

Using Microsoft Access to Explore the Database

Introduction

The OMEX I database contains a significant proportion of the project data set. The CD-ROM includes three copies of the database in different variants of the Microsoft JET format. Also included is a copy of the Microsoft Access run-time edition software which may be freely distributed providing it is accompanied by an Access database.

The database may be found in the DBJET directory which is present on both discs of the OMEX I package. Ideally, we would have liked to have had all copies of the database in one place, but space considerations made this impossible.

In the DBJET directory on Disk 1 there are two database copies named OMEX1.MDB (JET 2.5) and OMEX1V7.MDB (JET 3.0). The third copy of the database, called OMEX197.MDB (JET 3.5), is in the DBJET directory on Disk 2.

The Access and JET variants are discussed more fully in the next section, but the following summary table of which file to use with which software may prove helpful.

Access 2.0	OMEX1.MDB	Disk 1
Access 7.0	OMEX1V7.MDB	Disk 1
BODC Database Explorer	OMEX1V7.MDB	Disk 1
Access97	OMEX197.MDB	Disk 2
Run-time Access	OMEX1V7.MDB	Disk 1

Access Versions

At the time of writing, four versions of Microsoft Access have been released. The first of these, version 1.0, was current for a very short period of time and was not widely adopted. This is the only version that may not be used with any of the JET databases on the CD-ROM.

Each version of Access has its own version of the JET database format associated with it thus:

Access 1.0	JET 2.0	Access 2.0	JET 2.5
Access 7.0	JET 3.0	Access97	JET 3.5

Each of these formats is different and there is only limited compatibility between versions. One would expect that earlier versions of the software would not be able to read later versions of the format. However, whilst the later versions of the software are able to read earlier versions of the format, their functionality is limited. It is possible to use objects, such as forms, to retrieve data and to modify the data held in tables, but it is not possible to modify the design of objects or to create additional objects.

There is an additional compatibility problem for databases on CD-ROM. The later versions of Access insist on placing some information into earlier version database files the first time they are opened by the later version software. CD-ROM is a read-only medium. Consequently, when one tries to open a JET 2.0 database on CD-ROM with one of the later versions of Access, the result is a fatal error. It is therefore important to use the correct copy of the database to match the version of Access being used.

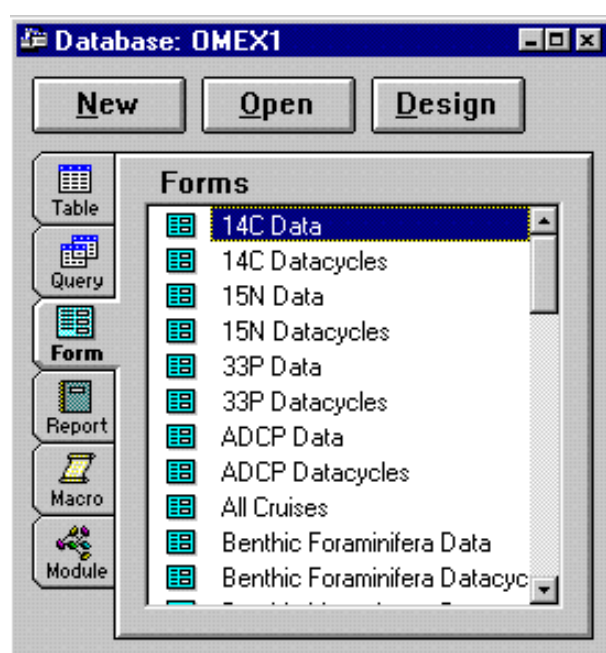
Some users may wish to copy the database from CD-ROM onto hard disk. Modern hard disks have much faster seek times and higher data transfer than the fastest CD-ROM drive. This results in significantly improved performance when using the database.

Copies of the database on hard disk may be modified by the user. This may be desirable. For example, users might wish to add data of their own into the database. However, a word of caution is required. The forms provided in the database have been built on the assumption that the database contents will be protected by the fact that CD-ROM is a read-only medium. Without this protection, it is possible to modify the data held in the database by simply typing something into a form field. This is surprisingly easy to do in Access. If you wish to guard against this possibility, simply set the 'read-only' attribute for the database file using *Windows Explorer* or *File Manager*.

