Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Upstream versus downstream control of meltwater plumes under ice shelves** ANDREW WELLS, University of Oxford — In many locations the Greenland and Antarctic ice sheets discharge into the ocean through ice shelves floating on top of a warm salty ocean. The turbulent buoyancy-driven flow of meltwater beneath the sloping ice-shelf base enhances heat transfer and provides a feedback on ice melting rates, with consequences for ice sheet dynamics and predictions of sea-level rise. Previous steady-state models of meltwater plumes under ice shelves have solved for the development of flow along the slope from an initial source, corresponding to solely upstream control of the plume dynamics. I re-interpret the plume dynamics embedded within the framework of a time-dependent model, and show that the flow exhibits distinct regimes depending on the source conditions. Solutions with upstream control are physically consistent for certain source conditions, but the plume is influenced by a combination of upstream and downstream conditions in other regions of parameter space. The dynamics are illustrated for flow underneath a two-dimensional ice shelf of initially constant basal slope, and stable attracting states are determined. The implications for modelling meltwater flow under ice shelves are discussed.

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Date submitted: 02 Aug 2013 Electronic form version 1.4