Solid Earth Physics Seminar

Friday, 6 February 2009, noon (will start 12:10 sharp)
Room 209 Pierce Hall

Fluid mechanics of sea ice and ice shelves

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Abstract: Ice is an important component of the global climate system, though it is often displayed as merely an indicator of global warming - a canary in the mine. I shall discuss two fundamentally different types of ice: sea ice, which forms by direct freezing of the ocean; and marine ice sheets, which form by accumulation and compaction of snow inland and flow glacially towards the ocean, ultimately to form ice bergs. Because sea ice forms from salt water, it has the structure of a sponge, with brine occupying the pores of a matrix of pure ice crystals. The dense brine can leach out of sea ice into the ocean and contribute to the forcing of ocean circulation. Guided by a combination of laboratory experiments and field studies we have developed new, fundamental physical theories to describe the structure and evolution of sea ice and to quantify the strength of ocean forcing by brine drainage. The great ice sheets of Western Antarctica slide on bedrock that is some kilometers below sea level. As they flow, they thin and eventually detach from the bedrock to form a freely floating ice shelf. The transition from sheet to shelf is known as the grounding line. Its location is determined dynamically and its stability is key to determining significant sea-level rise. I shall discuss these issues in the context of some simple laboratory experiments and associated theory.