GLACIAL GEOLOGY - LECTURE 7
DEBRIS FLOW SEDIMENTS

PROCESSES

Position

Mostly ice-marginal, some subglacial. Lots of active reworking.

Sediment flow -

Downslope flow of sediment or sediment-water mixtures under the flow of gravity.
Many individual processes
Gradation from simple lateral transition to fluid flow.

CHARACTERISTICS

Poorly sorted, poorly stratified, till- like

Diamictons all

Grain size

coarser than source reflecting some winowing

Associations

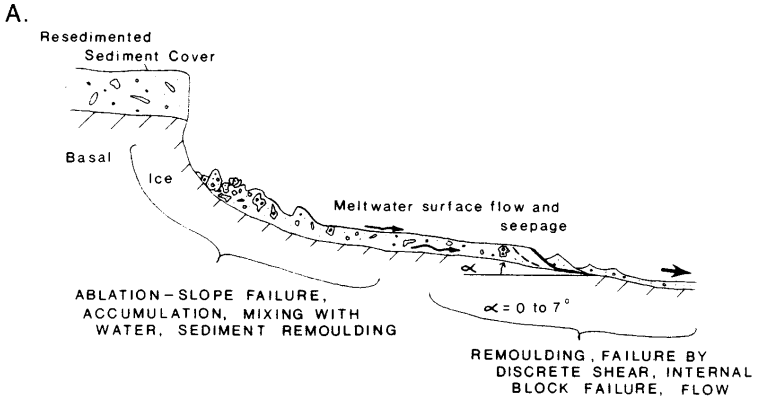
Interbedded with outher flows and stratified deposits.

SIGNIFICANCE

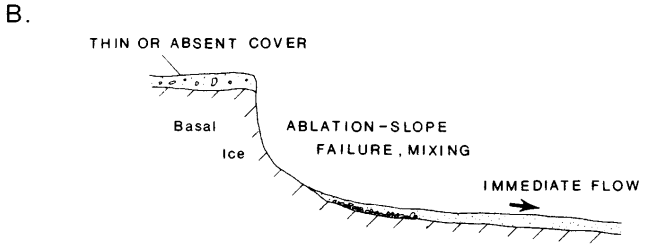
Distribution and compostion highly variable and impossible to predict.

LANDFORMS OF SUPERGLACIAL AND ICE-CONTACT DEPOSITS

parallel, transverse, non-oriented
moraines and valley fills



a. Most typical situation for sediment flow initiation. Types II and III are primarily the result of failure and flow of downslope edge of sediment accumulated at base of laterally retreating ice-cored slope. Type I flows result from failure in a thin zone at the base of a sediment pile with low water content.



After Lawson, 1979

b. Type IV flows initiated directly from ablating ice-cored slope where relative availability of meltwater is high and sediment low.

