Parent

OMEX Hydrographic and Nutrient Atlas

Home

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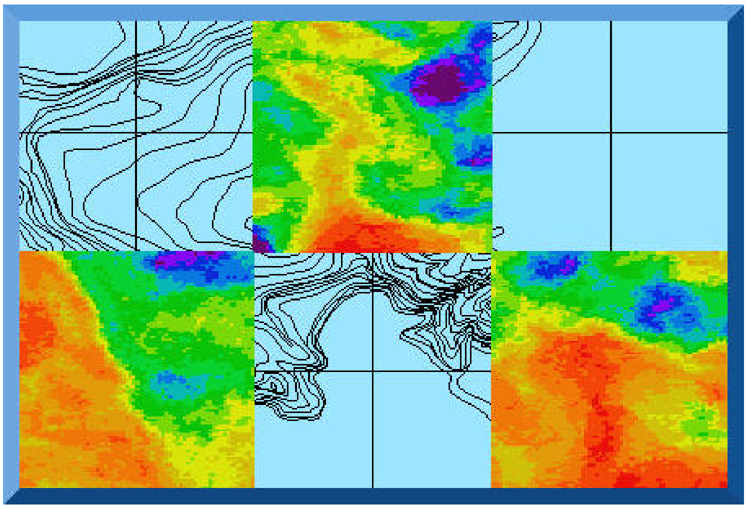


The above image is a composite of bathymetry and sea-surface temperature for the Goban Spur region. It illustrates the dynamic nature of water masses at the shelf-break with patches of upwelling cold water (blue) and surface-heated warm water (red).

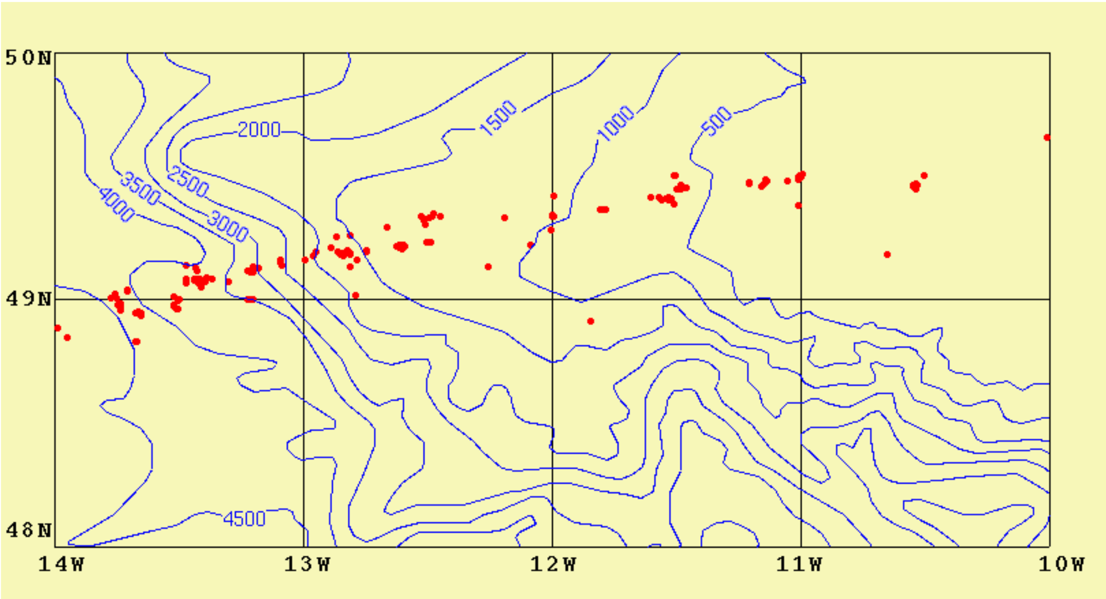
Contents

1. Introduction

This atlas has been compiled from CTD data gathered during OMEX cruises between 1993 and 1995. It aims to show the spatial and temporal variation of nutrient and physical parameters across the shelf edge and with depth. The parameters included are listed below:

Nitrate *(N)* * Phosphate *(PO4)* * Silicate *(Si4)* * Dissolved Oxygen *(DOxy)* * Oxygen Saturation *(OSat)* * Temperature *(Temp)* * Salinity *(Salin)* * Chlorophyll *(Chl)*

The data were collated from the BODC database and were restricted to observations across the shelf-break at the Goban Spur. This region was chosen because most of the OMEX cruises followed a track along this line. Figure below shows the plot of CTD locations used for compiling this atlas.



The main part of the atlas contains the plots of nutrient and physical parameters along this transect for the various cruises. There are also time series plots showing changes in a parameter throughout the sampling period for single stations (OMEX2, OMEX8 and Belgica stations). Finally there are difference plots which aim to show seasonal variation of parameters.

2. Table of data available from OMEX cruises

Cruise	Vessel	Month/Year	Graphs available
VLD137	Valdivia	Jun/Jul 93	N PO4 DOxy Si4 Temp Salin
BG93_22A	Belgica	Sep 93	N PO4 DOxy Si4 OSat Temp Salin
PLG93	Pelagia	Oct 93	N PO4 DOxy Si4 OSat Temp Salin Chl
M27_1	Meteor	Jan 94	N PO4 DOxy Si4 Temp Salin
CD84	Charles Darwin	Jan 94	N DOxy Sat Temp Salin
CD86	Charles Darwin	May/Jun 94	N PO4 DOxy Si4 OSat Temp Salin Chl
M30_1	Meteor	Sep 94	N PO4 DOxy Si4 Temp Salin Chl
CD94	Charles Darwin	Jun 95	N PO4 DOxy Si4
DI216	Discovery	Aug/Sep 95	N PO4 DOxy Si4 OSat Temp Salin Chl
DI217	Discovery	Oct 95	N PO4 DOxy Si4 Temp Salin Chl
Time series OMEX2 (49.2N, 12.8W)			N PO4 DOxy Si4 Temp Salin
Time Series OMEX8 (48.9N, 13.7W)			N DOxy
Time Series Belgica (47.5N, 7.3W)			N PO4 DOxy Temp Salin
Difference Plots			N Temp

3. Hydrography in the North East Atlantic: with particular emphasis on the OMEX area

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In the following figure temperature and salinity data are plotted for water bottle samples collected during OMEX cruises CD84 and CD94 on the UK-NERC research vessel RRS Charles Darwin. The notes which follow consider the different water masses which are present in the North East Atlantic and may have been observed in the OMEX survey region between the Goban Spur area and La Chapelle Bank.

In the North Atlantic, the water masses in the top 600 m of the water column are characterised by relatively high temperature and high salinity. These water masses are formed by deep winter convection in the Northern Atlantic and in the Bay of Biscay. They are named respectively Sub Polar Mode Waters (SPMW, McCartney & Talley, 1982), and the Eastern North Atlantic Water (ENAW, Pollard et al., 1996). In the North East Atlantic, SPMW is entrained North East towards the Norwegian Sea by one branch of the North Atlantic Current (McCartney & Talley, 1982). Pollard et al. (1996) argue that ENAW circulates weakly east of the Mid Atlantic Ridge. Another important feature of the Northeast Atlantic is the slope current that flows hugging the continental slope from the Bay of Biscay to the Norwegian Sea Pingree & Le Cann, 1990, Ellett, 1995).