Access Objects

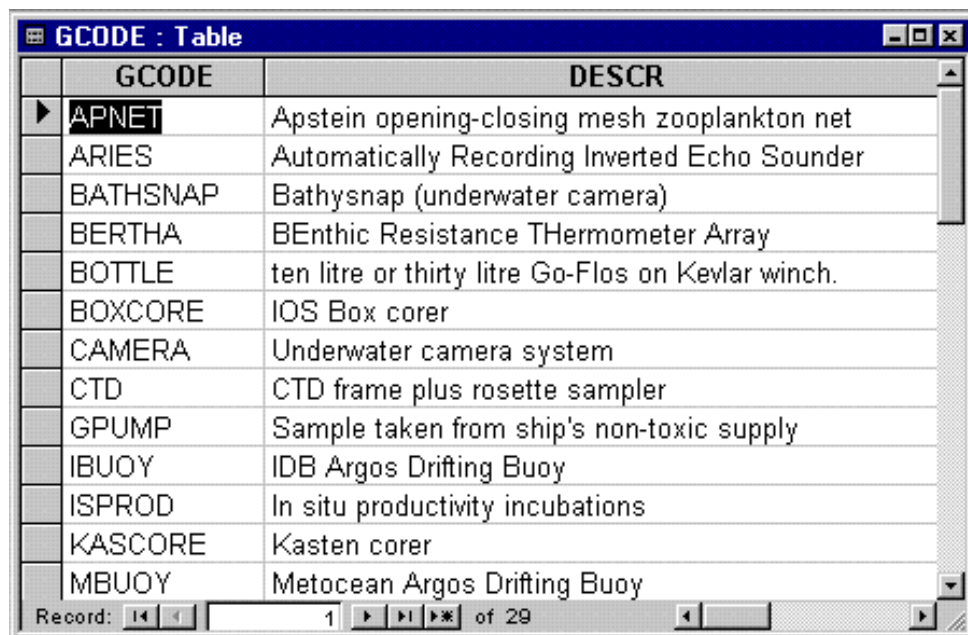
When a database is opened using Access, a dialog box is presented offering a choice of the objects available. The Access 2.0 dialog is shown here but is broadly similar in design to the later versions.

There are six types of object: tables, queries, forms, reports, macros and modules. Users of the JET database on the CD-ROM need only be concerned about the first three of these.



The type of object required is selected by clicking one of the tabs on the left-hand side of the dialog. This presents a list of the available objects of that type. The desired object is simply highlighted by clicking on it and then opened by clicking on the 'Open' button. Alternatively, an object may be opened by double clicking on it.

Table objects, as their name suggests, are the actual tables of data that make up the relational database. Opening a table object provides a listing of the table contents in the form of a spreadsheet grid like this:



GCODE	DESCR
APNET	Apstein opening-closing mesh zooplankton net
ARIES	Automatically Recording Inverted Echo Sounder
BATHSNAP	Bathysnap (underwater camera)
BERTHA	BEnthic Resistance THERmometer Array
BOTTLE	ten litre or thirty litre Go-Flos on Kevlar winch.
BOXCORE	IOS Box corer
CAMERA	Underwater camera system
CTD	CTD frame plus rosette sampler
GPUMP	Sample taken from ship's non-toxic supply
IBUOY	IDB Argos Drifting Buoy
ISPROD	In situ productivity incubations
KASCORE	Kasten corer
MBUOY	Metoccean Argos Drifting Buoy

The fields and records visible may be adjusted by using the horizontal and vertical scroll-bar controls. Any subset of rows and columns may be highlighted by dragging the mouse cursor over them and then transferred to other applications via the clipboard. However, as individual tables from a relational database are rarely self-contained, this may be of limited value.

Query objects, or 'views' as they are known in other relational database systems, may be thought of as additional table objects that combine several base tables together or filter the contents of base tables. Their main reason for being is to underpin form objects. However, users may find them convenient for exporting some types of data into other applications. Like table objects, opening a query object causes its contents to be listed in the form of a spreadsheet grid.

