

Glaciomarine Sedimentation and Landforms

GES 441

Everything is on larger scale than in a lake

Sedimentation methods

- 1) Direct deposition - dumping or melt out - rate depends on amount of ice, forward velocity, debris content
- 2) Rain out from ice bergs and sea ice - much more calving than in lakes, bigger ice bergs, more violent calving, accelerated by waves and tidal flexure, icebergs often get stuck with tides
sea ice also can carry sediment-rockfall in fjords, stream flow, aeolian, bottom freeze on
- 3) Meltwater flows - almost always overflows, result in very rapid deposition, usually in fan
- 4) Settling out of suspension - caused by **flocculation** - salt neutralizes repulsive charge in clay, **pelletization** by marine organisms
- 5) Gravity flows - from unstable slopes
- 6) Rockfalls, debris flows from fjord walls
- 7) Iceberg scour and resuspension
- 8) Current reworking
- 9) Shoreline sedimentation
- 10) Biological - diatoms, forams

Three Main Environments

Ice-contact environment

- till and waterlain diamicton present
- dominated by meltwater outflow, except in cold-based situations
- grounding line often controlled by pinning points and calving, may show cyclic behavior

Landforms include **moraine banks** (composed of till, waterlain diamicton, stratified sediments), **ice-contact deltas**, **subaqueous fans**
delta-moraines - i.e., Pineo Ridge



Pineo Ridge Delta, Down East Maine

till deltas/grounding line wedge-stable or advancing margin
small, minor, possibly annual moraines - small push features or crevasse fill-unstable margin



Minor moraine deposited in the sea, Down East Maine

Proximal Environment - inner shelf or fjord

Dominated by suspension sedimentation - can be so fast as to inhibit benthic organisms
as defined by lack of bioturbation

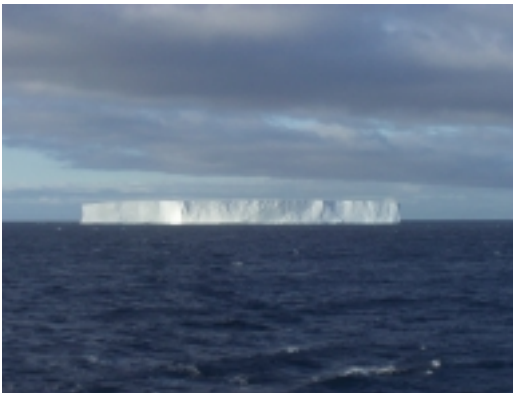
Sediment size and amount decrease rapidly away from glacier
laminated or rhythmic sediments - can be annual (**varves**), but may be tidal

Very rapid sedimentation results in unstable sediment, gravity flows

Winnowing by currents important

IRD may not be important - too close for much melting

Landforms include **subaqueous fans** and distal parts of **deltas**, iceberg **keel marks**, **ice shelf moraines**



Iceberg near the South Shetland Islands.

Distal Environment - outer shelf, open ocean

Dominated by IRD and more normal marine sedimentation

Stratigraphic sequence anticipated from advance and retreat

Distinguishing glacial marine diamicton from subglacial diamicton

Glacial marine - Lack of tectonic structures, weak stratification, marine organisms, current winnowing and redeposition, may not be as compact