Below SPMW and ENAW, at intermediate depths, two water masses dominate. These are the Sub Arctic Intermediate Water (SAIW) and the Mediterranean Overflow Water (MOW). SAIW is characterised in the NW of the North East Atlantic basin by low temperature and salinity. This water mass originates in the Labrador Current, North of 55N (Arhan, 1990) and at 48N it is found around the 800m depth contour. It is separated from the MOW by a front around 23W at 48N (Harvey, 1982). MOW is a mixture of Mediterranean Water and North Atlantic Central Water, which spreads from the Gibraltar Strait at depth of about 1000m. It is distinguished by relatively high salinity and temperature. This water mass can be seen in a wide area in the North East Atlantic, reaching the Rockall Channel (Ellett et al., 1986, Ellett, 1995) and 50W at 20N (Broecker & Takahashi, 1980).

The first of the deep waters encountered going down the water column is the Labrador Sea Water (LSW). It is formed by winter convection in the Labrador Sea. It is characterised by a low salinity and a high dissolved oxygen content. It is advected throughout the North Atlantic at depths between 500 and 2000m, occurring as far south as 40(N in the North East Atlantic (Talley & McCartney, 1982).

Below LSW, a small salinity maximum denotes the presence of North East Atlantic Deep Water (NEADW) at depths around 2700m (Tsuchiya et al., 1992).

Finally, the last water mass, near the bottom, has been shown to be of South Atlantic origin (Tsuchiya et al., 1992). This water, usually referred to as Antarctic Bottom Water (AABW), actually originates in the Lower Circumpolar Water which has travelled north along the Mid Atlantic Ridge, with North Atlantic Deep Water, crossed to the East Atlantic through the Vema Fracture Zone, and flowed northward to the Iceland Basin (Tsuchiya et al., 1992, McCartney et al., 1991, Schmitz & McCartney, 1993). AABW is identified by a low salinity, a low temperature and a high silica content.

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4. Data quality

It is important when producing interpolated plots that spurious or suspect data are not included since these can seriously affect the final contour plot. The data taken from the BODC database had already been quality controlled and suspect values were flagged with a variety of codes allowing their subsequent removal if necessary. All flagged data were removed in this case, where data have been marked suspect if the originator or BODC were not happy with those data.

Having produced an initial contour plot by interpolation the contoured plot was compared with the original values to ensure that no features had been masked. This can occur where the size of interpolation grid is coarser than the spatial resolution of features of interest. A standard size grid of 30 x 40 was used although in cases where data were sparser a coarser grid was used (20 x 30). Changing the size of interpolation grid can produce very different results (see Figure), a guide for the size of grid is to ensure that it is slightly greater than the distribution of original data points. If the grid is too fine then the data won't be generalised enough and the resultant plot will be difficult to interpret. If the grid is too coarse then the data will be too generalised and features of interest will be lost. For example, the dissolved oxygen maxima shown in figures *a* and *b* is not evident in figure *c* suggesting that a 10x10 grid is too coarse.

Where there are large gaps between downcasts the interpolation image may show exaggerated features or artefacts. This is an inherent feature of the interpolation method used and cannot be removed without affecting parts of the plot with good data coverage. The best option is to mask out parts of the interpolated plot which are far from any data - and has been done for some of the Belgica cruise data. Indeed, interpolation is not valid outside of the area bounded by all data points even though the package used does allow for this.

5. Acknowledgements

The data atlas in its original form was the result of work by Liz Osborne and David Hydes. During the OMEX project the atlas has been refined and redrawn with help from staff at the Plymouth Marine Lab. Roy Lowry at BODC has provided much useful advice on use of the database. Finally, this atlas would not be possible but for the work of all the OMEX scientists.
On behalf of staff at PML, BODC would like to apologise for the occasional poorer quality of some of the graph titles, axes and legends.

6. Data Access

Access to the OMEX database at BODC is currently limited to OMEX participants. Use the following link to request data if you are not in OMEX.

- Request for data: *http://www.nbi.ac.uk/bodc/omex/forms/OMEX/request.html*

7. Links to Related Sites

- OMEX Database at BODC: *http://www.nbi.ac.uk/bodc/omex.html*
- Satellite images of OMEX area: *http://www.npm.ac.uk/rsdas/omex*