The most important object type for those wishing to interrogate the database is the form object. These provide an interface to data from several tables combined in such a way that the user is provided with all the information necessary to make use of the data. Forms may be used to simply step through data records or display data as a spreadsheet grid. However, when used in conjunction with Access find and filter tools, forms provide a powerful and flexible means of searching the database.

Using Access Forms

When an Access form is opened, the information is presented in what is termed 'form view' which looks like this:

The screenshot shows the '14C Data' form with the following sections:

- Event:** 200290, **Gear:** BOTTLE, **Cruise:** VLD137
- Start:** 03/07/93 04:15:00, **End:** 03/07/93 04:45:00, **Originator's reference:** 310
- Latitude:** 49.333, **Latitude variation:** , **Site:**
- Longitude:** -12.5, **Longitude variation:** , **Water Depth:** 1220
- Water Collection Information** (button)
- Experiment:** V1C004, **Type:** IS, **Microplankton:** >5 um
- Start:** 03/07/93 05:00:00, **Duration (hr):** 24, **Nanoplankton:** 2-5 um
- Comment:** , **Picoplankton:** 0.2-2 um
- Incubation Information** (button), **Size Fraction Definitions** (button)
- Microplankton Uptake:** 189.21, **Nanoplankton Uptake:** 69.3, **Picoplankton Uptake:** 182.37
- Integration Depth (m):** 40, **Total Uptake:** 440.88
- Integrated 14C Uptake (mg C/m2/incubation duration)** (button)
- Table:**

	Experiment	Inc Depth	Coll Depth	Rel Light	Abs Light	Microplankton	SD Microplankton	Nanoplankton	SD Nanoplankton
▶	V1C004	1	1			4.443	0.565	1.888	
	V1C004	5	5			5.087	0.6	1.86	
	V1C004	10	10			5.985	0.766	2.36	
	V1C004	15	15			4.279	2.254	2.998	
	V1C004	20	20			3.075	0.382	0.832	
- Record navigation: Record: 1 of 9 (at bottom: Record: 4 of 33)

This presents the information from a single database record. In this case, each record represents a ^{14}C incubation experiment. The information from the record fields are displayed in discrete labelled boxes. In addition, there is a second form within the form displaying the data from child records (the individual sample bottles involved in the experiment) owned by the experiment record.

The record displayed may be changed using the 'video' control in the bottom left-hand corner of the window to step one record forwards, one record backwards or to jump directly to the first or last record.

For a form such as this to be of practical use there are two things that the user needs to be able to do. First, the user must be able to find the record or records of interest. Secondly, the user must be able to get the information from those records into another application such as a spreadsheet.

One method for locating the record or records of interest is to use the video controls to single step through the records until a record of interest is encountered. This is a perfectly satisfactory method for forms containing up to 100 records. However, many of the forms contain a significantly larger number of records and so more powerful tools are required.

The first tool provided by Access is the 'find' tool that may be found in the 'Edit' pull-down menu or invoked using the button on the toolbar with the binocular icon. This tool can be used to search for a given string in either a single field (selected by clicking in the appropriate form box) or all fields. It is particularly useful for finding related records in other forms by searching for the BODC Event Number.

The most powerful tool provided by Access is the form filter. This allows the creation of a copy of the current form that contains a user-specified subset of records. The filter criteria are set up using the 'Edit filter/sort' option in the 'Records' menu, or as a button on the toolbar. Invoking this sets up a query design box displaying all the form fields into which the selection criteria are entered. The field names are dragged from the list provided. Sort criteria are simply selected from the list box.

However, the specification of the selection criteria is a little less straightforward. Access requires the information to include in the where clause of an SQL query and a rudimentary knowledge of SQL is definitely a help in giving it what it requires. However, the program is far from pedantic about syntax and usually accepts the obvious (e.g. =50, >50 or <50).

Tips. To select data values within a range use the syntax 'between value and value'. To match part of a string use the syntax 'like "wild-card string"'. The Access wild cards are '.' for a single character and '*' for any number of characters.

