



INTERNATIONAL SOIL REFERENCE AND INFORMATION CENTRE

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ISRIC Soil Information System

ISIS 4.0

User manual

**T. van de Ven
P. Tempel
J. Verhagen**

**Revised edition
1995**

Technical Paper 15 b

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Inquiries

ISRIC
P.O.Box 353
6700 AJ Wageningen
The Netherlands
Telefax: int + 31.317.471700
E-mail: SOIL@ISRIC.NL

FOREWORD

When ISRIC was established as the International Soil Museum in 1965 its main objective was to assemble soil profiles, soil samples and associated information to illustrate the units of the FAO-Unesco Soil Map of the World. At present, the world soil collection consists of over 900 monoliths from 60 countries accompanied by soil and environmental data. In addition the collection is supported by a soil map collection, soil report library, a soil thin section collection and a slide collection.

To facilitate the storage and management of the soil and environmental data a computerized database management system, called ISIS (ISRIC Soil Information System) has been operational since 1986. The objectives of ISIS are:

- To make an orderly arrangement of soil data and relevant environmental data of all soils sampled for ISRIC's world collection;
- To improve the accessibility of the site and environmental information, including linkages to other information sources at ISRIC (map collection, soil report library and slide collection);
- To stimulate the use of soil information in and outside ISRIC;

ISIS served as a model for the FAO-ISRIC Soil Database (SDB) and has been adapted for several national databases, particularly in Africa.

The foundation of ISIS was laid by E. van Waveren. Ever since, ISIS has been substantially improved by A.B. Bos, J. Verhagen, T. van de Ven, and P. Tempel, which resulted in ISIS version 4.0. Many thanks are due to E.M. Bridges of ISRIC, who performed the task of finalizing the manuscript.

Although developed to serve ISRIC's internal needs, the flexibility of ISIS is such that it can also be employed as a prototype for the development of a soil database at any soil centre. ISRIC is willing to cooperate with national soil centres, especially those in developing countries, for such an endeavour.

No computer program is perfect; we look forward to receiving comments for improvements.

Dr. Ir. L.R. Oldeman
Director

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1 INTRODUCTION

ISIS, the ISRIC Soil Information System, is a soil pedon data management system for micro computers (IBM AT and compatibles). It incorporates procedures for storing, editing and printing soil data. ISIS is written in the dBASE application language. dBASE is a well known and widely used relational database management system for micro computers.

The prime objective of ISIS is the management of data and documentation associated with the ISRIC soil reference collection. In this collection, soil descriptions are extensive and output procedures are written to meet ISRIC's requirements. However, ISIS can be used as a foundation for the development of a soil information system, customized to your specific needs. Anyone familiar with the dBASE application language can readily modify the procedures to make the system suitable for use in a non-ISRIC environment.

This manual contains instructions on the **installation** and proper application of ISIS. Although ISIS is fully interactive and self-explanatory (all necessary instructions appear on screen), this manual provides additional information to enable a more effective use of ISIS. It is therefore recommended that this manual should be read carefully before applying any of the ISIS procedures.

In this manual, the ←-sign will be used to indicate the use of the Enter-key. This key on the computer keyboard is sometimes also called the Return-key. All words contained in the index of the user manual are printed in **bold**. Commands to be entered by the user are printed in *ITALIC CAPITALS*. Menu bars visible on the screen are printed as with a **shaded background**.

The **ISIS 4.0 Technical Manual** (ISRIC Technical Paper no. 15) discusses the technical aspects of ISIS. It contains a data dictionary and guidelines to work with ISIS data files at dBASE command level (i.e. at the **dot prompt**).

The following kind of data are stored in ISIS:

site data	about 60 attributes on location, geology, landform, soil surface properties, hydrology, land use and vegetation;
soil morphology data	about 100 attributes on depth, colour, composition, structure, consistence, pores, roots, mottles, cutans, inclusions, pans, biological activity and boundary characteristics for every soil horizon;
analytical data	more than 100 physical, chemical and mineralogical attributes for every soil horizon;
climatic data	monthly averages, per meteorological station, of an unlimited number of meteorological parameters. Any number of meteorological stations can be linked to any number of monoliths;
classification	soil classification in FAO-Unesco Soil Map of the World Legend; classification in USDA Soil Taxonomy; local classification.

All **ISIS-attributes** are listed in appendix A.

ISIS is represented schematically in figure 1. The database proper consists of 13 **data files**. Each data file represents a particular **data category**. Every data file can be edited from an input screen. Output from ISIS consists of a compilation of data from several or all ISIS data files. Output can be sent to all hardcopy devices supported by dBASE IV version 2.0. ISIS 4.0 can also create **print files** for all these printers. These print files can be sent to a printing device from DOS with the COPY or PRINT command. Printing to an **ASCII-file** enables the incorporation of the text in a wordprocessor. All print files, and other ASCII-files, can be edited from within ISIS 4.0.

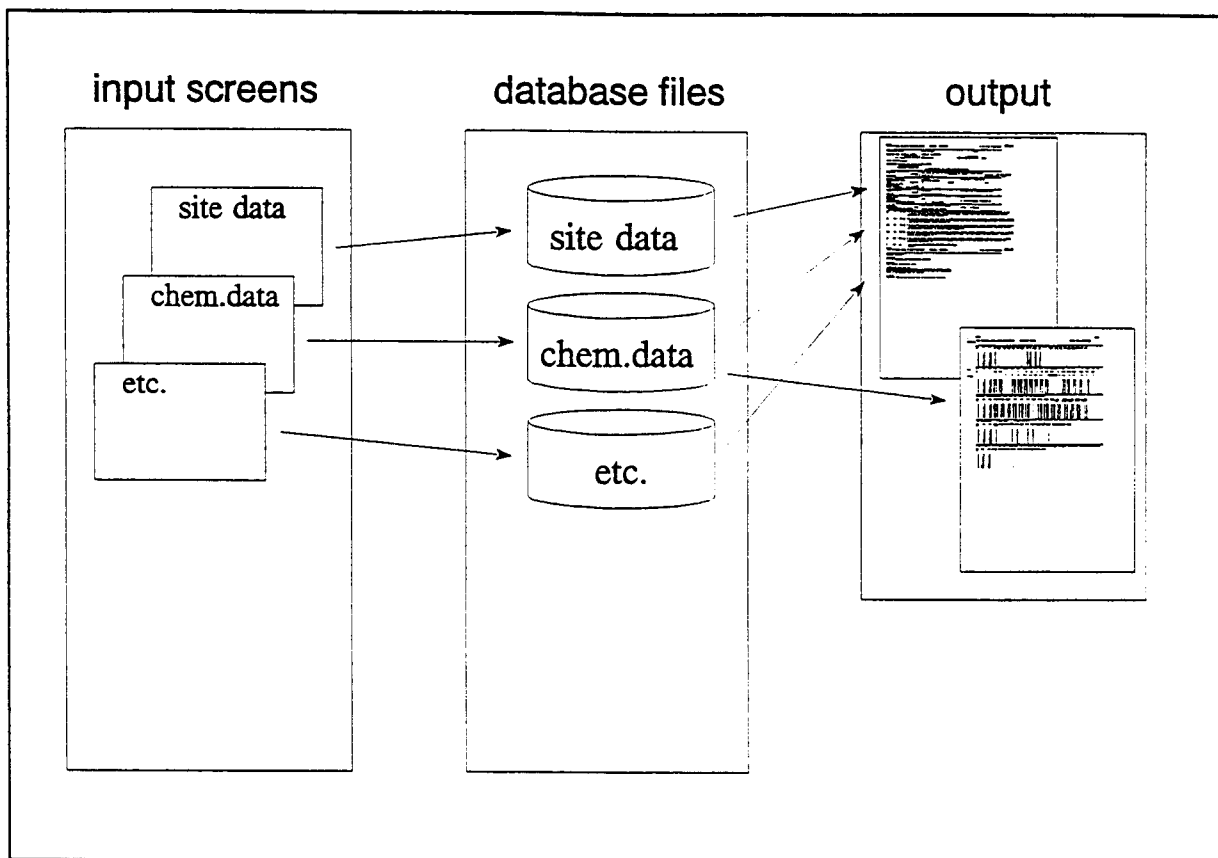


Figure 1: Schematic representation of ISIS 4.0.

2 ISIS 4.0 - A RELATIONAL SOIL PEDON DATABASE

ISIS is a **relational database system**. It consists of 13 different data files. Each file contains data from a single data category (pedon site data, physical analyses data, etc.). These distinct data categories are the backbone of ISIS 4.0. Data editing, indexing and deleting can be done in only one category at a time. Data categories can be selected from the **data file selection menu** (screen 6). Whenever ISIS requires the use of a particular data category, this menu will pop up

When designing a relational database system, separate data sets (i.e. database files) are created, primarily to avoid data redundancy and inconsistency. However, for data from separate data sets to appear in a single screen listing or printed report, the data sets have to be related as if they comprised a single set.

Each data file in a relational database therefore has a **primary key**. A primary key is a unique identifier for each record in a data file. The primary key consists of one or more attributes with the property that, at any given time, no two records of the data file contain the same value for that attribute or combination of attributes. Each attribute is represented by a field in the data file. Fields used in the primary key will further be referred to as **key fields**.

Table 1 shows for every data file the key field(s) that make(s) up its primary key. Thus, table 1 shows which field values must be entered before a record in a particular data file can be added or edited.

ISIS_ID is the name of the key field that uniquely identifies each reference soil. **ISIS_ID + HORI** is the key field combination that uniquely identifies each horizon. **STATCODE** is the name of the key field that uniquely identifies each meteorological station. **STATCODE + TYPE** is the key field combination that uniquely identifies each climate characteristic (e.g. mean monthly temperature, or mean monthly windspeed).

Each data file may also contain one or more **foreign keys**. A foreign key is a field or combination of fields in a data file whose values are required to match those of the primary key of some other data file. Foreign-to-primary-key matches represent **references** from one data file to another; they are the "glue" that holds the database together. Another way of saying this is that the foreign-to-primary-key matches represent certain **relationships** between records.

Data are entered into a data file in **natural order** - the order in which the data are received by the data file. However, you usually want to work with the data in alphabetical, numeric or date order. An **index**¹ controls the order in which data appears. Moreover, it will help ISIS to conduct more efficient data searches, and relate data files. An index is a special kind of stored file. To be specific, it is a file in which each entry (i.e. data record) consists of a key expression of one or more fields, plus a pointer to the corresponding record in the data file that has been indexed (figure 2).

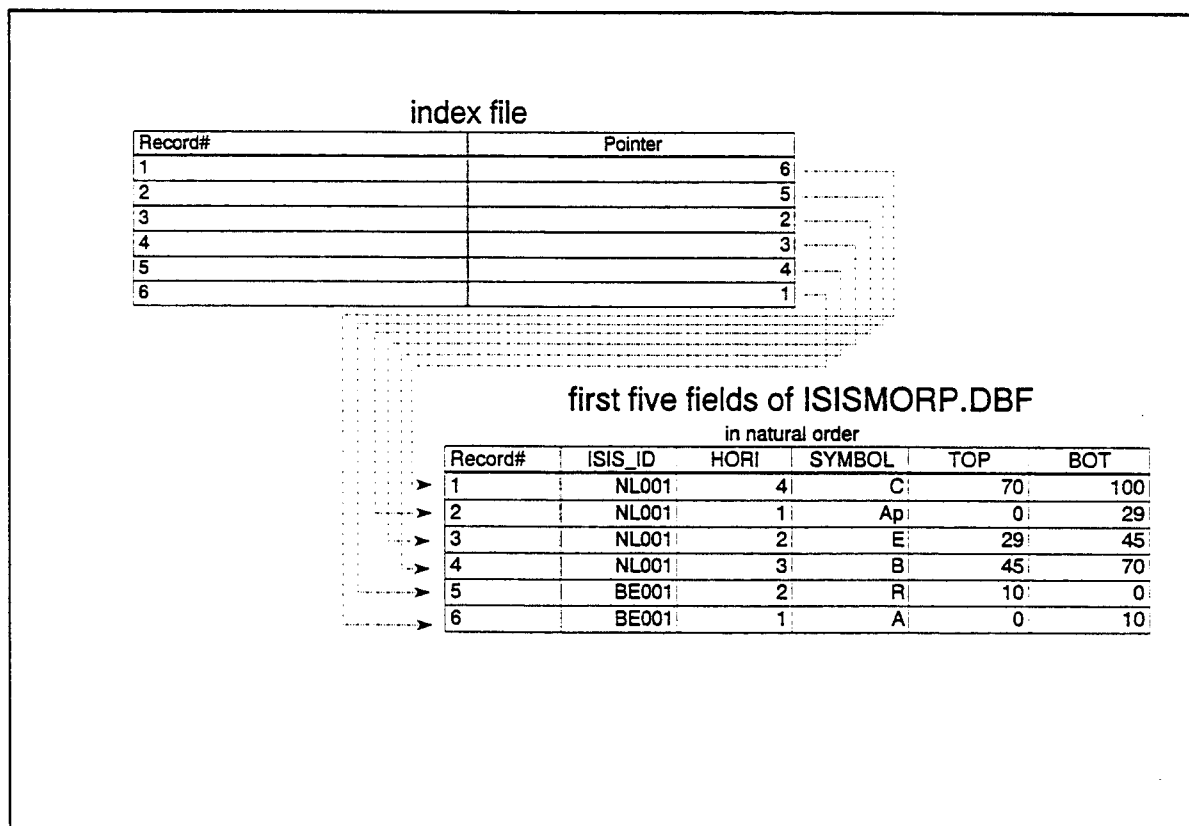


Figure 2: Example of indexing. The upper table represents the indexfile of the lower table. The lower table represents the ISIS 4.0 data file ISISMORP.DBF

¹ It is called an index by analogy with a conventional book index, which also consists of entries containing "pointers" (i.e. page numbers) to facilitate the retrieval of information from an "indexed" file (i.e. the body of the book).

data category	ISIS 4.0 data file	key fields			
		ISIS_ID	HORI	STATCODE	TYPE
Site data	ISSITE.DBF	•			
Morphological data	ISMORP.DBF	•	•		
Classification	ISCLAS.DBF	•			
Physical data	ISPHYS.DBF	•	•		
Chemical data	ISCHEM.DBF	•	•		
Water soluble salts	ISSALT.DBF	•	•		
Clay mineralogy	ISMIN.DBF	•	•		
Sand mineralogy	ISSMIN.DBF	•	•		
Elemental composition soil	ISSOEL.DBF	•	•		
Additional analyses	ISANAD.DBF	•			
Link site and climate data	ISCLST.DBF	•		•	
Climate station	CLIMSTAT.DBF			•	
Climatic data	CLIMDATA.DBF			•	•

Table 1
Primary key fields

3 INSTALLING ISIS 4.0

3.1 Installation Requirements

Installation of ISIS 4.0 requires the presence of dBASE IV version 2.0 or higher on your computer. To install dBASE IV version 2.0 the following hardware and software (minimal configuration) is needed:

- an IBM or IBM-compatible, **protected-mode** 286, 386, or 486 computer
- a monochrome, CGA, EGA, or VGA monitor
- 2MB RAM (at least 1,024kb **extended memory**. More RAM will significantly enhance the performance of the dBASE IV software)
- 7.5MB **hard disk space** to install all dBASE options
- 4.5MB hard disk space to install dBASE IV system files only
- DOS 3.3x or higher

To run ISIS 4.0 you will need the following hardware and software :

- a copy of the **dBASE IV version 2.0** database management system installed on your computer
- 1.5MB free space on your hard disk to install the ISIS 4.0 software.

