



## **The freshwater export from the Arctic Ocean and the circulation of liquid freshwater around Greenland - constraints, interactions & consequences**

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The freshwater added to the Arctic Ocean is stored as sea ice and as liquid freshwater residing primarily in the upper layers. This allows for simple zero order estimates of the liquid freshwater content and export based on rotationally controlled baroclinic flow. At present the freshwater outflow occurs on both sides of Greenland. In Fram Strait the sea ice export in the East Greenland Current is significantly larger than the liquid freshwater outflow, while the liquid freshwater export dominates in the Canadian Arctic Archipelago. Although the outflow in the upper layer and the freshwater export respond to short periodic wind events and longer periodic atmospheric circulation patterns, the long-term trend is controlled by the net freshwater supply – the freshwater input minus the ice export. As the ice formation and ice export are expected to diminish in a warmer climate the Canadian Arctic Archipelago, comprising several passages, should gradually carry more of the total Arctic Ocean freshwater outflow. However, the channels in the Canadian Arctic Archipelago discharge into the restricted Baffin, which also receives a part of the Fram Strait freshwater export via the West Greenland Current. In a situation with increased glacial melting and freshwater discharge from Greenland the density of the upper layer in Baffin Bay may decrease considerably. This would reduce the sea level difference between the Arctic Ocean and Baffin Bay and thus weaken the outflow through the Canadian Arctic Archipelago, in extreme cases perhaps even reverse the flow. This would shift the main Arctic Ocean liquid freshwater export from The Canadian Arctic Archipelago to Fram Strait. The zero order dynamics of the exchanges through the Canadian Arctic Archipelago and Baffin Bay are described and the possibility for a weakening of the outflow is examined.