Access 7.0 and later include an alternative filtering interface termed 'Filter by Form'. In this the filter criteria are entered into the boxes on the form rather than through a query design form. Whilst this is a much better interface, it adds little to the power of the tool.

Once the filter criteria have been set up, the 'Apply filter/sort' option is invoked from the 'Records' menu or using the toolbar button. The result is a form of identical appearance to the original except for the number of records it contains.

Having identified a record of interest in an Access form, the next problem to address is how to get the information from that record into another application such as *Excel*. The best way of doing this by far is to copy the data over the Windows clipboard. To do this, click on 'Select Record' in the 'Edit' menu followed by 'Copy'. The record, including column names based on table field names, may then be pasted into *Excel*.

Providing the form doesn't contain a sub-form, that's all there is to it. However, most of the forms present in the OMEX database include sub-forms. The data from these must be copied over in a separate operation. Select the sub-form data by clicking on the small box in its top left-hand corner. Then, simply click 'Copy' in the 'Edit' menu and paste the data into a convenient empty cell in the *Excel* spreadsheet.

This section has presented a very brief digest on how to use the forms included in the OMEX database. Access is both intuitive to use and includes extensive documentation. The more one learns about the program, the more one can get out of it. By all means use this section as a starting point but please do not regard it as an exclusive alternative to the documentation provided by Microsoft.

OMEX I Database Forms

A large number of forms have been created to allow the contents of individual tables or groups of tables to be viewed conveniently. At first sight, the list of forms might look daunting. However, nearly half of the forms in the list are sub-forms embedded in other forms and these may be safely ignored by the user. To make them easy to recognise, all of these forms include the word 'Datacycles' in their name.

There are a number of database tables, BOTDATA, CORETOT, COREPROF and TRAPDATA, for which the forms included have limited functionality. These forms list each parameter profile sequentially, rather than in spreadsheet grid format. The latter presentation would be much more useful but is impossible to produce using simple Access forms. This is because these tables all contain a 3-field primary key (sample reference, parameter code and originator code) to reflect the real world where different people may well measure the same thing on the same sample. Sadly, this creates terminal problems for the cross-tabulated queries required to present the parameters across a row. The BODC Database Explorer was primarily written to circumvent this problem and may be used instead. However, there are many tables in the database that are most effectively interrogated using a form interface.

The forms that have been created are listed below, classified into the same groupings used for the documentation of the database contents.

These groups are:

[Event Inventory](#)

[Data Dictionaries](#)

[Water Column Profile Data](#)

[Pelagic Biology Data](#)

[Benthic Data](#)

[Current Measurements](#)

[Particle Flux Data](#)

[Rate Measurements](#)

[Atmospheric Chemistry Data](#)

In each section, the side headings specify the form names as they appear in the *Access* object list.

Bug Fix. The forms in the OMEX I database have been built on a computer with *Windows* large fonts selected for the screen display. Due to a bug in some versions of *Access*, viewing the forms on a system with small fonts selected causes some of the form field labels to be truncated. If this problem is encountered, it may be rectified in seconds by converting to a large font display.

Event Inventory Forms

All Cruises

This form presents information from table CRSINDX for every mnemonic included in the cruise field of the EVENT table. All the Continuous Plankton Recorder tows are included, as well as research cruises. It is probably of little use to those who do not have additional knowledge of CPR operations.

Non-CPR Cruises

This is an identical form to 'All Cruises' except that the CPR tows have been excluded to make the information on research cruises easier to find.

Events

This form provides access to all the information held in the EVENT table, together with information from the CRSINDX table. The form is divided into four segments. Two of these display general information concerning the event and its associated cruise. The other two sections provide information specific to point events and traverse events. One or other of these will be blank, depending upon the type of event described by the current record.

Browsing this form can quickly provide an overview of the scope of the oceanographic measurements held in the database.