You can use the DOS command "DIR" to display free hard disk space. The amount of extended memory can be displayed with the DOS command "MEM".

Should the amount of free disk space not be sufficient; delete redundant software or data from your hard disk, or make a backup of infrequently used software or data.

Should the amount of **memory** not be sufficient; check if memory areas are being used as expanded memory. DBASE does not use expanded memory, so releasing expanded memory can resolve your memory deficiency. To change the memory configuration; change the memory driver settings (e.g. add 'NOEMS' to the EMM386.SYS driver declaration) in your config.sys file, in the root directory. Or, change the configuration so that less programs or drivers (socalled TSR's) are loaded into upper memory. Do this by changing your CONFIG.SYS or AUTOEXEC.BAT file.

3.2 The ISIS 4.0 Installation Program

Your ISIS 4.0 distribution diskette comes with an **installation program** that will copy all programs and data files required by ISIS automatically to your hard disk.

To install ISIS on your hard disk, do the following

- Turn on your computer
- Check if the hardware requirements (see paragraph 3.1) are met by your computer
- Insert the ISIS 4.0 distribution diskette in a floppy disk drive
- Change to the disk drive containing the distribution diskette
- Type "INSTALL" followed by a letter, designating the hard disk on which you want to install ISIS. E.g. to install ISIS on hard disk C, enter "INSTALL C".
- Specify a directory for the ISIS 4.0 program (.PRG), memory (.MEM), and key (.DBF/.MDX) files. If the directory does not exist, it will be created. If the directory already exists, its contents will be overwritten. The default **program directory** is "C:\ISIS".
- Specify a directory for the ISIS 4.0 data (.DBF/.MDX) files. If the directory does not exist, it will be created. If the directory already exists, its contents will be overwritten. The default **data directory** is "C:\ISIS\DATA".
- Specify from what floppy disk drive you are installing ISIS 4.0: A or B (press "Q" to quit the installation).

Accept preferably the default directories. The installation program will copy two archive files to the appropriate directories and unpack them. ISIS is now ready for use. Screen 1 shows an example installation dialog.

```

Welcome to ISIS 4.0!
ISIS installation utility

By default ISIS program files will be installed in directory C:\ISIS
Do you wish to change this directory [Y/N]?

ISIS program files will be installed in directory C:\ISIS
Continue [Y/N]?

Programs directory C:\ISIS already exists.
Its contents will be overwritten.
Continue installation [Y/N]?

By default ISIS data files will be installed in directory ISIS\DATA
Do you wish to change this directory [Y/N]?

ISIS data files will be installed in directory ISIS\DATA
Continue [Y/N]?

Data directory C:\ISIS\DATA already exists.
Its contents will be overwritten.
Continue installation [Y/N]?

```

Screen 1: Installing ISIS 4.0

With the installation utility it is not possible to copy data files and program files to separate hard disks. However, after installation of ISIS 4.0, either program files or data files may be moved without any restriction to another location. The default ISIS output directory is "C:\".

IMPORTANT: if you have entered a data directory other than the default one ("C:\ISIS\DATA") you first have to use the "Change directory" option in the "Data management" pull-down menu, to make ISIS know where your data files are located. The ISIS output directory can be changed also with this menu option.

3.3 Structure and data conversion

ISIS 4.0 features a **data conversion** utility that will convert ISIS 3 database files into ISIS 4.0 database files. In addition it is capable of verifying and, for a number of attributes, modifying the **structure** of ISIS 4.0 database files.

Like ISIS this conversion utility is a dBASE application in itself. That is, it is a separate dBASE program that cannot be called from within ISIS.

To run the conversion utility, enter *DO CONVERT* at the dBASE dot prompt (or enter *DBASE CONVERT* at the operating system prompt). Subsequently an opening screen will appear with a two-option menu bar at the top; **Convert** and **Quit**.

On selection of **quit** you can either return to the operating system, or to the dBASE dot prompt (e.g. to run ISIS subsequently).

On selection of **Convert** a popup menu appears with another two options; **From ISIS 3 to ISIS 4.0** and **ISIS 4.0 structure check**. Both will now be successively discussed in more detail.

3.3.1 Conversion from isis 3 to isis 4.0

Option **From ISIS 3 to ISIS 4.0** copies data from ISIS 3 data files to newly created ISIS 4.0 data files. Using ISIS 3 files in ISIS 4.0 without **conversion** may lead to serious dBASE errors. Appendix A lists the database file **structure** for all ISIS 4.0 data files.

Compared to ISIS 3, there are a number of new data fields in ISIS 4.0. After conversion these fields will be empty, or assigned reworked data values from ISIS 3 (e.g. ISIS_ID).

The ISIS 3 data fields that are no longer supported by ISIS 4.0 are listed in table 2. These data will not be written to your new ISIS 4.0 files. Thus, do not delete your ISIS 3 files after conversion if you want to retain these data!

attribute	file	attribute description
AMMMN	ISISMIN	Mn by amm. oxalate
CP	ISISMIN	C by pyrophosphate
SI	ISISMIN	Si by Na-dithionite
SPECS	ISISPHYS	specific surface

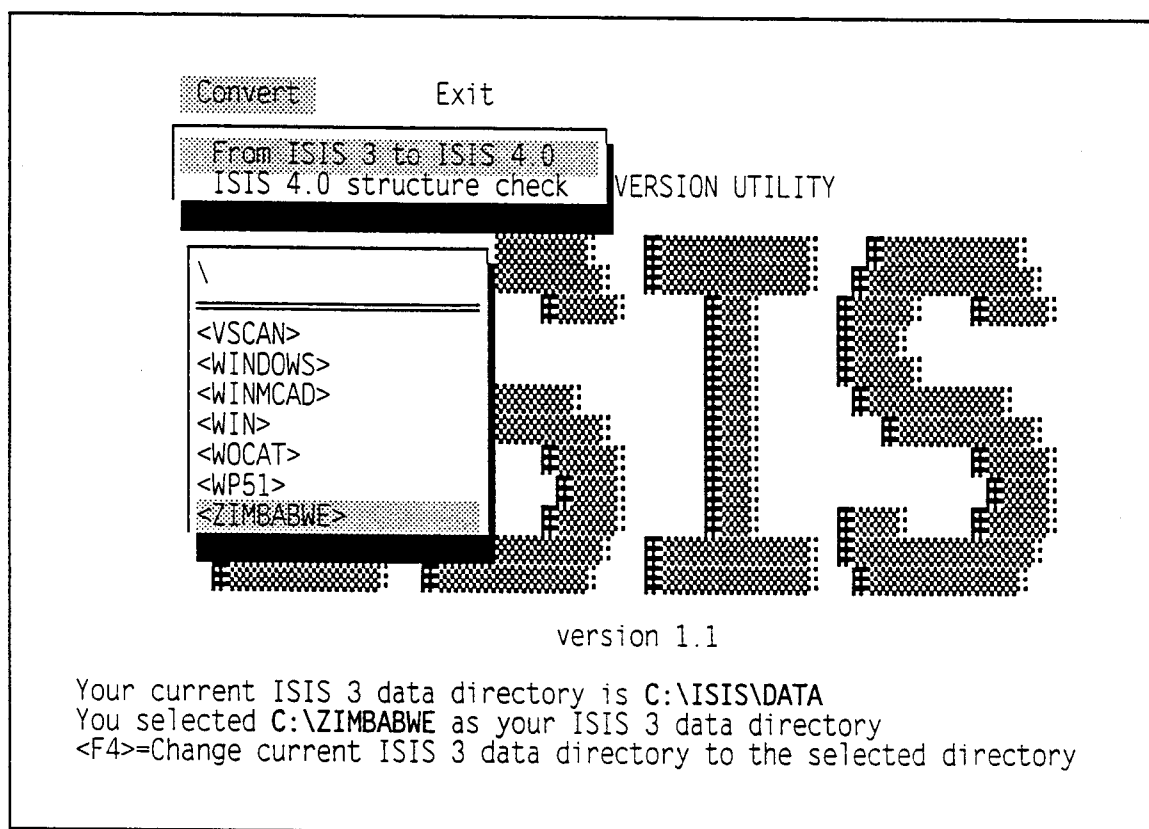
Table 2

ISIS 3 data fields that have become obsolete in ISIS 4.0

On selection of option **From ISIS 3 to ISIS 4.0** the **source directory** selection popup, and the **target directory** selection popup will successively appear. The source directory is the directory containing the ISIS 3 data files you want to convert. The target directory is the directory where the conversion utility will create the new ISIS 4.0 data files to store the converted ISIS 3 data.

Each selection popup displays a directory tree. The top shows the **current² directory**. The second row from the bottom of the screen shows the selected directory. This is the directory ISIS 4.0 will use if the <F4>-key is pressed. Move through the directory tree by highlighting a directory in the popup and pressing ← . To move to a higher level in the directory tree: highlight <parent> and press ← . To select another drive: select the root directory ("\" in screen 2) and press ← . A second popup will appear with all available disk drives. When pressing <F4>, the directory selection popup will disappear and ISIS will show in a message box the directory you actually selected. Screen 2 shows the selection popup for the source directory.

It is possible to use a floppy disk as your source or target directory. This is, however, not recommendable. Floppy disks have a very limited storage capacity. Furthermore, writing and reading of a floppy disk is notoriously slow. Thus, using a floppy disk will further slow down this already time consuming procedure. Whenever possible, copy your ISIS 3 data files to a hard disk before converting them.



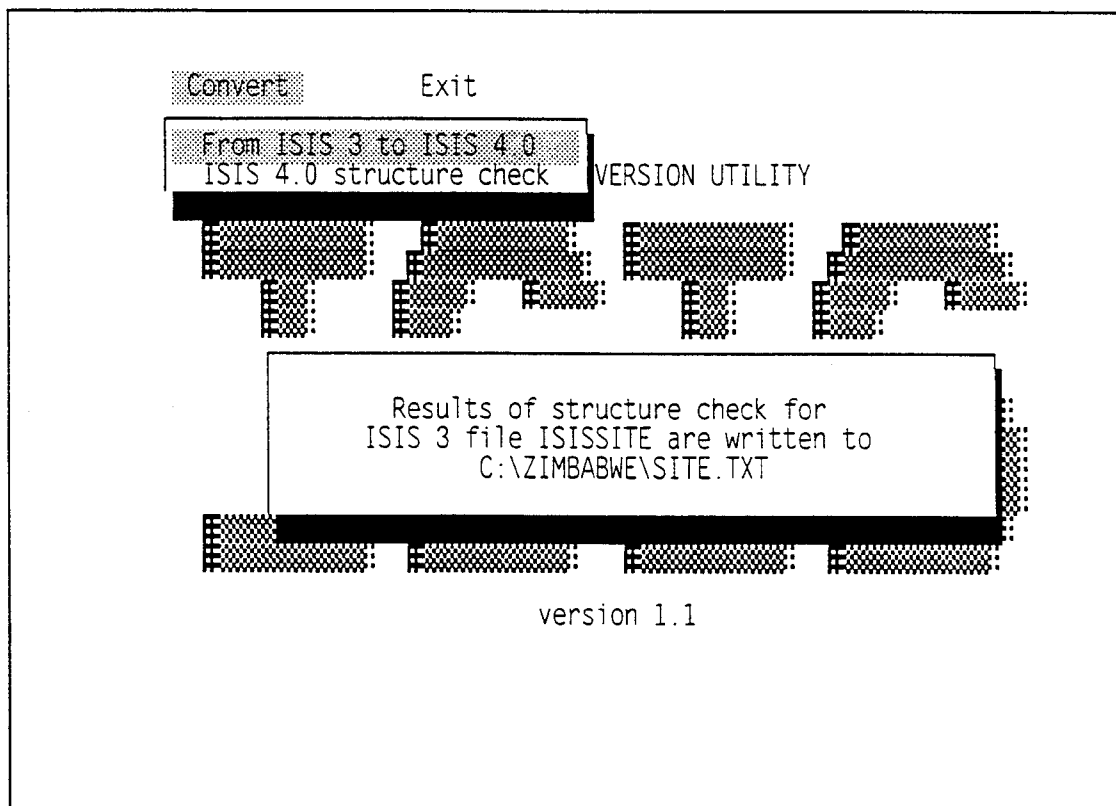
Screen 2: The selection popup for the source directory containing the ISIS 3 data files

After having selected a source directory and a target directory you have to specify whether you want to convert a single ISIS 3 datafile or convert a complete set of ISIS 3 datafiles. On selection of **Single file** a second menu with the available ISIS data categories will pop up. Each data category corresponds to an ISIS 4.0 data file. Select the data file you want to convert. On selection of **All files** ISIS will convert all ISIS 3 data files in succession.

² The **current** directory is the active (or actual) directory; by pressing <F4> the selected directory will become your current directory.

