Representing calving and iceberg dynamics in global climate models

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Antarctic mass loss

Melting: 45% Calving: 55%

Rignot et al. (2013)
Calving and icebergs

Ross Ice Shelf, Antarctica
- Ross Sea (cloudy)
- Nascent iceberg: 25 km
- Iceberg detachment rift
- 50-100 years

Jakovshavn Isbræ, Greenland
- Days-months
- 10 km

Larsen B Ice Shelf, Antarctica
- 60 km
- 12,000 years

Columbia Glacier, Alaska
- Hours
- 2 km
Why is there no “calving law”?

**spatial scales**
- 1mm-10 cm: grain size; start cracks
- 1m -1 km: fractures; rifts, ice bits
- 10 km-1,000 km: tabular icebergs; ice shelves

**temporal scales**
- 1 sec-1 min: crack propagation
- hours-days-seasons: tide-water calving; duration of collapse
- 100 yrs-10,000 yrs: tabular iceberg calving; ice-shelf collapse
This project

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Iceberg tracks (1999-2010)

icebergs > 5 km x 2 km
the most southern Jan 7, 2014: ~ 45 S 6W

The Antarctic Iceberg Tracking Database
Iceberg representation in the GFDL climate model
We plan to do

– Calving parameterizations
– Iceberg-ocean interactions
– Compile available data