Data Dictionaries

In most cases, the information contained in the data dictionary tables has been incorporated into the forms rather than displaying codes. Consequently, there is no need for forms to be provided for the dictionary tables. The exception to this is the parameter codes that have up to 200 bytes of supporting information associated with them. This cannot be displayed within the available screen space. Consequently, the parameter codes are included in the forms and a separate form is provided to facilitate their translation.

Parameter Dictionary

The primary purpose of the Parameter Dictionary form is to allow the meaning of a parameter code to be obtained. If using a form that includes a parameter code, it may be convenient to also have this form open at the same time. Codes may then be looked up as required using the 'Find' tool.

Water Column Data

CTD Data

This form provides access to all the CTD profiles held in the database. The header information (date/time, position, etc.) is in the main body of the form with the profile data included as a sub-form. Filtering this form to focus the data displayed is advisable as it contains a lot of records. The nephelometer data that are held in a separate table in the database have been included on this form as if they were part of the same table.

Light Profile Data

This form contains the profiling radiometer data in a similar format to the CTD data. The main body of the form consists of two sections. The upper section provides information on when, where and how the profile was collected. The lower segment displays the characteristics of the individual sensor on the profiling instrument. If a radiometer includes several sensors then each sensor will be displayed as a separate record. The profile itself is presented as an embedded sub-form.

Remember that some CTD profiles from the UK research vessels may also include downwelling and upwelling PAR irradiance channels.

Marine Snow Profiler Data

This form presents the particle abundance and volume data collected using the CTD-mounted camera system. Form and sub-form format is used to display the header information and datacycles.

SeaSoar Data

This form presents gridded SeaSoar data as if each column in the grid were a data profile. It should be regarded as an extension of the CTD Data form as it contains the same type of data in a similar format.

Water Bottle Data

This table presents water and air sample data. Each record displayed by the form represents a sample collection event. Consequently, all depths sampled by a CTD rosette are included as one record. The embedded sub-form displays the profile for each parameter measured sequentially. This may be found useful if the profile for a single parameter is required. The rows for the

parameter of interest may be highlighted by drawing the mouse cursor over them and then copied to another application. If a spreadsheet format with several parameters in each row is required, then use the Database Explorer software.

XBT Data

This form presents expendable bathythermograph data with the header parameters as fields in the main form and the profile data cycles in an embedded sub-form.

Pelagic Biology Data

CPR Phytoplankton Data

This form displays one record for each Continuous Plankton Recorder tow segment. A sub-form is included that displays the individual phytoplankton taxon abundances. Users are referred to the database table structure documentation for the definition of the abundance parameter used.

CPR Zooplankton Data

This form displays one record for each Continuous Plankton Recorder tow segment. A sub-form is included that displays the individual zooplankton taxon abundance. Users are referred to the database table structure documentation for the definition of the abundance parameter used.

LHPR Data

This form presents the data returned by the Longhurst-Hardy Plankton Recorder. The main body of the form contains information concerning the complete tow. The embedded sub-form contains one row for each sample collected during the tow (i.e. each piece into which the silk was cut) and includes both header information, such as depth of tow, and abundance data. This is subdivided into taxa for some samples.

RMT Data

This form displays the data collected using the Rectangular Mid-water Trawl net and is divided into four sections. The top section provides header information for the tow as a whole and will be the same for each sample collected during a tow. The second section provides header information for each individual catch. The total sample data, volume and biomass, are displayed in the third section. The fourth section is a sub-form that lists the volume and biomass data for the catch subdivided by taxonomic group.

Benthic Data

Benthic Foraminifera Data

This form presents live and dead benthic foraminifera abundance profiles along cores. The main body of the form gives information on where and when the core was collected. The embedded sub-form provides a sequential display of taxon abundance for each horizon sampled.

Benthic Macrofauna Data

This form presents benthic macrofauna abundance and biomass profiles along cores. The main body of the form gives information on where and when the core was collected. The embedded sub-form provides a sequential display of taxon abundance for each horizon sampled.

Benthic Megafauna Data

The Benthic Megafauna Data form displays biological data collected using an epibenthic sledge. The form is divided into four sections. The first section lists information about where and when the trawl took place. The second section presents information pertaining to the catch as a whole. The third section is an embedded sub-form that lists the abundance and biomass data by taxonomic group.