The actual conversion of an ISIS 3 database file to an ISIS 4.0 database file involves several steps. The CONVERT utility will

- 1 Check the structure of the ISIS 3 file to be converted (this is your source database file);
 - 2 Create an empty ISIS 4.0 file (this is your target database file);
 - 3 Append all records from the ISIS 3 file to the newly created ISIS 4.0 file;
 - 4 Replace those fields whose structure or contents in ISIS 3 and ISIS 4.0 are different (notably the data fields ISO, ISIS_ID, and STATCODE)
 - 5 Create the required index(es) for the ISIS 4.0 file.
- ad 1 *Check the structure of the ISIS 3 file.* The conversion utility will compare the structure³ of the ISIS3 file - the source file - with the standard ISIS 3 structure as documented in the original ISIS 3 manual. CONVERT generates a report for every ISIS 3 file checked. This report, a plain ASCII file, is written to the source directory. The report's name will be displayed in a message box before structure checking starts (screen 3). Its extension is always ".TXT"



Screen 3: CONVERT generates a structure status report for every ISIS 3 file you selected for conversion

³ The **structure** of a database file is the definition of field names, field types, field lengths, number of decimal places (for numeric fields), and a flag indicating the presence of an .mdx tag for each field.

Every report either states that the ISIS 3 file qualifies for conversion, or it will list all data fields in the file that do not comply with the standard ISIS 3 structure. In the former case, a message box will display that the structure of the file "qualifies for conversion", and the conversion program will continue with step 2. Otherwise, CONVERT will display the report. Screen 4 shows an example report for an ISIS 3 climate data file

```

[ .....^_1.....^_2.....^_3.....^_4.....^_5.....^_6.....^_
Source : C:\ZIMBABWE\CLIMDATA
Target : C:\TRASH.BIN\CLIMDATA
date   : 23/10/95
time   : 10:09:37

ISIS 3 attribute ANNUAL : ERROR - length 7 should be 5
ISIS 3 attribute APR   : ERROR - length 6 should be 5
ISIS 3 attribute AUG   : ERROR - length 6 should be 5
ISIS 3 attribute DEC   : ERROR - length 6 should be 5
ISIS 3 attribute FEB   : ERROR - length 6 should be 5
ISIS 3 attribute JAN   : ERROR - length 6 should be 5
ISIS 3 attribute JUL   : ERROR - length 6 should be 5
ISIS 3 attribute JUN   : ERROR - length 6 should be 5
ISIS 3 attribute MAR   : ERROR - length 6 should be 5
ISIS 3 attribute MAY   : ERROR - length 6 should be 5
ISIS 3 attribute NOV   : ERROR - length 6 should be 5
ISIS 3 attribute OCT   : ERROR - length 6 should be 5
ISIS 3 attribute SEP   : ERROR - length 6 should be 5

<PgUp><PgDn><↑><↓>=move through text <ESC>=exit

```

Screen 4: Structure status report, generated by CONVERT, for an ISIS 3 climate data file

Examine the report carefully and note all structure deficiencies. Close the report with <Esc>, or confirm the "Are you sure you want to abandon operation" prompt. Subsequently, CONVERT will invoke the "MODIFY STRUCTURE" command of dBASE that will give you access to the database file design. Adjust the file's structure to meet the ISIS 3 standard, press <CTRL>-<End>, and confirm all subsequent dBASE prompts. CONVERT will keep on repeating the file structure check until you exit the procedure (by answering "No" to the "Do you want to correct the database structure now" prompt) or the file structure "qualifies for conversion".

ad 2 *create an empty ISIS 4.0 file.* This procedure creates an empty ISIS 4.0 data file in the target directory. If the file already exists, you will be prompted whether you want to overwrite this file or not. If you answer "No", the conversion utility continues without converting your ISIS 3 file.

ad 5 *replace those fields whose structure or contents in ISIS 3 and ISIS 4.0 are different.* This step involves the conversion of those ISIS 3 data fields that are different in structure from their ISIS 4.0 counterparts. Name, structure or contents of these fields are changed automatically by the conversion utility.

Errors in this conversion step are likely to be the result of **incorrect data values** in the ISIS 3 file. If an incorrect **country code** is encountered, conversion will be suspended and the user given the opportunity to select the correct country from the ISO country code list. The program will default to country code "XX" in case no country was selected from this list. Country codes must be correct because they are part of the key fields ISIS_ID and STATCODE.

Error message "numeric overflow" will only be printed to the screen and not to your structure status file. This message means the program is trying to convert an ISIS 3 data value that is in conflict with the structure of the ISIS 4 data field. For example, if CONVERT converts an ISIS 3 value for SODE (soil depth) into the ISIS 4.0 value for SODE, it has to change the field type from character to numeric. If SODE contains a non-numeric character (e.g. "*", "NA" or "MV"), its converted value will be displayed as a string of asterisks (***). This kind of error can not be trapped in dBASE IV programs. So, in case of numeric overflow, check your target database file manually for the occurrence of a string of asterisks.

ad 6 *Create the required index(es)*. The last step in the conversion is the creation of the appropriate indexes for the new ISIS 4.0 files. After being indexed the files are ready for use with ISIS 4.0.

3.3.2 ISIS 4.0 Structure check

Option **ISIS 4.0 structure check** will check the structure of one, or all, ISIS 4.0 database files in your current data directory. The name of the current data directory will be displayed at the bottom of the screen when the option is highlighted. **The current data directory can only be changed from within ISIS**, with option **Change directory** in the **Data management** pull-down menu.

This option essentially does the same for an ISIS 4.0 database file, as option **From ISIS 3 to ISIS 4.0** in its first step does for an ISIS 3 file: it compares the structure of an ISIS 4.0 file with the standard ISIS 4.0 structure as documented in this manual (appendix A). CONVERT generates a report for every ISIS 4.0 database file it checks. This report, a plain ASCII file, is written to the current data directory. The report's name will be displayed in a message box before structure checking starts. Its extension is always ".TXT"

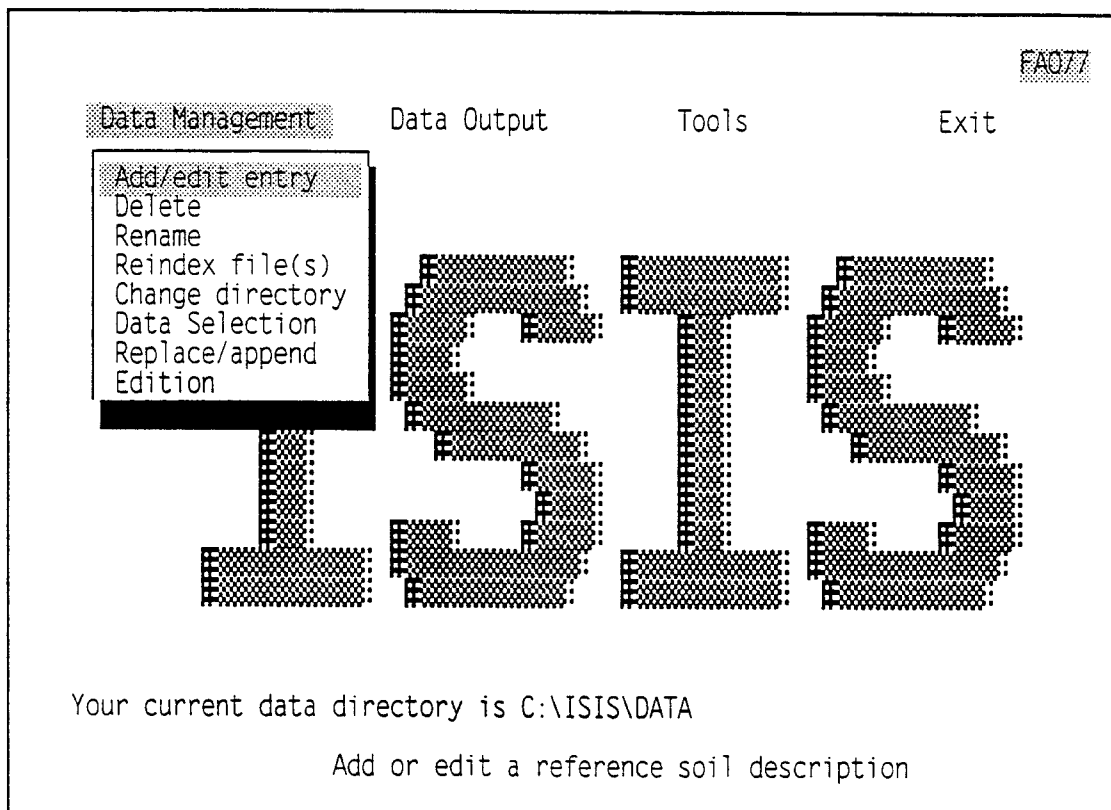
Every report either states that the file's structure is correct, or it will list all data fields in the file that do not comply with the standard ISIS 4.0 structure. In the former case, a message box will display "structure OK". Otherwise, CONVERT will display the report. Examine the report carefully and note all structure deficiencies. Close the report with <Esc>, or confirm the "Are you sure you want to abandon operation" prompt. Subsequently, CONVERT will invoke the "MODIFY STRUCTURE" command of dBASE. Adjust the file's structure to meet the ISIS 4.0 standard, press keys <CTRL>-<End>, and confirm all subsequent dBASE prompts. CONVERT will keep on repeating the structure check until you exit the procedure (by answering "No" to the "Do you want to correct the database structure now" prompt) or the structure evaluates to "correct".

On selection of **ISIS 4.0 structure check** you can opt to verify the structure of a single ISIS 4.0 datafile, or to verify the structure of a complete set of ISIS 4.0 datafiles. On selection of **Single file** a second menu with the available ISIS data categories will pop up. Select the data file you want to verify. On selection of **All files** ISIS will verify the structure of all ISIS 4.0 data files in succession.

4 WORKING WITH ISIS 4.0

4.1 Starting ISIS 4.0

After installation of ISIS 4.0 change to the ISIS program directory (Default C:\ISIS). Subsequently ISIS can be started from the program directory by entering *DO ISIS* at the dBASE dot prompt, or alternatively, by entering *DBASE ISIS* at the operating system prompt. A few seconds after startup, the user will be presented with the following opening screen (screen 5).



Screen 5: ISIS 4.0 main screen with the data management pull-down menu open

At the top of the screen is a horizontal **bar menu** similar to many spreadsheet menus, with four options: **Data management**, **Data Output**, **Tools** and **Exit**. This is the ISIS **main menu** through which all ISIS facilities can be accessed. You select an item from the menu bar by moving the highlight to the item and pressing \leftarrow , or by clicking it with your mouse. On selection of a main menu item, a pull-down menu opens. Again, an item can be selected by moving the highlight to the item and pressing \leftarrow , or by clicking it with the mouse. The remainder of this chapter will discuss the main menu items and their auxiliary submenu options in more detail.

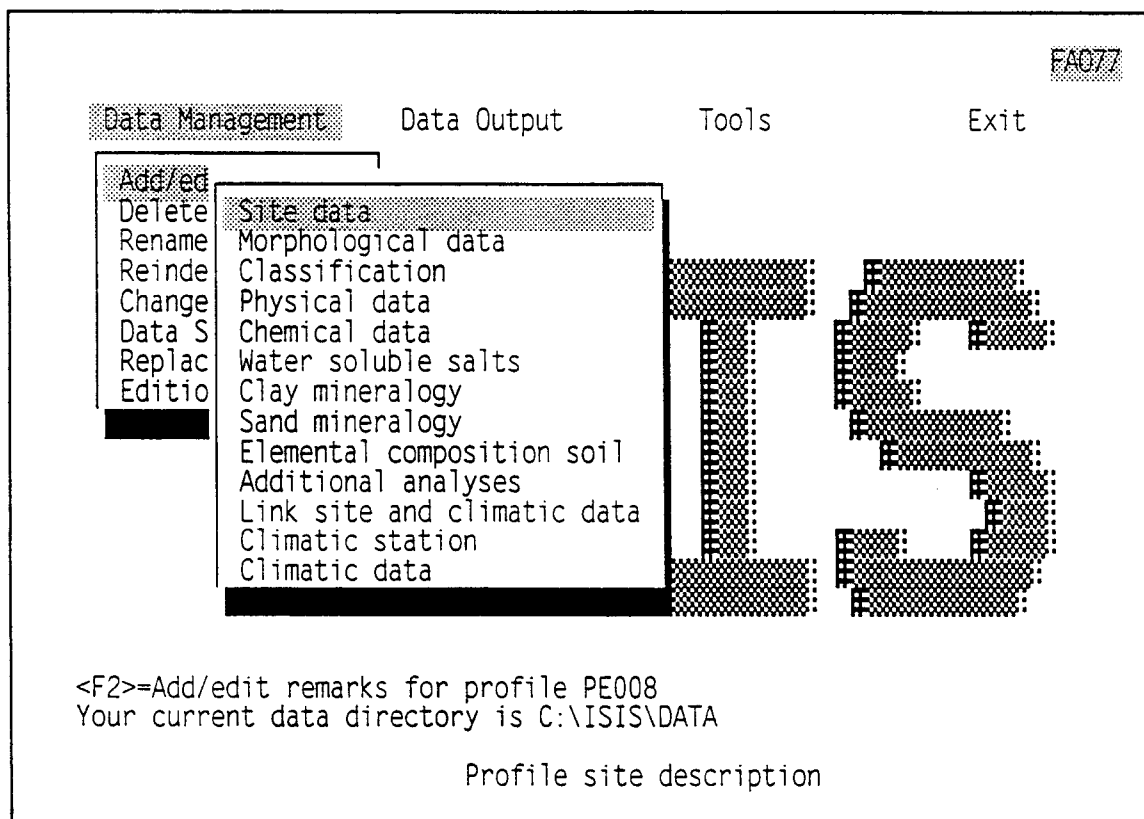
ISIS 4.0 automatically resets a number of **system memory variables** to establish its default **working environment**; the configuration of screen, printer, and keyboard, and other aspects of the environment in which ISIS runs. A number of these memory variables can be changed freely to meet specific user demands. Changing ISIS' working environment can be accomplished using the dBASE IV **DBSETUP** utility - at the operating system prompt, type *DBSETUP* <enter>. ISIS' default environment settings are stored in **configuration file CONFIG.DB** in the ISIS 4.0 program directory (or in the dBASE IV directory, if the ISIS 4.0 directory does not contain this file). Refer to your dBASE manual "Getting started" for a detailed description of **DBSETUP.EXE** and **CONFIG.DB**.

4.2 Data Management

Data management encompasses a set of tools enabling you to manipulate your data. On selection of **Data management** the pull-down menu displayed in screen 6 appears. Data management options are started by selecting the appropriate menu bar of the data management menu with ←, or with the mouse.

4.2.1 Adding or editing data

On selection of **Add/edit** in the data management pull-down menu, a menu with the available pedon data categories pops up (screen 6). Pedon data are to be entered per data category. Select a data category for which you want to **add** or **edit** data.