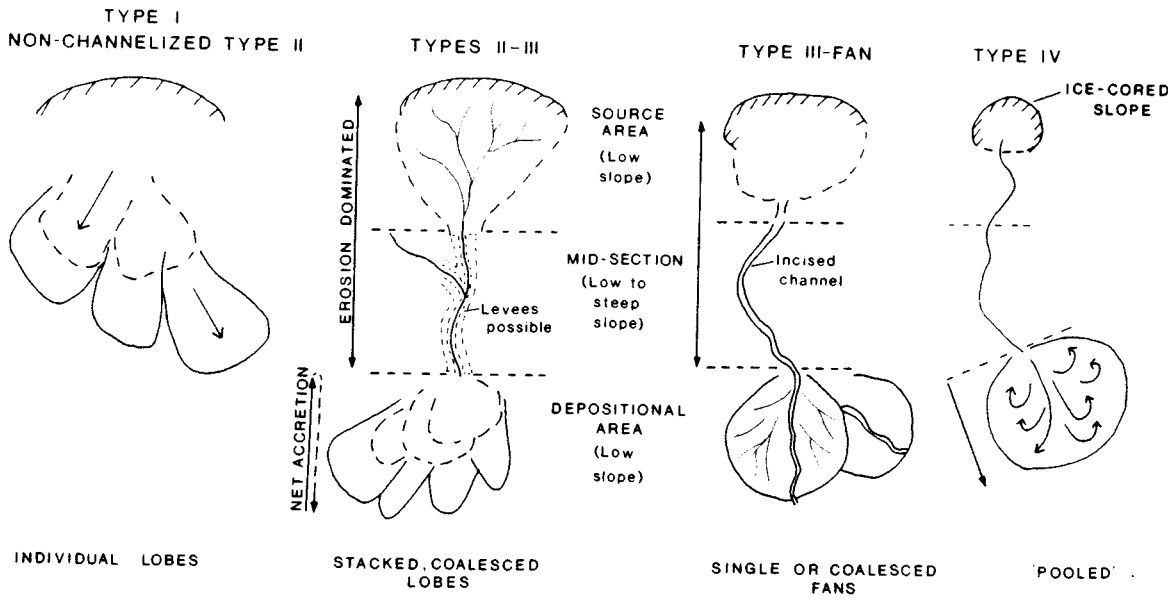


Figure 37. Idealized characteristics of sediment flow system and modes of deposition. In general, source and depositional areas are of low angled slope (1° to 70°), whereas the midsection may be steep and locally irregular in slope. Stacking and coalescing of deposits is common; different flow types may originate and be deposited from the same source area. Preservation of the system and sediments is limited to the depositional area; meltwater availability determines the extent of preservation.

After Lawson, 1979

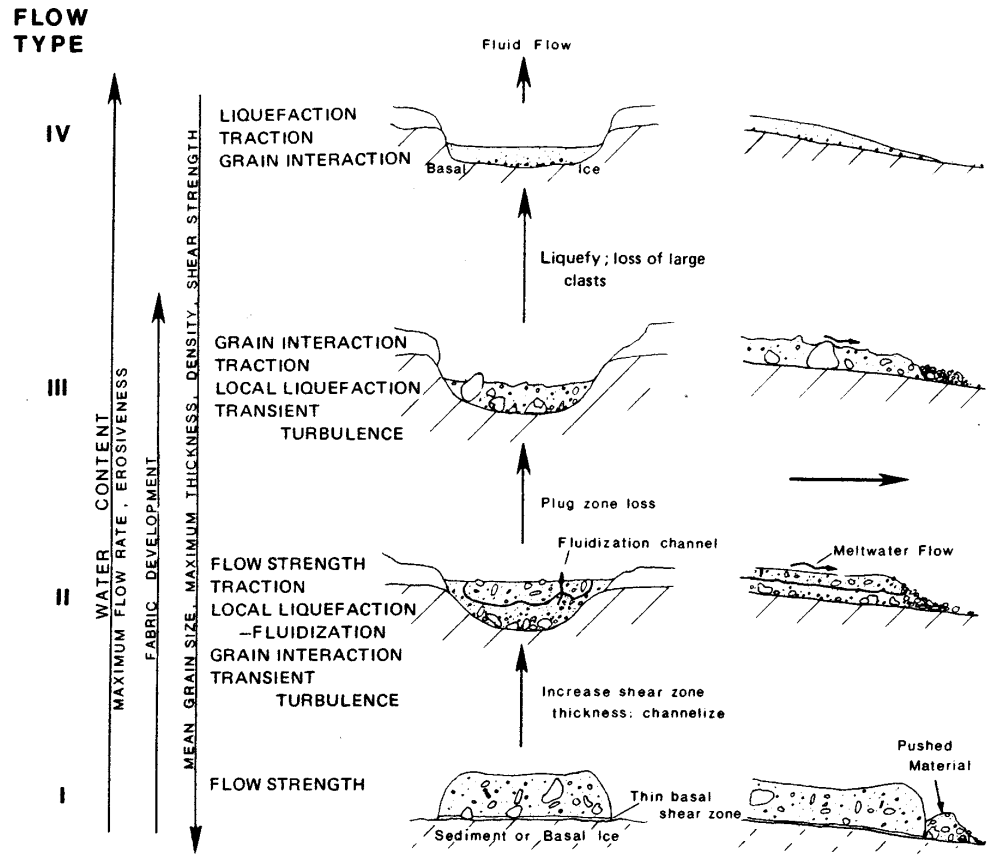


Figure 33. Idealized cross sections, transverse and parallel to direction of flow, of the four sediment flow types. Flow types are transitional to one another. Channels usually are ice-floored with walls of sediment and ice. Grain support and transport mechanisms are indicated. Trends in various parameters are shown; water content increases from bottom to top.