Benthic Meiofauna Data

This form provides access to profiles of benthic meiofauna abundance and biomass. The main body of the form gives information on where and when the core was collected. The embedded sub-form provides a sequential display of taxon abundance and biomass for each horizon sampled.

Core Profile Data

The Core Profile Data form gives access to a wide range of parameters measured as profiles along cores. The form is divided into three sections. The top section displays information on where and when the core was collected. The middle section provides additional information for the sub-core on which the profile was measured. The bottom section is an embedded sub-form that lists the profiles for each parameter measured sequentially. If a spreadsheet format with several parameters in each row is required, then use the Database Explorer software.

Whole Core Data

This form presents measurements made on either a whole core, sub-core or grab samples. The form is in three sections. The top section displays information on the coring event. Below this is additional information on the individual sub-core used. The third section is a sub-form containing one record for each parameter measured.

The whole core data in the OMEX database include relatively small numbers of parameters. Consequently, the form display provides adequate access to the data. However, if the parameters are required listed across a row of a spreadsheet, the Database Explorer software may be used instead.

Current Measurements

ADCP Data

This form presents Acoustic Doppler Current Profiler data, including signal amplitude that provides semi-quantitative information on zooplankton biomass distribution. The form is in four sections. In the main form, one section displays information on where and when the profile was collected and two sections provide information on how the data were processed. The fourth section is an embedded sub-form that lists the current profile datacycles.

Drifter Data

The Drifter Data form presents the tracks of drifting buoys and sediment traps. The main body of the form provides information on the deployment and recovery of the instrument. The track co-ordinates are listed in the embedded sub-form.

Particle Flux Data

Sediment Trap Data

This form displays sediment trap data and includes four sections. The top section provides trap deployment information common to all trap types. Below this are two sections that display trap position information appropriate to moored traps (on the left) or drifting traps. Further information on drifting trap courses may be obtained using the Drifter Data form.

The fourth section is a sub-form displaying each parameter profile time series sequentially. If a spreadsheet format with several parameters in each row is required, then use the Database Explorer software.

Rate Measurements

14C Data

This form presents data from ^{14}C incubation experiments. The data included here are from long-term experiments where it is inappropriate to normalise the data in terms of uptake per hour or from P:I experiments that have not been parameterised in terms of alpha and Pmax. Note that normalised uptake data and P:I parameters are included as water bottle parameters and may be obtained using either the Water Bottle Data form or the Database Explorer software.

The form contains five sections. The top section displays information on where, when and how the water used in the experiment was collected. Below this are sections presenting information on the incubation conditions and the size fraction definitions. The fourth section displays column integrated uptake data. The fifth section is a sub-form that presents the uptake rates for the individual samples incubated during the experiment.

15N Data

This form presents data from ^{15}N incubation experiments. The data included here are from long-term experiments where it is inappropriate to normalise the data in terms of uptake per hour. Note that normalised uptake are included as water bottle parameters and may be obtained using either the Water Bottle Data form or the Database Explorer software.

The form contains five sections. The top section displays information on where, when and how the water used in the experiment was collected. Below this are sections presenting information on the incubation conditions and the size fraction definitions. The fourth section displays column integrated uptake data. The fifth section is a sub-form that presents the uptake rates for the individual samples incubated during the experiment.

33P Data

This form presents data from ^{32}P and ^{33}P incubation experiments. The data included here are from long-term experiments where it is inappropriate to normalise the data in terms of uptake per hour or from P:I experiments that have not been parameterised in terms of alpha and Pmax. Note that normalised uptake data and P:I parameters are included as water bottle parameters and may be obtained using either the Water Bottle Data form or the Database Explorer software.

The form contains five sections. The top section displays information on where, when and how the water used in the experiment was collected. Below this are sections presenting information on the incubation conditions, including the phosphorous isotope used, and the size fraction definitions. The fourth section displays column integrated uptake data. The fifth section is a sub-form that presents the uptake rates for the individual samples incubated during the experiment.