Screen 6: The ISIS 4.0 pedon data categories

Each data category has its own set of input screens, and all data entered in this set is sent to one particular ISIS data file. Thus, each data category in the add/edit popup corresponds to a single ISIS data file. After selection of a data category, ISIS will prompt for one or two attribute values. These attributes are the key fields which comprise the primary key for that particular data file.

E.g. by selecting bar **Site data**, data file **ISSSITE.DBF** is opened. This file is indexed on key field **ISIS_ID** (the **ISRIC** reference soil identification code). Data for a record in **ISSSITE.DBF** with this particular reference soil identification code can subsequently be added or edited by means of the input screens for site data.

Refer to table 1 for an overview of all data categories and their corresponding key fields. An **ISIS_ID** code is 5 characters wide and always starts with a two-character ISO 3166 **country code** (see appendix B for all ISO-3166 country codes), followed by a three-digit sequence number. Spaces are not allowed, and cannot be entered in an **ISIS_ID** code. Thus, pedon number 7 from Brazil would be coded as "BR007".

A **STATCODE** uniquely identifies a climatic station. This code is 6 characters wide and always starts with a two-character ISO 3166 country code, followed by a capital C, followed by a three-digit sequence number. Again, spaces are not allowed and cannot be entered in a **STATCODE**. Thus, meteorological station number 7 from Brazil would be coded as "BRC007".

Horizons (**HORI**) are sequentially numbered from top to bottom, starting with 1.0 (one).

Pedon samples are numbered in a similar way, but do not have to start from one. It should be noted that sample and horizon boundaries do not always correspond, consequently the horizon numbering for samples and pedons may not correspond. Both sample and horizon boundaries are printed in the standard ISIS data sheets to avoid confusion.

The meteorological data type (**TYPE**) is entered in lower and upper case characters. All meteorological data types are designated by conventional indicators, like T for mean monthly temperature. If a meteorological data type is requested by ISIS, press <F5> to make a selection from a list of valid meteorological data types. Parameters not present in the standard list of meteorological data types should be entered as *xa*. Always use small caps for these extra parameters! If the meteorological station has a second non-standard parameter, this is called *xb*, a third would be called *xc*, and so forth. The non-standard meteorological data types entered should be explained in the remarks block, e.g.:

METEOROLOGICAL DATA: *xa* - average soil temperature at 50 cm (°C).
 xb - average soil temperature at 100 cm (°C).

After entering the requested primary key values, ISIS will search the selected data category, or file, for a record uniquely identified by that primary key. If found, ISIS will load the data into the input screen and display it for the user to edit. If no record is found with a primary key matching the one searched for, ISIS 4.0 will ask whether the record should be added. If the answer is confirmative, ISIS 4.0 will add a new record to the data file with the entered primary key. Subsequently the appropriate input screen will appear. Screen 7 shows the first input page (out of four) for site data.

Entering Data in the Input Screens

Site and profile data are to be entered in coded form according to the "Guidelines for the description and coding of soil data" (ISRIC Technical Paper 14), or the FAO "Guidelines for soil profile description" (Rome, 1990). Although information once entered can be edited afterwards, it will be more expedient to enter only completed profile descriptions instead of preliminary profile data. This will avoid intricate data editing and promote database integrity.

Missing Values

Missing values depend on the data type of a field. A field of type "character" that is empty, or filled with any number of blanks, will be considered to contain a missing value.

For fields of type "numeric" a common missing value does not exist due to the varied nature of these type of data. For all analytical data the missing value is -1. Analytical data categories are:

- Physical data
- Chemical data
- Water soluble salts
- Clay mineralogy
- Sand mineralogy
- Elemental composition soil

```

Monolith code PE008. Description: FAO Guidelines 1977 Page : 1 of 4

----- GENERAL INFORMATION -----
Country PE Date 8 91
Author Fernandez, G. Paredes

----- LOCATION -----
Description Campo Verde Carretera Federico Basadre Km 36. Pucallpa >>
Latitude S 8° 28' 38" Altitude 280 m.
Longitude W 75° 2' 10" Köppen Am

----- PARENT MATERIAL -----
mode derived from texture weathering resistance
1 X U H
2
Remarks Clay and sand depos Lithological boundary 0 cm.

Last update : 11 January 95

<Esc>=Cancel <F3>=Del+Exit <F4>=Save+Exit <PgUp><PgDn>=Page up/down
ISO code

```

Screen 7: The first input page (out of four) for site data.

For all other numeric data categories a common missing value cannot be defined. A missing value of minus one (-1) for example cannot be used with temperature since minus one is a wholly valid and realistic temperature. A missing value of -99 on the other hand would be useful for temperature data, but does not fit in a chroma field. For a number of categories the numeric data fields therefore have no common missing value. The default value for empty numeric fields in these categories is zero. These "zero-valued" missing values will be printed as "-" in the ISIS standard data sheets. This will be the case for:

- Site data
- Morphological data
- Classification
- Link site and climatic data
- Climatic station
- Climatic data

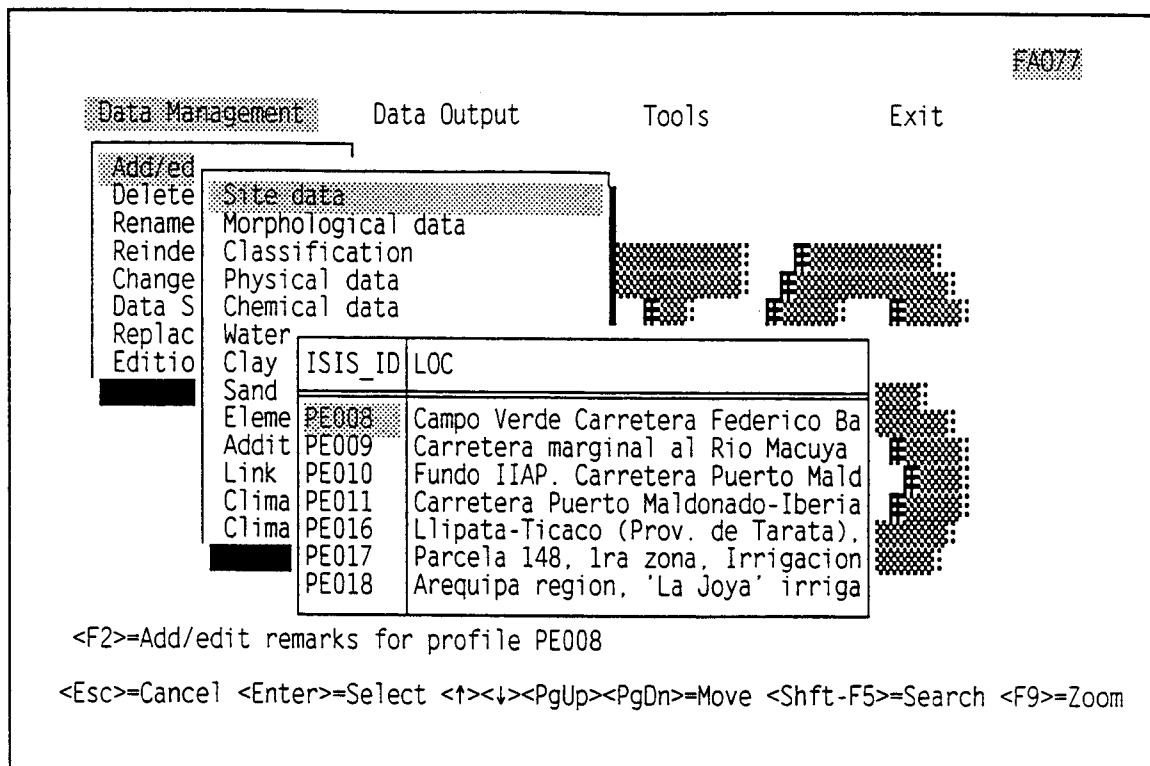
The code for class "Nil" or "None" is always a Ø (zero), not a capital "O". Note the difference!

User Keys and Input Screen Features

Whenever an input screen is opened by ISIS, it places the cursor in the first field in the top left corner. To move through the fields use ←, the arrow keys, <TAB> OR <Shift-TAB>. You can also move the cursor to a field by positioning the mouse pointer in a field and pressing the left mouse button.

In each input screen three text lines are visible at the bottom of the screen. The first two lines show the keys available for special functions. The last line is the **message line**. The message line conveys vital information with regard to valid entries for the active data field, i.e. the data field containing the cursor. For example, the message "ISO code" indicates that you should only enter a code that complies with the ISO 3166 standard. Normally the following keys will be available for each input screen:

- <ESC> Use this key to **quit the input screen** and return to the data management menu. Pressing this key will ignore all changes you made to the data. Data in the data file will not be affected.
- <PgUp> <PgDn> Use these keys to go to the **next or previous input page**. In case all data fields (attributes) for a data category do not fit into one screen, **multiple input pages** are used. The page number and total number of input pages is displayed in the top right corner of every input page.
- <F2> Use this key to add or edit the memo field containing the **general remarks** block for a reference soil. The remarks block can be called from nearly any input screen, popup or dialogue box with the <F2> key. This key activates an edit window and displays the remarks for the reference soil last selected. The reference soil identification code of the remarks block is displayed below the edit window. The remarks block is stored in the site data file. If there are no site data for this reference soil, ISIS will ask whether a record for this reference soil should be created in ISISSITE.DBF, the file containing the site data. The remarks block will be loaded into the default **memo editor**. The default memo editor is the editor that has been assigned to Wp, a dBASE IV system variable that can be changed by running the DBSETUP program. DBSETUP creates the file CONFIG.DB which stores all settings of dBASE IV. At the installation of dBASE IV the default editor is the dBASE editor. This default can be changed to any external editor (like the DOS editor (EDIT.COM), or the WordPerfect editor (ED.EXE)). If an editor other than the dBASE editor is used, save the "file" under its default name.
- <F3> Use this key to **quit the input screen and delete** the current record. ISIS will prompt you for a confirmation before the record is definitely deleted from the database file.
- <F4> Use this key to **quit the input screen and save** the changes you have made.
- <F5> Use this key to activate a **picklist**. A picklist is only available if the message line says so. The picklist displays the codes available for the current field. The codes correspond to the codes in the "Guidelines for the description and coding of soil data" (ISRIC Technical Paper 14), or the FAO "Guidelines for soil profile description" (Rome, 1990). Codes other than in the picklist should not be entered. ISIS only recognizes codes from the picklists. Select a code by highlighting it and pressing ←.
- <F6> Use this key whenever ISIS prompts you to enter one or more **key field values**; ISRIC reference soil code, horizon number, station code or meteorological data type. A popup will appear displaying the key field values for all records in the data file. You can select a record by highlighting it and pressing ←. Its key field value(s) will be assigned to the corresponding field(s) in the dialogue box. To search the index of the data file press <Shift-F5>.
- <Shift-F5> Use this key to **search the primary key** when you are browsing a database file (see also key <F6>). E.g. to find the first reference soil of Peru, press <Shift-F5>, enter *PE001*, and press ← (screen 8). ISIS will look for a record in the active database file with a primary key matching this reference soil identifier. If the search is not successful, ISIS 4.0 will position the highlight on the record with a code that resembles the entered code the most.
- <F9> Use this key to **zoom in on a window** so that it will use the entire screen. Pressing <F9> when a window is already fullscreen will reduce the window to its initial size and location on the screen.
- <F10> Use this key when you are in the dBASE editor. It will activate the **dBASE editor menu**.



Screen 8: Search the site data file for a particular reference soil identification code (ISIS_ID) by pressing key <Shift-F5>

The first page of the Site data input screen (screen 7) demonstrates all possible features of an ISIS 4.0 input screen. The upper left corner always shows to which monolith or meteorological station the input screen applies. The upper right corner shows which page of a set of input screens is active. For site and morphology data input screens the first line will also show the coding system in use for the profile. The bottom line of the input window shows the last date at which the data have been saved, i.e. the last update.

In the location description field the ">>" symbol indicates that this is a scrollable field: text typed past the end of this input field will scroll to the left. Text scrolling off the screen is not lost.

The message "<SPACE> browse entries" at the bottom of the screen means that values for the current field can be entered in two ways; you either type a value, or you browse through all valid entries by pressing the space bar successively.

Search nearest climate stations

When adding or editing the link⁴ between a pedon site and a climate station, ISIS offers the possibility to search for the nearest climate station(s). Press key <F6> when the cursor is in the STATCODE field of the primary key entry box. Subsequently, the entry screen on the next page (screen 9) will be displayed.

ISIS will look for all climate stations in the database that are located at a distance less than, or equal to, the search radius. Next, it will display the nearest user-specified number of climate stations in a table. This table comprises the identification code, name, location, altitude, distance and direction to site, and the available data for the selected climate stations. From the table, you can select one climate station to link to the pedon site. If you need to link more than one station from the table to the pedon site, write down its identification code, and direction and distance to the site, and add the link in the normal way. This way you don't need to repeat the search for these additional stations.

⁴ These links are represented by the "Link site and climatic data" data category, and are stored in database file ISISCLST.DBF.

```

Enter number of nearest stations to select 5
Enter search radius 100 km

Site coordinates (defaults to values of PE008)
Latitude S 8°28' Longitude W 75°2'

<Esc>=Cancel
<space> browse entry codes

```

Screen 9: Search for the climate stations nearest to the site, and within the search radius

4.2.2 How to delete or rename records

Deleting a record means it will be irrevocably removed from the database. **Renaming a record** means entering new values for its primary key fields. To delete or rename a reference soil, reference soil horizon, or climate station, select **Delete** or **Rename** respectively from the **Data management** pull-down menu.

ISIS 4.0 first needs to know what kind of database entity should be deleted or renamed: a reference soil, a reference soil horizon, or a climate station. Secondly ISIS wants to know whether this entity should be deleted or renamed in all data files, or in just one particular data file (screen 10). In the latter case, you will also be prompted to select a data category.

