Marine-terminating outlet glaciers: How can modelers guide observationalists?

Gordon Hamilton
University of Maine
Observationalists... use remote sensing observations or in situ measurement to:

- Survey boundary conditions
  - geometry
  - climate
- Survey kinematics
  - surface velocities, strain rates
  - rate of elevation change
  - rate of terminus change
- Other
  - ice-column temperature
  - subglacial hydrology

Some things are easier to do than others
Calving vs ice-shelf margins

Hard to access
Rapid changes

Easier to access
Things that observationalists (should) worry about...

...and where modelers can really help us

1) Are we observing things at the appropriate scale?
   - spatial resolution
   - temporal resolution
Remote sensing vs in situ

- spatially extensive
- periodic sampling
- easy and cheap

- spatially limited
- continuous sampling
- expensive, challenging
Annual...
~Daily...

Jakobshavn Isbræ

Helheim Glacier
Sub-hourly...
Joughin et al., 2008 (JGR)
Nettles et al., 2008 (Geophys. Res. Lett.)
Things that observationalists (should) worry about...

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2) Are we making measurements in the right place(s)?
   • at/near the terminus? or farther inland?
   • along the centerline? or closer to the margins?
66.35
66.40
66.45
66.50
66.55

-38.7
-38.6
-38.5
-38.4
-38.3
-38.2
-38.1
-38.0

reference sites

ice sites, 2007

ice sites, 2006

Helheim GPS network

July 4
August 15
Helheim GPS network

Reference sites

Ice sites, 2006

Ice sites, 2007

July 4

August 15
Things that observationalists (should) worry about...

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3) Are we missing key observations?
   • water routing, subglacial hydrology
   • ice rheology (column temperature, fabric)
Hydrology is difficult... does it have to be done in situ?
Hydrology is difficult...

or are far-field proxies ‘good enough’?
Questions? Discussion...