After Lawson, 1979

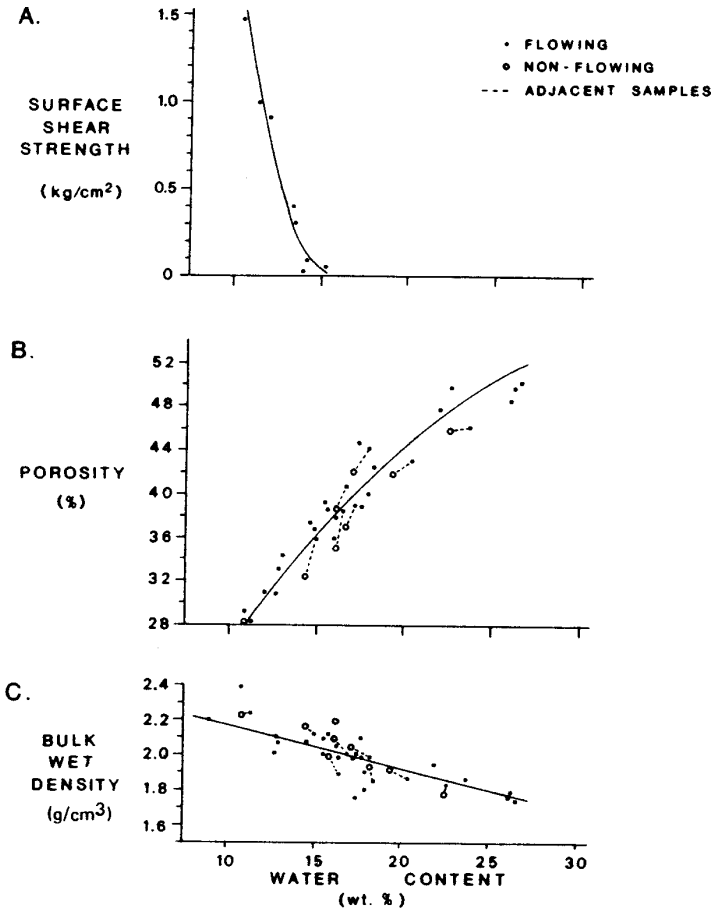


Figure 32. Comparison of surface shear strength, porosity (calculated) and bulk wet density with water content for samples of flowing and adjacent nonflowing sediments (prior to failure). Trends for samples from active sediment flows are shown.

After Lawson, 1979

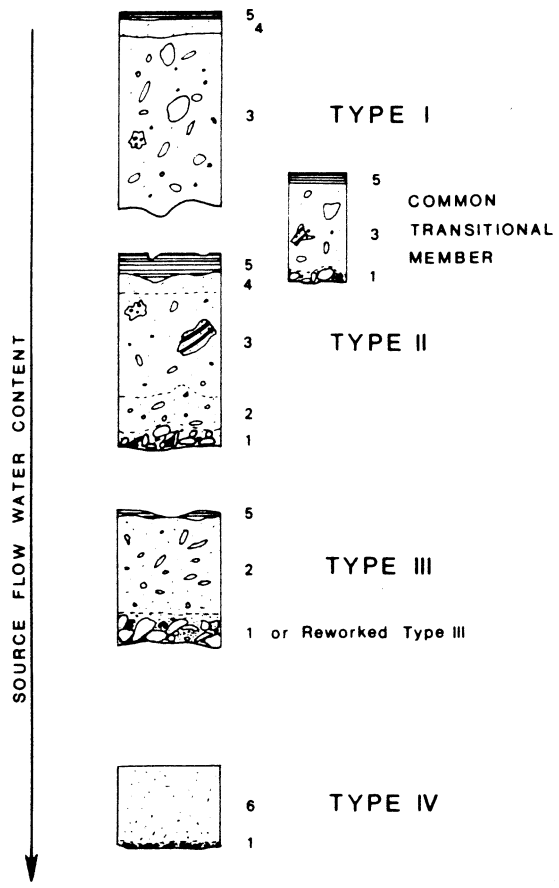


Figure 38. Idealized characteristics of sediment flow deposits. Six distinct zones are recognized; any may be missing due to erosion, nondeposition, or absence from source flow. The characteristics of the zones are 1) texturally heterogeneous with increased gravel content of tractional origin, massive to graded, weak to absent pebble fabric; 2) massive, texturally heterogeneous but absence of large grains due to settlement, possible decrease in silt and clay due to elutriation, weak pebble fabric; 3) massive, texturally distinct and sometimes structured sediments may occur, pebble fabric absent, vertical clasts common; 4) massive, fine-grained (sand to clay) similar to matrix of zone 2, lacks coarse clasts due to settlement during and after deposition; 5) stratified to diffusely laminated silts and sands of meltwater flow origin; and 6) massive to partially or fully graded, silty sand, fabric absent. Basal contacts vary from conformable to unconformable, sharp to transitional and deformed to planar. Type III flow sedimentation in fans results in selective deposition of each zone, or of individual particles by size.