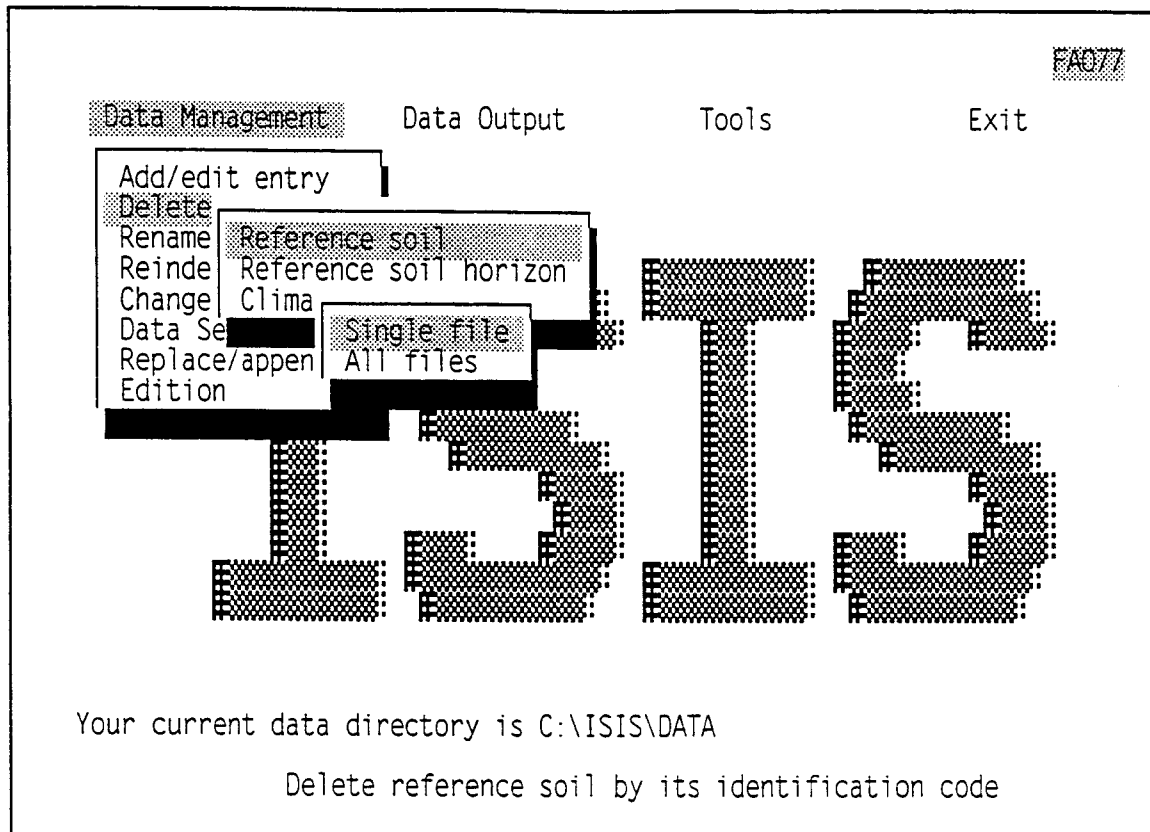
Keep in mind that a climate station can be linked to more than one reference soil, and a reference soil can be linked to more than one climate station. Thus, only delete those climate stations for which you are sure they are redundant.

4.2.3 Reindexing

You enter data into a data file in **natural order**. That is, the order in which the data are received by the data file. However, ISIS uses data files in **indexed** form. Refer to your dBASE user manual for an explanation of the use and creation of indexes.

In general it is not necessary to reindex your ISIS data files. ISIS 4.0 indexes the files if they are opened. Instances when you should reindex the ISIS 4.0 data files are:

- if data are changed outside ISIS 4.0, e.g. from the dBASE IV control centre or the dBASE dot prompt.
- if data have been **corrupted** (e.g. in case of a system failure).



Screen 10: Delete a reference soil in all data files, or in one particular data file

If the index of a file is not correct (not up to date) the following problems may occur:

- ISIS recognizes a record for e.g. reference soil ID001 as being a record with primary key ID002.
- ISIS finds a record that has been deleted.
- ISIS can't find an existing record.

All ISIS data files are indexed on one or more key fields (table 1). You can reindex one particular data file, or reindex all data files.

On selection of **Reindex file(s)** in the data management submenu, a menu with two options pops up: reindex a single data set, or reindex all data sets. On selection of **Single file** a second menu with the available ISIS data categories will pop up. Each data category corresponds to an ISIS data file. Select the data file you want to reindex. On selection of **All files** ISIS will reindex all ISIS 4.0 data files in succession.

While reindexing, the name of the data file is displayed in a message box.

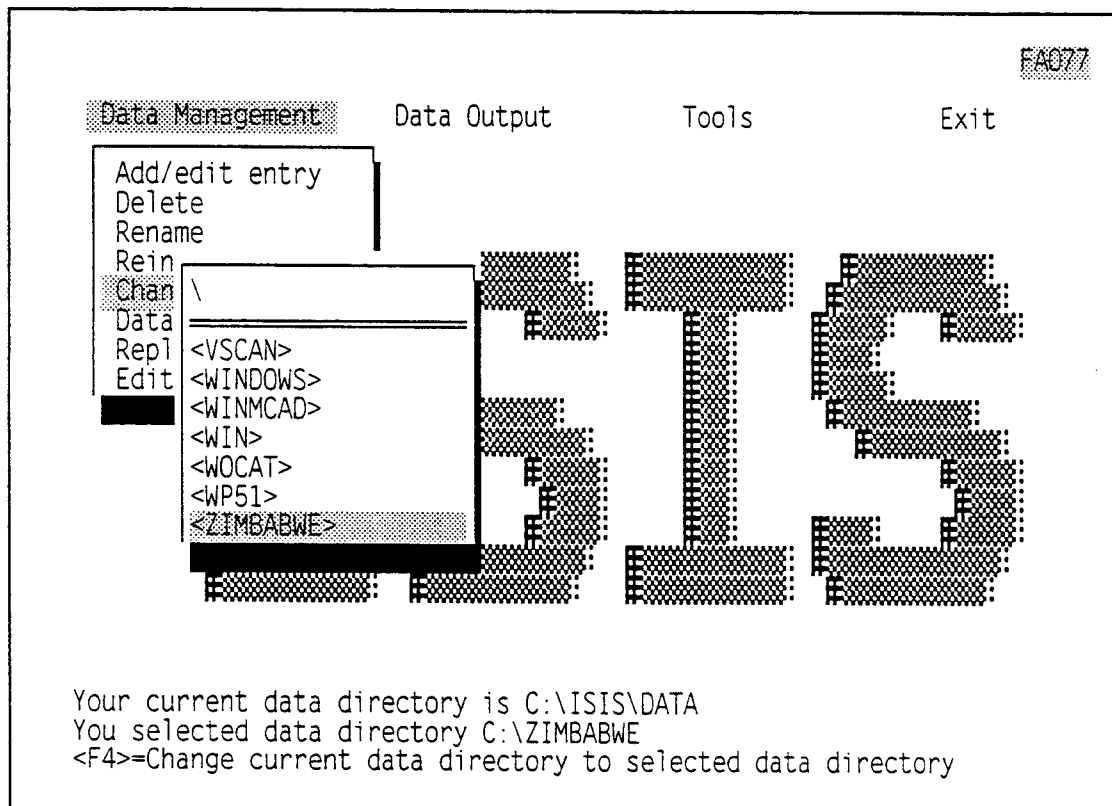
CAUTION: When adding records manually (i.e. directly in dBASE) to a data set, uniqueness of the primary key - the identifier for each record in a data file - can no longer be guaranteed. That is, the data set can contain more than one record with the same key value(s). After reindexing, ISIS will recognise only the first occurrence of records with the same key in a data file.

4.2.4 Changing directories

With this option of the **Data management** menu, the data and output directory can be changed. The **data directory** is the directory containing your current set of ISIS data files. The **output directory** is the directory to which, among others, the print files are sent.

To change a directory, select the **Change directory** option of the **Data management** pull-down menu. ISIS will ask which directory to change: the data directory or the output directory. On selection of either one, the screen will show a popup displaying a directory tree (screen 11). The top of this popup displays the current directory. The second row from the bottom of the screen displays the selected directory. This is the directory ISIS 4.0 will select if the <F4>-key is pressed.

Moving through the directory tree can be done by highlighting a directory in the popup and pressing ←. To move to a higher level in the directory tree: highlight <parent> and press ←. To select another drive: select the root directory ("\" in screen 11) and press ←. A second popup will appear with all available disk drives. When pressing <F4>, the directory popup will disappear and ISIS shows in a message window the new data or output directory.



Screen 11: Changing directories; select a new data directory from the directory tree

4.2.5 Selecting data

To retrieve selected data from the ISIS pedon database, select **Data selection** from the **Data management** pull-down menu. You can either create a **user-defined selection set** (data selection submenu option **Create**) or an **ISIS subset** of the database (data selection submenu option **ISIS subset**). The latter is a fully fledged ISIS database in itself - a complete set of ISIS data files with corresponding indexes. User-defined selection sets can

be viewed, edited and deleted with two other options from the Data selection submenu: **View/edit** and **Delete** respectively. ISIS subsets can only be examined by making the output directory your data directory: an ISIS subset is always written to the output directory.

After selecting either **Create** or **ISIS subset** from the **Data selection** submenu, a window with a selection criteria panel opens (screen 12). The first step in both creating a user-defined selection set and an ISIS subset is defining up to four **selection criteria** for a preliminary data set; each reference soil in the set

- Has a certain identification code, or ISIS_ID OR
- Is located in a certain country AND
- Is classified as a certain 1974 FAO soil unit AND
- Is classified as a certain 1992 FAO soil unit AND
- Is within a certain altitude range (meters above mean sea level)

Selecting a criterion opens a popup menu with all valid values for that criterion. Select the values you want the criterion to meet, and close the popup with <Esc>. You can select more than one identification code, country, or soil unit from the popup.

Not every selection criterion has to be applied. For example, your selection set can consist of all pedon data from the Chilean coastal plains, 0-100 meters above mean sea level. In this case only a country and an altitude criterion are used. Or your selection set may contain all data for reference soils GR003, ML001, and BR027, in which case the only selection criterion is the reference soil identification code.

The selection set according to the criteria in screen 12 will comprise data from all ferric Acrisols in Kenya, Tanzania and Uganda, at an altitude between 500 - 1500 meters above mean sea level.

```
ISRIC monolith code
OR Country          : enya, Uganda, Tanzania, United Republic of
AND FAO soil unit (1974) : AF
AND FAO soil unit (1992)
AND Altitude       : Altitude is 500 - 1500 m. above sea level

Select
```

Your current data directory is C:\ISIS\DATA
<Esc>=quit <Enter>=select
Select reference soils according to one or more criteria (none: all soils)

Screen 12: Specifying the selection criteria for the base dataset

Selecting **Select** from the selection criteria panel will create a selection set according to the criteria you specified; the **base data set**. The base data set always consists of the following fields:

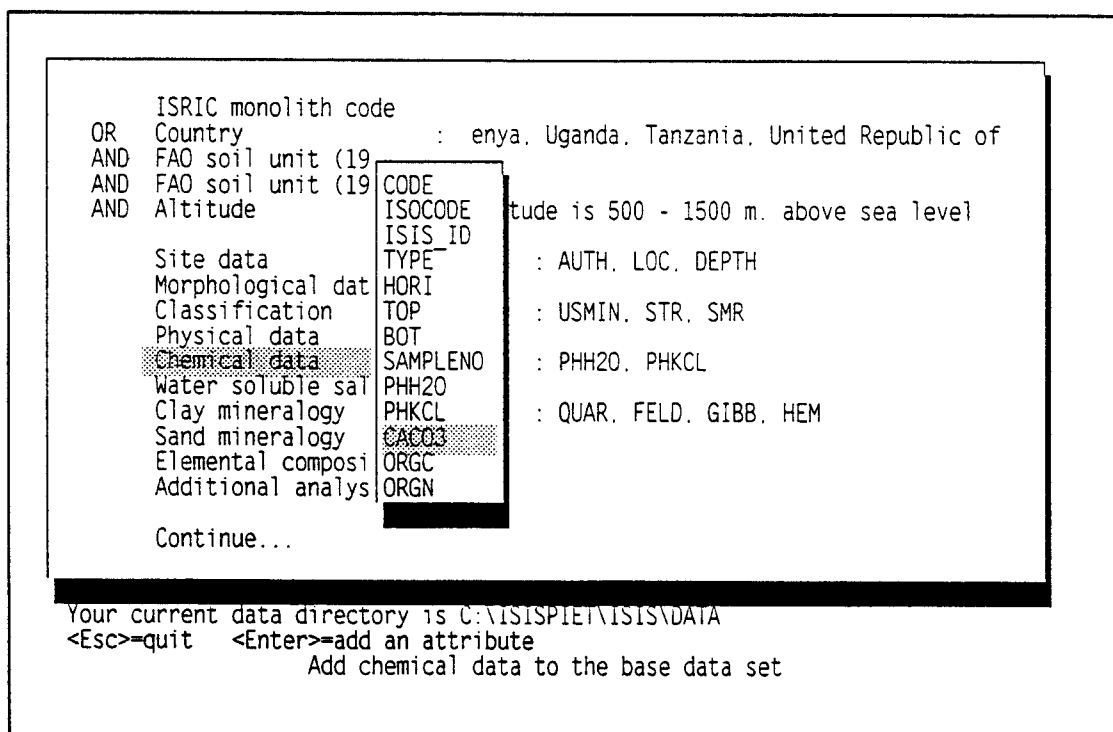
- ISIS_ID : the reference soil identification code
- ISO : the ISO country code
- CLIM : Köppen climate class
- ALT : altitude
- FAO_74 : FAO soil unit 1974
- FAO_88 : FAO soil unit 1988
- HORI : horizon number
- TOP : depth of the top of the horizon
- BOT : depth of the bottom of the horizon

If no criteria have been specified, ISIS will ask you whether all reference soils should be selected.

In case of an ISIS subset, first a preliminary base data set is created. Subsequently, ISIS starts copying records from every ISIS data file to a file of the same name in the output directory. When finished copying records, ISIS closes the selection criteria panel and returns to the data selection submenu.

In case of a user-defined subset, a second selection panel opens listing all data categories except those linked with climate. This selection panel will enable you to add any field from any data category to the base dataset. Selecting a data category opens a popup menu with all fields in that data category. Select the fields you want to add, and close the popup with <Esc>. The data for the selected fields are instantly added to the base data set (screen 13).

NB. In order to successfully create the base data set, at least the identification code and horizon numbers for the reference soils you try to select must have been entered in the site data, physical data, and classification data categories!



