

## **“Down Under the Ice: The Ocean’s Role in Melting (and Freezing) ”**

Robin ROBERTSON

*University of New South Wales, Canberra, Australia*

In the polar regions, the ocean lies under the sea ice and ice shelves. The ocean brings heat from offshore to the sea ice or ice shelf above it, melting them. The heat loss from the ocean to the ice shelf drives a circulation with fresher, cold water flowing out at the surface and warmer, saltier water flowing in below. Basically, melting of the ice shelf freshens the ocean water, making it less dense, and driving a flow out of the region under the ice shelf. The replacement flow is warmer, providing more heat to the system and maintaining the flow. Sea ice also reacts with the ocean and the atmosphere, forming when the atmosphere cools the surface ocean below the freezing point and melting when the ocean or atmosphere is warmer than the freezing point. As it melts/freezes, it changes the salinity and density of the water, to be fresher/saltier and lighter/denser.

The oceans are believed to be the prominent driving force in melting of the Antarctic and Arctic ice shelves. Ocean currents and tides are believed to be the primary cause of melting. They also play a minor role in the recent rapid collapse of several Antarctic ice shelves with most of the credit going to surface melt ponds. Using models, the relative importance of these processes are investigated. For example, recently tides were found to increase melting in some ice shelves by  $\sim 3$  m/a, which more than doubles the melting for a few of them.