Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01442, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01442
EGU General Assembly 2008
© Author(s) 2008

# Greenland's Island Rule and the Arctic Ocean Circulation

**T. M. Joyce** and A. Proshutinsky (WHOI)
Woods Hole Oceanographic Institution (tjoyce@whoi.edu)

The flow of the upper layers of the Arctic Ocean is considered for both wind forcing and inflow through the Bering Strait. A simple extension of Godfrey's (1989) island rule calculation is made for the flow around Greenland. The theory has been extended to permit inclusion of Bering Strait inflow and bottom friction to represent the dissipation supplied by the porous Canadian Archipelago to the west of Greenland. It has also been applied in a quasi-steady manner to the circulation in both an elevated and reduced wind forcing states represented by the Arctic Oscillation (AO) Index. Increasing friction shifts more of the expected flow to the east of Greenland, while wind-driving produces an overall cyclonic flow around Greenland. Numerical experiments are run to illustrate the dependence of the physics on bathymetric variations from a flat 200m deep ocean, on lateral friction, and on properly resolving the flow in the archipelago with the numerical model. Cyclonic flow is increased for a positive AO index and reduced for a negative AO. Model tuning to agree with direct measurements of transport in the Davis Strait is sensitive to both the forcing and the dissipation. The circum-Greenland transport by winds can exceed the Bering Strait inflow and account for most of the observed flow (ca. -2.5 Sv) to the west of Greenland. Poor physical representation of the Canada Strait opening(s) in numerical models can result in the false intensification of the East Greenland current and in the reduction of the Atlantic water inflow to the Arctic Ocean. Indeed, the dynamics of the island rule requires that Atlantic waters flow into the Arctic.