Screen 13: Adding pedon attributes from various data files to the base data set

```

    ISRIC monolith code
OR   Country           : enya, Uganda, Tanzania, United Republic of
AND  FAO soil unit (1974) : AF
AND  FAO soil unit (1992)
AND  Altitude         : Altitude is 500 - 1500 m. above sea level

    Site data           : AUTH, LOC, DEPTH
    Morphological data
    Classification      : USMIN, STR, SMR
    Physical data
    Chemical data       : PHH2O, PHKCL
    Water soluble salts
    Clay mineralogy    : QUAR, FELD, GIB
    Sand mineralogy
    Elemental composition soil
    Additional analyses

Build your condition: select a RELATIONAL OPERATOR...

```

<=
 =
 >=
 #

```

PHH20 < 8.00 .AND. BOT...

```

NB! Default value is 0.0

Screen 14: Build an additional selection criterion

```

    ISRIC monolith code
OR   Country           : enya, Uganda, Tanzania, United Republic of
AND  FAO soil unit (1974) : AF
AND  FAO soil unit (1992)
AND  Altitude         : Altitude is 500 - 1500 m. above sea level

    Site data           : AUTH, LOC, DEPTH
    Morphological data
    Classification      : USMIN, STR, SMR
    Physical data
    Chemical data       : PHH2O, PHKCL
    Export format       : QUAR, FELD, GIBB, HEM

```

Export format
 dBASEIV file (.DBF) on soil
 DOS Text file (.SDF)
 Delimited (.TXT)

```

PHH20 < 8.00 .AND. BOT < 100.00...

```

NB! Default value is 0.0

Screen 15: Write a user-defined selection set to a disk file

After selecting **Continue**, an additional selection criterion can be formulated for the current selection set. You build a condition from field names from the current selection set, from relational and logical operators, and from strings and numeric values (screen 14). Only records from the current selection set that meet this final selection criterion, will be written to a **disk file**.

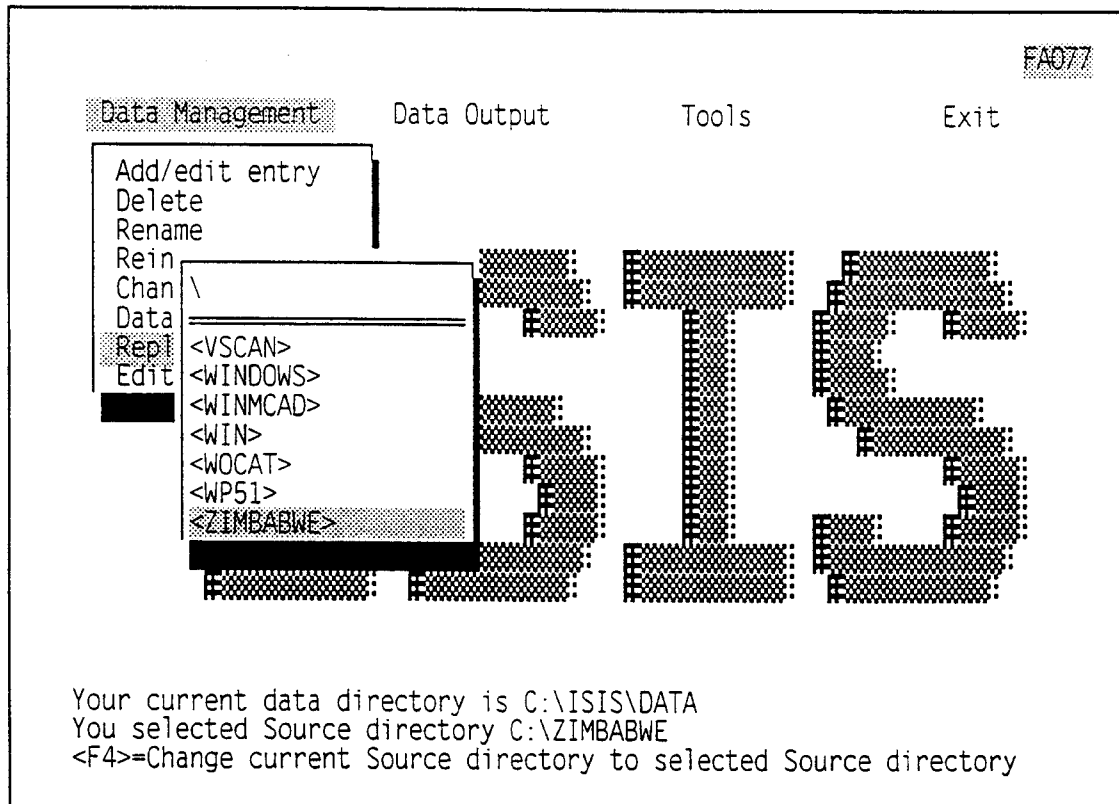
The ultimate selection set can be written to three different kind of disk files (screen 15) with a user-specified name (ISIS will warn you if the file you want to create already exists):

- a dBASE IV file, with extension DBF
- a DOS text file, with extension SDF
- a comma-delimited file, with extension TXT

A user-defined selection set can be examined with option **View/edit** from the data selection submenu. Deleting a selection set with **Delete** only means it is not accessible anymore from within ISIS. However, the **selection set file is not deleted from your disk**.

4.2.6 Replacing and appending sets of reference soils

Imagine you created an ISIS subset with a limited number of reference soils to be edited (possibly on another computer, by someone else). Once finished editing this **small subset**, you can **replace** the old soil descriptions in your database with the updated descriptions using the **Replace/append** option in the **Data management** pull-down menu.



Screen 16: Select the source directory, i.e. the directory where the data you want to replace in, or add to, the database are located.

You can also use this option to join two ISIS pedon databases together. That is, to **append** one database to the other.

On selection of **Replace/append** a popup with a directory tree is activated. Select from this popup with the <F4>-key your **source directory**; the directory where the data you want to replace in, or add to, the database are assumed to be located. Move through the directory tree by highlighting a directory in the popup and pressing ←. Move to a higher level in the directory tree by highlighting <parent> and pressing ←. To select another drive: select the root directory ("\" in screen 16) and press ←. A second popup will appear with all available disk drives. When pressing <F4>, ISIS will show in a message window the source directory you selected. Next, ISIS needs to know whether you want to **confirm** every replacement of an existing reference soil in your ISIS pedon database with a new one from the subset in the source directory.

Finally, ISIS needs to know whether **all**, or just a **selection** of profiles from the subset in the source directory should be transferred to the database. In case of the latter, a picklist will popup from which the reference soils to be appended or replaced, must be selected.

ISIS will start replacing and/or appending reference soils from the subset in the source directory to your ISIS pedon database once all these questions have been answered.

Mind that **Replace/append** can be a very time-consuming operation, especially if you are transferring data to a large pedon database. Progress is indicated by a percentage count near the bottom of the screen.

4.2.7 Edition: changing between coding systems

In the first release of ISIS - version 3 - data had to comply to the FAO "Guidelines for soil profile description" edition of 1977. That is, only soil profile descriptions recorded in the 1977 coding system could be entered in ISIS.

In ISIS 4.0 both the old 1977 as well as the new 1990 revised edition of the FAO "Guidelines" are supported. The coding system actually used in a soil profile description is recorded in field FG_VERSION of the site data file, ISISSITE.DBF.

The **default** coding system that will be used when entering a new profile description, is selected through option **Edition** in the **Data Management** pull-down menu. This coding system will also be used in generating ISIS 4.0 standard data sheets if no "Guidelines" edition was specified, i.e. field FG_VERSION is empty, or contains a value other than "FAO77" or "FAO90".

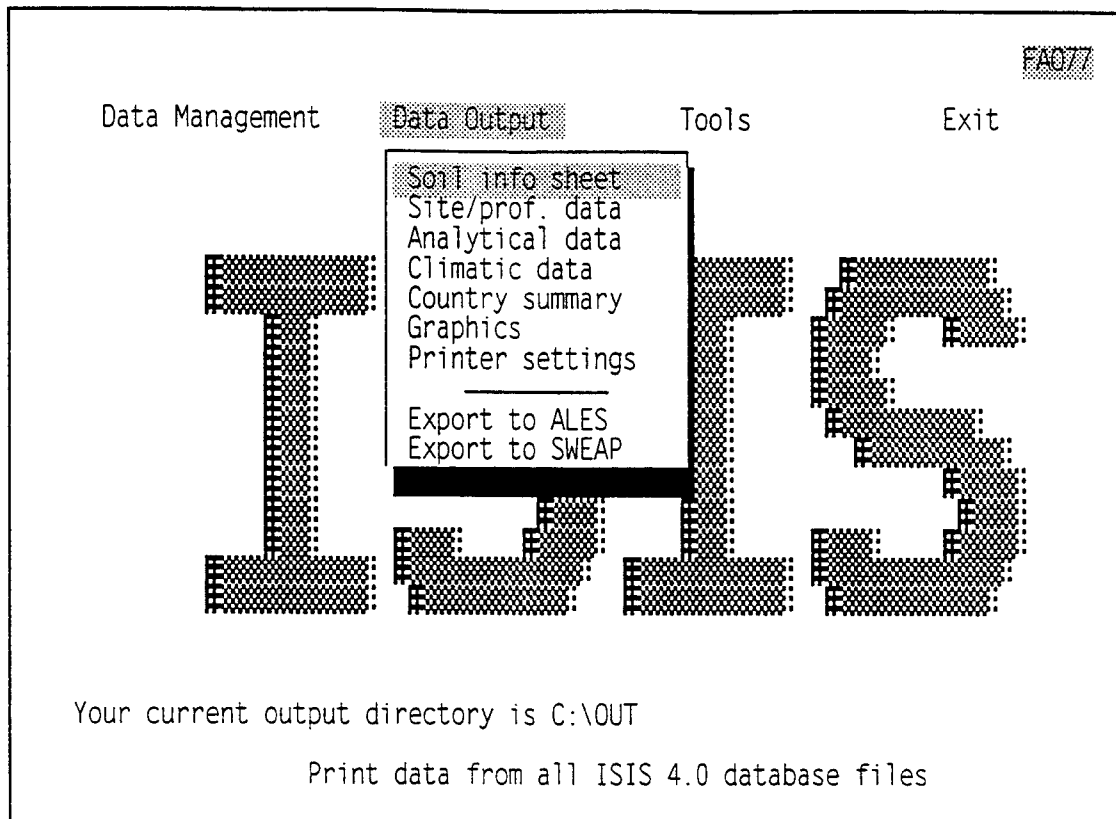
In all other cases the coding system actually used for the soil profile description (recorded in field FG_VERSION of file ISISSITE.DBF) will be applied.

On selection of **Edition** a pull-down menu with two options will open. These options are **1st Edition 1977** and **3rd Edition (Revised) 1990**. Select the edition describing the coding system you want to be your default coding system for new profile descriptions, or for profile descriptions without a (valid) entry for the coding system used.

The name of the default coding system will be permanently displayed in the upper right corner of the ISIS 4.0 main screen: "FAO77" for the 1977 "Guidelines" edition, and "FAO90" for the 1990 edition.

4.3 Data Output

ISIS 4.0 will work with all **printer drivers** supported by dBASE IV version 2.0. ISIS 4.0 output is sent directly to a printer, or to a print file. A **print file** is a file that, besides (ASCII) text, contains so called escape sequences. Escape sequences instruct the printer how to print the text following the escape sequence.



Screen 17: The data output pull-down menu

On selection of **Data Output** in the main menu (screen 17), a pull-down menu opens. The first four options in this menu create one of the ISIS 4.0 standard data reports. Option **Country summary** generates two dBASE tables with summary information for a particular country. Option **Graphics** will represent (numeric) data you entered in ISIS 4.0 as different types of graphs. The **Printer settings** option is used to change, as one might expect, the printer settings. The last two options in the pull-down menu generate export files that can be used as input for the ALES and SWEAP program respectively.

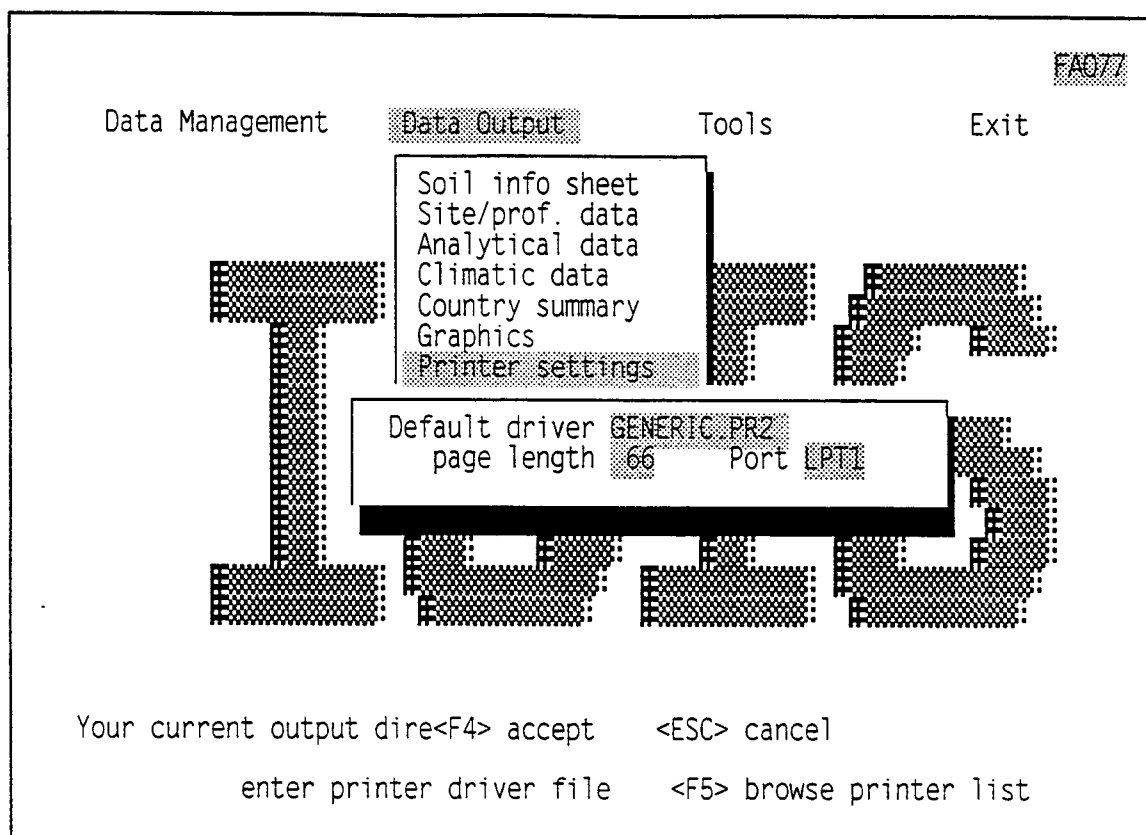
4.3.1 Changing printer settings

To select the correct **printer driver**, **page length** and **printer port**, select **Printer settings** in the data output pull-down menu. The printer settings dialog box will appear (screen 18). The dialog box has three entry fields. In the first field you enter the name of a printer driver file, in the second field you enter the number of lines on each standard data report page, and in the third field you enter a printer port.

