Overview

Denmark Strait Overflow Water is a key component in the formation of North Atlantic Deep Water, which is important for the maintenance of a strong global thermohaline circulation. As Denmark Strait Overflow Water flows over the shallow sill of the Denmark Strait, entrainment of surrounding water masses occurs primarily through eddy mixing, causing the volume flux to increase substantially. Here, Voet and Quadfasel use data from current meter moorings to increase understanding of the mechanisms controlling the variation of heat flux in the overflow plume as it flows downstream from the sill. They show that heat flux by lateral eddies is significant in the region 200 km downstream of the sill.

Section 1

This section provides an excellent background to the subject area explaining clearly how this new piece of research fits in with previous studies. All related work was very well referenced.

Section 2

This section explains well the types of instruments used in the study and their spatial arrangement, but I felt that a separate figure describing the coordinate system used for each current meter would have improved clarity.

Section 3

Here all equations and calculations are presented clearly and flow in a logical sequence. I do have some specific comments here. On p. 2630 line 14 it is stated that salinity varies only by about 0.05 between the overflow plume and the ambient water, justifying the use of heat flux as a proxy for density flux. I felt the value of 0.05 should have been referenced. Also on p. 2631 line 21, values for the temperature gradients dT/dz and dT/dy are estimated in order to calculate the two remaining advective terms. I was unclear as to how these estimates were obtained.

Section 4

I thought this was all very clear and well explained with good in-text reference to figures.

Section 5

This section provides very good detail of the numerical and integration methods used to calculate the eddy heat transports. However, I did find some of the material on p. 2636 slightly difficult to follow. A great deal of detail is given as to the integration methods used, upper integration isotherm boundary selection and vertical interpolation methods, together with the use of pairs of moorings to form a box with the upper isotherm to create an integration area. Although I understood this more clearly after re-reading several times, I felt that a figure relating specifically to the methods used here would have been helpful. I

also thought more explanation was required as to how different error estimates were derived from the use of different interpolation methods, and a statement as to whether the errors are significant in this context (p. 2636 line 25-30).

Section 6

Very clear, concise conclusions.

Figures

All figures were excellent with appropriate font size and clear labelling. Although in fig.1 I struggled to see any grey vectors representing instruments that were not situated in the overflow plume as mentioned in the title.

Spelling and Grammar

- In the abstract 'bouyant' should be 'buoyant'
- p. 2632 line 7 should read motion in **the** x-direction, line 9 motion in **the** y-direction, line 12 motion in **the** x- and z-direction
- p. 2632 line 8 'center' should be 'centre'
- p. 2636 line 12 'center' should be 'centre'
- p. 2637 line 3 and 9 the word 'solely' should be replaced with 'only'
- p. 2637 line 17 'heatflux' should be 'heat flux'
- Figs. 1, 2, 5 titles, 'gray' should be 'grey'
- Figs. 2, 6 titles, 'colors' should be 'colours'