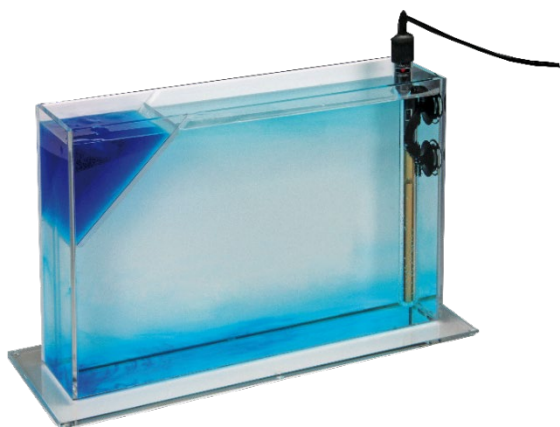




Contents

- 1 acrylic container with white back plate
- 1 small acrylic plate for positioning in the top left-hand corner

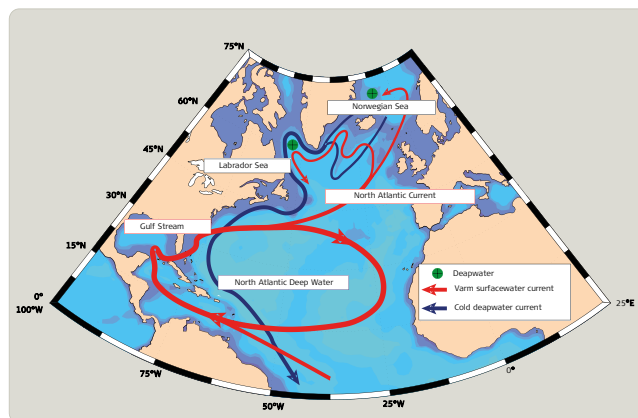
Extra equipment

- 796015 Thermostatic heater 50 W
- 862800-5 Methylene blue 1%
- or 309800 Vegetable dye set, 4 colours

Background

The Greenland Pump is part of the Gulf Stream. The Greenland Pump is integral to the Gulf Stream's transport of warm water, which makes the Northwestern European winters mild. The Gulf Stream and its extension, the North Atlantic Drift, flow northwards, resulting in evaporation of the warm seawater and a release of heat into the colder surroundings. This causes a rise in the density of seawater in the North Atlantic Ocean and the heavier water sinks to the bottom and draws new surface water into the area. The sinking water becomes the southbound North Atlantic Deep Water Current. This sinking water carries the CO₂ surface water down into the deep ocean.

This makes the Greenland Pump part of the carbon cycle, and a very important driver of global thermohaline circulation.



Source: Steffen Malskær Olsen / DMI

Setup

Place the supplied small plate in the slanted grooves in the top left corner of the container with the small opening facing downwards. This forms an ice holder. Attach the thermostatic heater, using the suction cups, to the right-hand side of the container away from the ice holder, as close to the bottom as possible; see photo. The model is now ready for use.

How to use

Experiment 1: The effect of water temperature on the Greenland Pump

Fill the container with water to no more than 1 cm from the rim. Pour ice into the ice holder. Switch on the heater. Wait for about 1 minute and drip methylene blue or vegetable dye into the ice. This reveals the circulation of the water.

Experiment 2: The effect of salinity on the Greenland Pump

Fill the container with water to no more than 1 cm from the rim. Pour a saturated saline solution into the ice holder. Switch on the heater. Wait for about 1 minute and drip methylene blue or vegetable dye into the saturated solution in the ice holder. This reveals the circulation of the water.

Experiments 1 and 2 can be performed at the same time. This gives an insight into how both water temperature and salinity increase the water density and thus contribute to the circulation. This is the Greenland pump in action.

Warranty

A two-year warranty applies, calculated from the invoice date. The warranty covers defects in materials and manufacturing.

The warranty does not cover equipment that has been mistreated, poorly maintained or incorrectly assembled, and equipment not repaired at our workshop is not covered by the warranty.

The return of defective equipment for repair under warranty is at the customer's risk and expense and can only be made after agreement with Frederiksen. Unless otherwise agreed with Frederiksen, carriage must be prepaid. The equipment must be properly packaged. Any damage to the equipment caused by the shipment is not covered by the warranty. Frederiksen will pay for the return of the equipment after repair under warranty.

© A/S Søren Frederiksen, Ølgod

This instruction manual may be copied for internal use at the address for which the apparatus concerned was purchased.