To select one of the available printer drivers, press <F5>. A table with all printers supported by dBASE IV will pop up. Select a printer by highlighting it and pressing ←. The first entry field in the printer settings dialog box will now show the driver for the printer you just selected. To send a standard report to an ASCII-file, select printer driver ASCII.PR2.

ISIS 4.0 will save your printer settings. Next time you start ISIS 4.0 these settings will be in effect again.

The **page length** will be changed automatically from its default 66 to 80 lines per page if the printer is a Hewlett Packard laserjet. However, these page lengths are not obligatory. ISIS 4.0 prints data per category. That is, all data for a certain category (e.g. climate) will always be printed on the same page. To omit page breaks altogether, make the page length larger than the total number of lines in your standard report.



Screen 18: The printer settings dialog box

Using one of the dBASE IV printer drivers is also no guarantee for a uniform layout of the ISIS 4.0 standard reports. The size of the condensed pitch used by ISIS 4.0 is not always the same for different printers. The following printers have been tested with ISIS 4.0 and should give no problems: Hewlett Packard laserjet IV, Epson RX-80F/T+ matrix printer, and the Star LC-20 matrix printer. Contact ISRIC if your printer does not print the ISIS 4.0 reports correctly.

4.3.2 The ISIS 4.0 standard reports

The first four options in the **Data Output** pull-down menu create an ISIS 4.0 standard data report. On selection of one of these options a 'destination' popup will appear. Select **Print** to send output directly to a printer⁵. Select **Print to file** to send output to a print file. The name of a print file will consist of the identification code of the reference soil or climate station you selected, and a standard file extension (see table 3).

ISIS 4.0 uses a **print queue** (screen 19). The standard reports for all reference soils (or climate station codes in case of a climatic data sheet) in the print queue will be printed sequentially, and without interruption. Reference soils or climate stations are selected from a list displaying all printable reference soils or climate stations. Printable means the data needed for a specific standard report have been entered in ISIS. It might be that for a reference soil only analytical data have been entered, but no site data. In that case only an analytical data sheet can be generated, and the selection table for the print queue will only list the reference soils that have been entered in the database file with analytical data, ISISPHYS.DBF. Soil information sheets can only be printed for reference soils that have been entered in the database file with site data, ISSISITE.DBF.

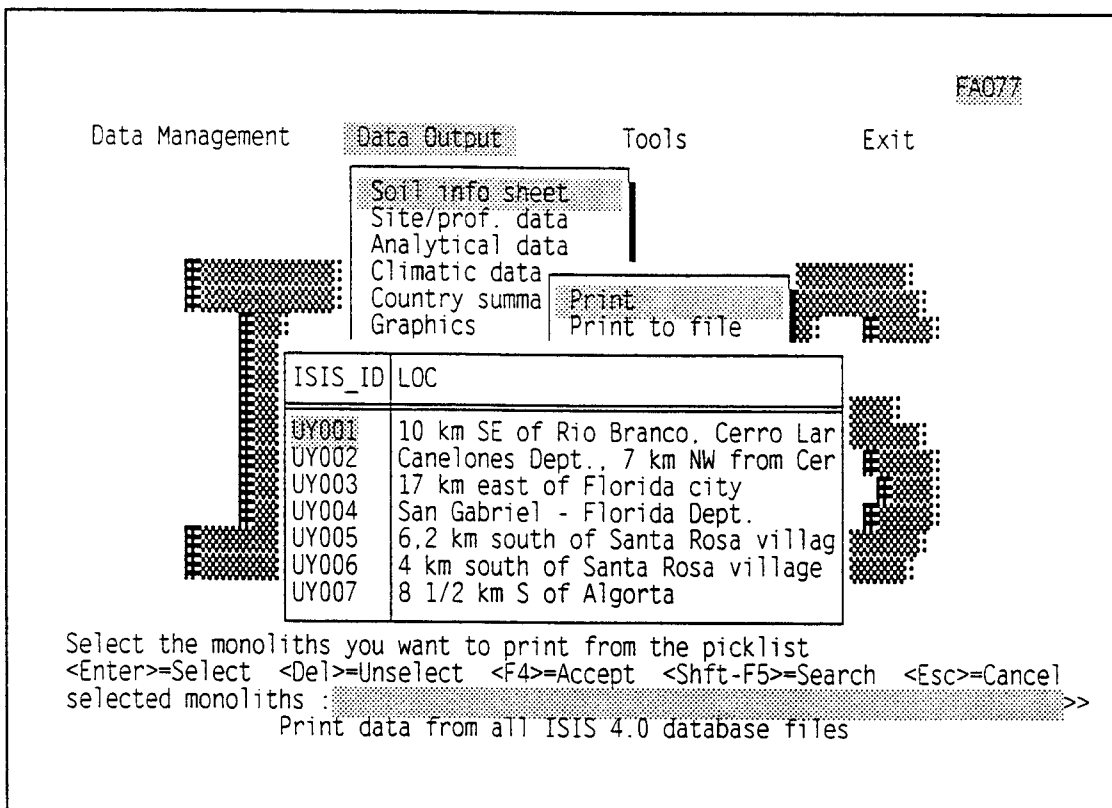
⁵ Be sure you have selected the proper printer driver, and the printer is on line, i.e. the printer is switched on and connected to your computer.

Standard report	file extension	Contents description
Soil information sheet	SHT	All data from all ISIS 4.0 data files.
Site/profile data sheet	PRO	All classification, site and morphology description data
Analytical data sheet	ANA	All physical, chemical and mineralogical analyses data
Climatic data sheet	CLI	All data of a meteorological station.

Table 3

The selected standard report will determine the **contents** of the report that is sent to the printer or to the printer file.

To add a reference soil or climate station to the print queue, highlight its identification code in the selection table and press enter. Subsequently, the selected identification code will be added to the end of the print que. To delete an identification code from the print queue, highlight it in the selection table and press . Accept the current print queue by pressing <F4>. Only then will ISIS start with the compilation of the standard reports. In case standard reports are printed to file, a separate standard report is generated for each reference soil or climate station selected.



Screen 19: The data output print queue

Use <Shft-F5> to search for a specific identification code. E.g. to find the seventh Indonesian reference soil in the selection table, press <Shift-F5>, enter *ID001*, and press ←. ISIS 4.0 will search the selection table for a reference soil with this identification code. If the identification code was not found, ISIS will position the cursor on a code that most nearly resembles the code looked for.

4.3.3 Editing print files

Select **Edit print file** from the 'destination' menu to edit print files. Subsequently, ISIS 4.0 will list all print files for the standard data report type selected (e.g. all files with a ".SHT" extension: all soil information sheets). Select the print file you want to edit from this list: highlight the file and press ←. On selection of a printer, the **default program editor** will be called. The default program editor is the editor that has been assigned to Tedit, a dBASE IV system variable that can be changed by running the DBSETUP program. DBSETUP creates the file CONFIG.DB which stores all settings of dBASE IV. At the installation of dBASE IV the default program editor is the dBASE editor. This default can be changed to any external editor (like the DOS editor (EDIT.COM), or the WordPerfect editor (ED.EXE)). If an editor other than the dBASE editor is used, save the print file under its default name.

4.3.4 Country summary

Option **Country summary** from the **Data Output** pull-down menu generates two dBASE tables with summary information for all reference soils of a particular country. These tables are sent to the ISIS output directory. On selection of **Country summary** ISIS displays a list with countries and their ISO country code. Highlight the country you want to generate a summary for, and press ←. Subsequently, ISIS will generate two dBASE files with summary data - actually a limited selection of data from the database - for all reference soils from the selected country.

The names of both tables start with the ISO country code for the selected country, followed by "1TABLE" for the first table, and "2TABLE" for the second table. Thus, the country summary for Peru would consist of two files, PE1TABLE.DBF and PE2TABLE.DBF.

The first table contains the following data:

- ISIS_ID : reference soil identification code
- FAO_74 : soil unit - FAO 1974
- FAO_88 : soil unit - FAO 1988
- USDA_92 : Soil Taxonomy 1992
- PAR : parent rock
- LOCAL : local classification
- MODE : mode of accumulation

and the second table contains the following data:

- ISIS_ID : reference soil identification code
- LUT : land use type
- CROP : land use - crops
- VET : vegetation type
- DRAIN : drainage class
- CLIM : Köppen climate class
- ALT : altitude
- LNDREG : regional landform
- LNDTOP : topography

NB. This option actually writes four tables to the output directory: beside the two aforementioned dBASE files, the same data are also written to two Lotus 1-2-3 spreadsheet files (release 1A). File names are identical to the dBASE files, except for the extension, which now reads ".WKS".

4.3.5 Graphics

Option **Graphics** will represent (numeric) data you entered in ISIS 4.0 as different types of graphs. Essentially, this ISIS option consists of a collection of external (i.e. non-dBASE) programs, written in C. On selection of one of the **Graphics** options, ISIS will generate an ASCII file named GRAPHICS.DAT with selected data from the database. Subsequently, the data in this file are displayed as a graph on your monitor by the external program associated with the graphics option you selected. Your graphs will look garbled in case of incorrect horizon boundaries. Horizons may overlap in case samples cross horizon boundaries.

Up to now **Graphics** offers three graph options: Texture, Two Parameters, and Parameter assessment.

Texture

This graphics option can display sand, silt, and clay fraction data for the horizons of a reference soil in two different ways:

- As asterisks (*) in a **textural triangle**. Every asterisk represents the textural data of one reference soil horizon (screen 20);
- As fractions of a (horizontal) bar in a **block diagram**. Every horizon is represented by a unit-length bar that is proportionally subdivided in a sand, silt, and clay part. The actual sand, silt, and clay fractions (percentages) are displayed alongside each bar.

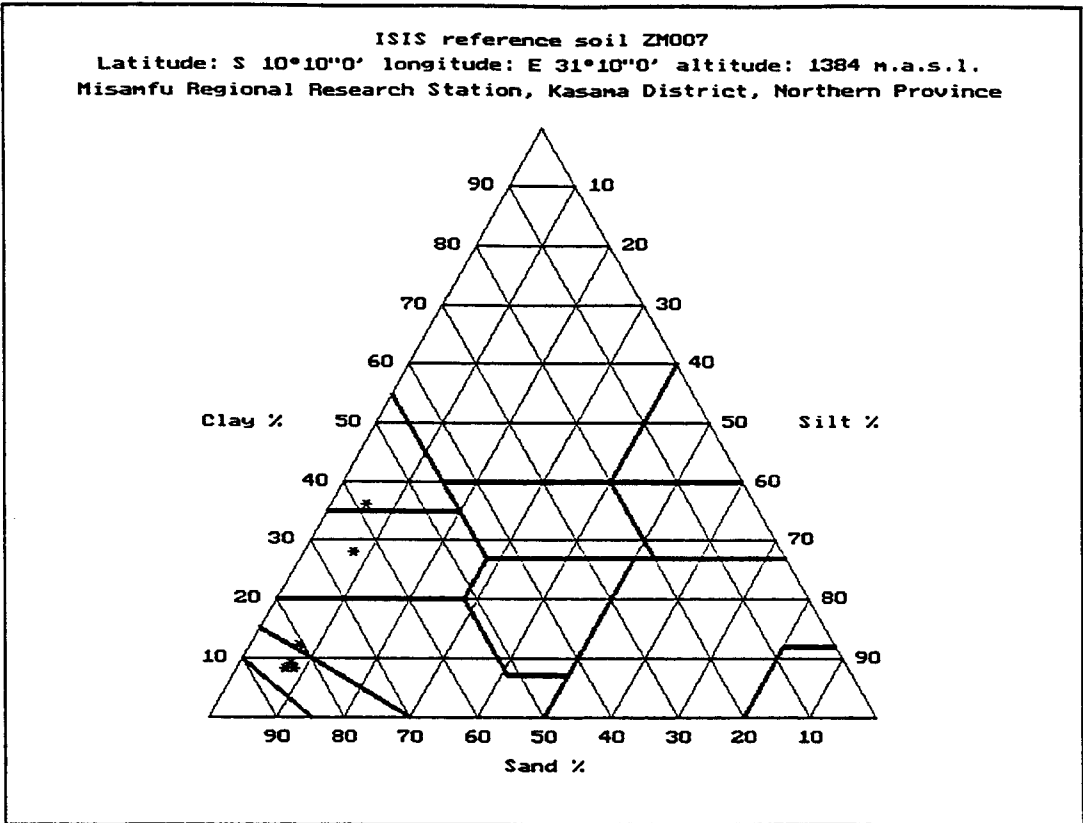
On selection of **Texture** a menu with the options **Textural triangle** and **Block diagram** pops up. Highlight the graph you want to see and press ←. Next, a picklist listing all reference soils will appear. Highlight the reference soil for which you want to display the texture data, and press ←. ISIS will extract the required data from the database and display either a textural triangle or a block diagram. Press any key to return to ISIS.

