Introduction
The transport of fresh and cold polar water transported through Fram Strait within the East Greenland Current (EGC) is a major, if not the main, oceanic pathway of freshwater entering the North Atlantic. A freshwater layer can close down deep convection in the subpolar gyres and hence influence the meridional overturning cell, also known as the Global Conveyor Belt. Rapid climate change can therefore be triggered by large freshwater anomalies. For the understanding of global climate knowledge of the magnitude and variability of the freshwater transport is therefore indispensable.

The Norwegian Polar Institute (NPI) has been making regular measurements in Fram Strait using moorings and hydrography since 1988. Starting in 2003 within the AMIP program, the focus is now on freshwater flux. In this paper we present an estimate of the liquid freshwater flux from these data.

Hydrography and geostrophic transports
An extensive hydrographic survey was carried out in Fram Strait in September 2005. The main section across Fram Strait shows the cold and low salinity Polar Water on the East Greenland Shelf in the western part of the section. At the upper Escarpment the warm and saline Atlantic Water flows northward into the Polar Ocean. After a journey through the Arctic, some of this warm return, transformed into colder and lower salinity Arctic Atlantic Water, which can be seen on the Greenland shelf break up to depths of about 2500 m. The third water mass forming north within the EGC is Arctic Atlantic Water which recirculates within Fram Strait, the IAW. Its characteristics are no as extreme as the inflowing AW, but is also characterized by high salinity and temperature, seen here at about 7ºN and 2500 m depth.

Mass transport in the ocean is mostly in the form of water, which is the driver of ocean currents. More interesting is the net freshwater transport in or out of a bounded region, as this relates to evaporation, precipitation and river runoff and changes of the total salinity content (not the steady state case) in this region. To use this concept also for a single section, the freshwater transport across a section is defined as the net mass transport, after compensating the sub-ice transport across the section with a transport of water with a certain salinity. We use a, in this region characteristic value of 0.49 as reference salinity. All sections were cut at the main core of the EGC, and total transport relative to the best is very similar. The freshwater transport is larger at the western sections, most probably due to the inclusion of larger portions of the shelf. Although the velocities west of the EGC core are not large, their direction is mainly seaward and the salinity is very low, leading to a larger southward freshwater transport.

Data
Since 1990 NPI has monitored the EGC at about 79ºN using moored instruments. A continuous monitoring array of four moorings across the IWC have been in regular operation since 2003. During the years 2001-2002, instruments were also carried out. This paper focuses on the most recent data (1999-2003), although the errors of the 2000 to 2002 period are larger due to instrument loss. Work is in progress to analyse the whole data set including estimates of ice transport, which are still not fully processed.

Mooring transports
A direct estimate of the transports from the mooring data was made assuming representative areas around each current measurement (see figure) and using only the velocity measurement from the moorings. The salinities from the moorings are not used, as these measurements did not cover the uppermost low salinity layer due to dumping ice. The mean salinity in these areas was calculated using the monthly data from the World Ocean Atlas (WOA-resolution), and, for comparison with the geostrophic transports, also with summer 2003 salinities.

Mooring line

The moorings also included some DCM-current meters, which automatically measure the velocity in 5 m bins between deployment depth (usually 4 to 5 times) and the surface. Including the available DCM-data (2 in 2002, 2 in 2003) the freshwater transport is larger than using only RCM data. The salinity decreases towards the surface, and the geostrophic velocity decreases towards the surface in the current core (see figures). The course of a year the cores also reaches the mooring position. The higher near-surface velocities close to the SLP at the surface are the reason for the higher freshwater transport. The velocity transport is larger than in the geostrophic calculation, demonstrating that the geostrophic calculations are missing (or expected part of) the stratified subarctic flow. The summer freshwater transport however is comparable to the geostrophic calculations, although when including larger parts of the shelf the geostrophic transports are somewhat larger. From the water mass characteristics we expect a stratified flow on the shelf, the mooring estimates are therefore probably biased low. For a better estimate projections on the shelf are essential.

Further work
1. A new line of using fixed buoys we will map the mooring velocities onto the geostrophic velocity field for the transport integration
2. Include the time-dependent temperature and salinity information in a similar fashion
3. Improve the model to the structure in the upper 100 m, starting in 2003 we incorporated “tide measurements” in the mooring array
4. Extend the measurements onto the shelf, which was started in 2003
5. For a better mapping of hydrographic information with the moorings a winter section is planned, hopefully in early 2005.

Conclusion
The calculations presented here have large uncertainties. The geostrophic freshwater transport values are biased high since we are using the low near surface salinity values from summer and are biased low because they miss part of the barotropic velocity component. The mooring calculations are biased low because they are still missing the shelf region and some of the stronger currents near the surface. As this is ongoing work, the transport estimates will get more reliable in near future. For the moment we can hope that the low and high biases cancel out. Our best estimate, with a large error bound, of the liquid southward freshwater transport of the EGC in Fram Strait is therefore 1000 km² year⁻¹.

Further reading