Atmospheric Chemistry Data

Water Bottle Data

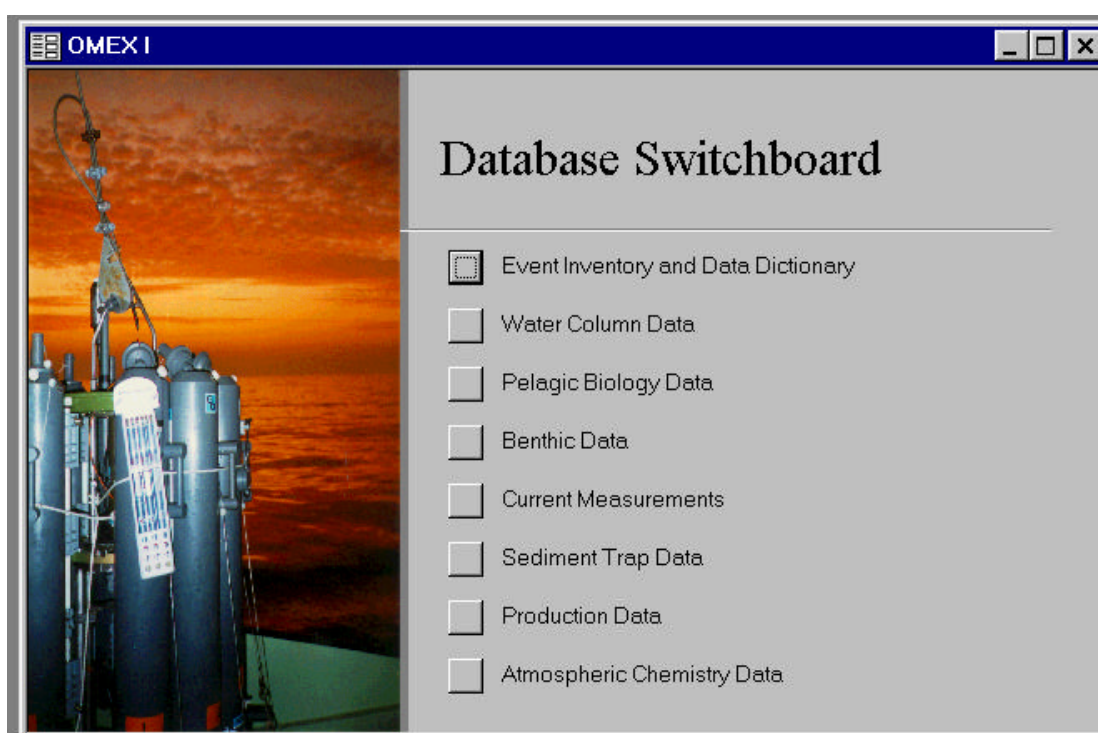
The form title might not be what is intuitively expected but water and air sample data are held together in the database. The task of identifying the atmospheric data may be eased by filtering the form using the gear code field.

Each record displayed by the form represents a sample collection event. The sub-form included displays each parameter measured. This will probably prove adequate for atmospheric chemistry data because only a small number of parameters have been measured at a single height. However, if a spreadsheet format with several parameters in each row is required, then use the Database Explorer software.

Runtime Access and the JET 3.0 Databases

This section of the document provides some additional information for users of Runtime Access and those who wish to modify the JET 3.0 databases with a full version of Access 7.0. It has no implications for the other versions of the databases.

When a database is opened in Runtime Access, instead of being presented with dialog lists of database objects a 'switchboard' appears thus:



The buttons on this either open up forms or additional pages of the switchboard. Simply press buttons until you have opened up the form you require.

The default menu options offered by Runtime Access are frustratingly short of filter/sort definition tools. Consequently, the JET 3.0 databases have been set up with customised menu options that include these tools, but exclude design tools that cause problems with runtime operation.

This has implications for anyone who wishes to further develop the JET 3.0 versions of the database as many of the menu items needed will be absent when these files are opened with a full version of Access. To overcome this (obviously on a copy of the database on hard disk), select the Startup option

from the Tools menu and change the Menu bar option from 'RUNTIME' to '(default)' using the list box provided.