- `double y_front(n_front);` y values along dotson front (m)
- `double month(time);` month values
- `double millan_bathy(X,Y);` processed bathymetry used in ocean model (m)
- `double millan_draft(X,Y);` processed ice topo used in ocean model (m)
- `double strmfunc(X,Y);` depth averaged stream function (Sv)
- `double outflow(n_front,depth);` outflow (cm/s)
- `double avgmelt(X,Y);` melt rate (kg/m/yr)
- `double melt_sensitivity(X,Y);` bathymetric adjoint sensitivity of melt rates (kg/m-y)
- `double vaf_sensitivity(X,Y);` bathymetric adjoint sensitivity of VAF (nondim)
- `double melt(time);` area averaged melt (kg/yr)
- `double delta_star_hfacc(time);` RMS of cell center thickness adjoint sensitivities (kg/yr-m)
- `double delta_star_hfacs(time);` RMS of cell south face thickness adjoint sensitivities (kg/yr-m)
- `double delta_star_hfacw(time);` RMS of cell west face thickness adjoint sensitivities (kg/yr-m)