Two parameters

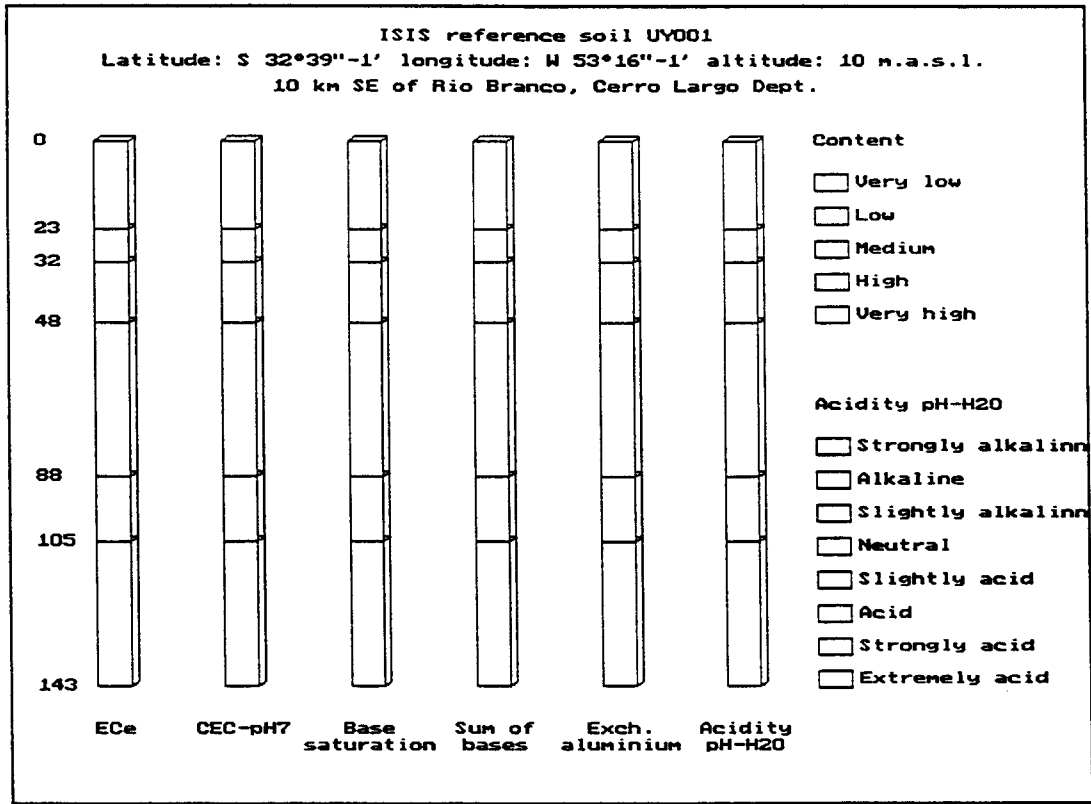
The 'Two parameters' option displays the data for two attributes (physical and/or chemical) as block diagrams⁶ next to one another on your screen. This option can be very useful in examining the relation between two attributes of a reference soil. In the block diagrams each horizon is represented by a horizontal bar with a length that is proportional to the value of the attribute.

On selection of **Two parameters** a picklist with reference soils will appear. Highlight the reference soil for which you want to compare two attributes and press ←. Next, a table with all physical and chemical attributes pops up. Select from this table the two attributes you want to compare: highlight and press ←. ISIS will extract the required data from the database and display the block diagrams, provided (valid) data for both attributes were available in the database. Press any key to return to ISIS.

⁶ Provided that sufficient (valid) data are available.



Screen 20: Graphics - texture triangle



Screen 21: Graphics - Single parameter assessment

Parameter ratings

This third **Graphics** option offers automatic assessment for the following attributes of a reference soil:

- *Electrical conductivity (ECe)*
 - very low < 2 dS/m
 - low 2 - 4 dS/m
 - medium 4 - 8 dS/m
 - high 8 - 10 dS/m
 - very high > 10 dS/m
- *CEC - pH 7*
 - very low < 4 cmol(+)/kg
 - low 4 - 9.9 cmol(+)/kg
 - medium 10 - 19.9 cmol(+)/kg
 - high 29 - 39.9 cmol(+)/kg
 - very high > 39.9 cmol(+)/kg
- *Base saturation*
 - very low < 10%
 - low 10 - 29%
 - medium 30 - 49%
 - high 50 - 80%
 - very high > 80%
- *Sum of bases*
 - very low < 1 cmol(+)/kg
 - low 1 - 3.9 cmol(+)/kg
 - medium 4 - 7.9 cmol(+)/kg
 - high 8 - 15.9 cmol(+)/kg
 - very high > 15.9 cmol(+)/kg
- *Exchangeable aluminium*
 - very low < 10%
 - low 10 - 24%
 - medium 25 - 49%
 - high 50 - 80%
 - very high > 80%
- *Acidity (pH-H₂O)*
 - extremely acid < 4.0
 - strongly acid 4.0 - 4.9
 - acid 5.0 - 5.4
 - slightly acid 5.4 - 5.9
 - neutral 6.0 - 7.5
 - slightly alkaline 7.6 - 8.4
 - alkaline 8.5 - 9.4
 - strongly alkaline > 9.4

On selection of **Parameter assessment** a picklist with reference soils will appear. Highlight the reference soil for which you want to assess the aforementioned single soil parameters, and press ←. ISIS will extract the required data from the database and display for every single soil parameter a 'soil monolith' with horizons shaded in accordance with their assessment (screen 21). Horizons for which no data were available are not shaded. Press any key to return to ISIS.

4.3.5 Export files

The last two options in the pull-down menu generate **export files** that can be used as input by other programs. Export files are written to the current output directory. This directory is displayed at the bottom of the screen. ISIS 4.0 generates export files for:

- SWEAP vs.1.5, the SOTER Water Erosion Assessment Program (ISRIC, 1995⁷). ISIS actually generates two export files for SWEAP: a climate data file (CLIMATE.DAT), and a terrain/soils data file (SOTER.DAT). ISIS assumes a default slope length of 100 m., and a default cover of 100%.
- ALES vs.4.0, The Automated Land Evaluation System (Rossiter & van Wambeke, 1993⁸). ISIS generates the following generic export files for use with ALES applications developed at ISRIC⁹: ISISCHEM.TXT, ISISCHM2.TXT, ISISCLIM.TXT, ISISDEF.TXT, ISISPHYS.TXT, and ISSISITE.TXT. File MISSING.TXT lists all missing data.

Export files are plain ASCII files that can be viewed or edited with any ASCII editor. On selection of either export option, a picklist with reference soils appears. Select all reference soils for which you want to export data, and confirm your selection with key <F4>.

4.4 Tools

The utilities discussed so far merely implied a "reshuffle" of your data. The ISIS toolset on the other hand will encompass a growing collection of utilities capable of generating new information from the data already available in your database. Up to now only one "tool" is available through this menu item; a climate classification utility called **Koepfen**. A second utility that will check the relational and data integrity of your database will be made available soon. Users that are sufficiently familiar with the dBASE programming language can of course add their own utilities to this main menu item.

4.4.1 Automated Köppen climate classification

This ISIS 4.0 tool automatically classifies the prevailing climate of a profile site according to Köppen (1923, 1931). The classification is based on data from the climate station(s) associated with the site. If more than one climate station has been assigned to the site, the utility will use data from the first station for the site in file ISISCLST.DBF, the file that links one or more climate stations to a site. If for a successful classification this climate station does not supply sufficient data, the missing data will be taken from the second station (and so forth).

On selection of **Koepfen** a picklist with reference soils pops up. Select all reference soils you want to classify from this picklist. You can select at most around 40 reference soils at a time, since the selection list (the highlighted bar with the selected identification codes) is only 255 characters long.

⁷ SWEAP: a computer program for water erosion assessment applied to SOTER; Documentation version 1.5. By Maurits van den Berg and Piet Tempel. ISRIC, Wageningen, 1995

⁸ Automated Land Evaluation System; ALES version 4 User's manual, May 1993 Printing. By David G. Rossiter and Armand R. van Wambeke, Ithaca, 1993.

⁹ e.g. Agricultural suitability of reference soils; The Automated Land Evaluation System applied to ISRIC Soil Information System. By S. Mantel and J.H. Kauffman. ISRIC, Wageningen, 1995.

If a site's climate can be classified on the basis of available climate data, the classification result

- will be written to field CLIM in the site datafile ISISSITE.DBF for the site, if this field is empty. That is, no climate classification was assigned to the site before.
NB. ISIS will NOT notify you of the classification result, the result will be written directly to file.
- will be compared with the contents of field CLIM in file ISISSITE.DBF for the site. If both are different, ISIS will display the old and new classification and prompt you whether the old classification should be replaced with the new one. Otherwise, the program continues with the next reference soil in the selection list (if any).

Otherwise a message box will be displayed notifying you that no sufficient climate data were available for this site to classify its climate.

4.5 Leaving ISIS 4.0

On selection of **Exit** in the main menu a pull-down menu with two options will appear. **Exit to dBASE** will return control to the dBASE dot prompt, and restore your dBASE working environment¹⁰. From the dot prompt you can run all dBASE commands as well as user written dBASE programs (like ISIS and CONVERT). Entering *QUIT* at the dot prompt will close all open files, terminate your dBASE IV session, and return control to the operating system. Selecting option **Exit to system** from the pull-down menu will have the same effect.

¹⁰ The working environment includes the default configuration of the screen, printer, and keyboard, and other aspects of the environment in which you work with dBASE. Using SET commands and system memory variables, you can establish a working environment (see your dBASE manuals).

NB. the conversion utility will NOT restore your working environment: screen colours and the status of a number of SET commands is changed by CONVERT

APPENDIX A STRUCTURE OF ALL ATTRIBUTES OF ISIS 4.0

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISSITE	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISSITE	ISO	C	2	0	ISO COUNTRY CODE
ISSITE	DATE	N	5	2	DATE OF DESCRIPTION
ISSITE	AUTH	C	50	0	NAME(S) AUTHOR(S)
ISSITE	LOC	C	70	0	LOCATION DESCRIPTION
ISSITE	LATNS	C	1	0	NORTHERN/SOUTHERN HEMISPHERE
ISSITE	LATD	N	2	0	LATITUDE DEGREES
ISSITE	LATM	N	2	0	LATITUDE MINUTES
ISSITE	LATS	N	2	0	LATITUDE SECONDS
ISSITE	LONEW	C	1	0	EASTERN/WESTERN HEMISPHERE
ISSITE	LOND	N	3	0	LONGITUDE DEGREES
ISSITE	LONM	N	2	0	LONGITUDE MINUTES
ISSITE	LONS	N	2	0	LONGITUDE SECONDS
ISSITE	ALT	N	4	0	ALTITUDE
ISSITE	CLIM	C	3	0	KÖPPEN'S CLASS. OF CLIMATES
ISSITE	PAR	C	2	0	PARENT ROCK 1
ISSITE	PAR2	C	2	0	PARENT ROCK 2
ISSITE	MODE	C	1	0	MODE OF ACCUMULATION
ISSITE	MODE2	C	1	0	MODE OF ACCUMULATION 2
ISSITE	TEXT	C	2	0	TEXTURE PARENT MATERIAL 1
ISSITE	TEXT2	C	2	0	TEXTURE PARENT MATERIAL 2
ISSITE	DEPTH	N	3	0	DEPTH LITHOLOGICAL BOUNDARY
ISSITE	WEAT	C	1	0	DEGREE OF WEATHERING 1
ISSITE	WEAT2	C	1	0	DEGREE OF WEATHERING 2
ISSITE	REST1	C	1	0	RESISTANCE PARENT MATERIAL 1
ISSITE	REST2	C	1	0	RESISTANCE PARENT MATERIAL 2
ISSITE	PARREM	C	20	0	REMARKS ON PARENT MATERIAL
ISSITE	LNDREG	C	2	0	REGIONAL LANDFORM
ISSITE	LNDTOP	C	1	0	TOPOGRAPHY
ISSITE	PHYS	C	30	0	PHYSIOGRAPHY
ISSITE	SLP	N	3	0	SLOPE GRADIENT
ISSITE	POS	C	1	0	POSITION OF SITE
ISSITE	SLF	C	1	0	SLOPE FORM
ISSITE	ASP	C	3	0	SLOPE ASPECT
ISSITE	KND	C	2	0	MICRORELIEF TYPE
ISSITE	PTRN	C	1	0	MICRORELIEF PATTERN
ISSITE	VAR	C	3	0	MICRORELIEF HEIGHT

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISSITE	ROCK	C	2	0	ROCK OUTCROP CLASS
ISSITE	STON	C	2	0	STONINESS CLASS
ISSITE	STSI	C	2	0	SIZE OF SURFACE STONES
ISSITE	STSH	C	1	0	SHAPE OF SURFACE STONES
ISSITE	CRA	C	1	0	SURFACE CRACKING
ISSITE	SEA	C	1	0	SURFACE SLAKING/CRUSTING
ISSITE	SALT	C	1	0	EVIDENCE SALT
ISSITE	ALKALI	C	1	0	EVIDENCE ALKALI
ISSITE	SODE	N	3	0	EFFECTIVE SOIL DEPTH
ISSITE	WADE	N	3	0	DEPTH WATER TABLE
ISSITE	WAUP	N	3	0	UPPER LIMIT WATER TABLE
ISSITE	WALO	N	3	0	LOWER LIMIT WATER TABLE
ISSITE	WAKE	C	1	0	KIND OF WATERTABLE
ISSITE	STAUP	N	3	0	UPPER LIMIT SLOW PERM. LAYER
ISSITE	STALO	N	3	0	LOWER LIMIT SLOW PERM. LAYER
ISSITE	STAPE	C	2	0	PERMEABILTY
ISSITE	RUN	C	1	0	RUNOFF
ISSITE	FLFR	C	2	0	FLOODING FREQUENCY
ISSITE	FLNA	C	1	0	NATURE OF FLOOD WATER
ISSITE	DRAIN	C	2	0	DRAINAGE CLASS
ISSITE	MOIWU	C	3	0	MOIST.COND. WET UPPER
ISSITE	MOIWL	C	3	0	MOIST.COND. WET LOWER
ISSITE	MOIMU	C	3	0	MOIST.COND. MOIST UPPER
ISSITE	MOIML	C	3	0	MOIST.COND. MOIST LOWER
ISSITE	MOIDU	C	3	0	MOIST.COND. DRY UPPER
ISSITE	MOIDL	C	3	0	MOIST.COND. DRY LOWER
ISSITE	ERT	C	2	0	EROSION TYPE 1
ISSITE	ERT2	C	2	0	EROSION TYPE 2
ISSITE	ERD	C	1	0	EROSION DEGREE 1
ISSITE	ERD2	C	1	0	EROSION DEGREE 2
ISSITE	AGGR	C	1	0	AGGRADATION
ISSITE	MASS	C	1	0	SLOPE STABILITY
ISSITE	LUT	C	4	0	LAND USE TYPE
ISSITE	CROP	C	3	0	LAND USE CROPS
ISSITE	IRR	C	2	0	LAND USE IRRIGATION
ISSITE	ROT	C	2	0	LAND USE ROTATION
ISSITE	IMP	C	2	0	LAND USE IMPROVEMENTS
ISSITE	VET	C	2	0	VEGETATION TYPE
ISSITE	VES	C	1	0	VEGETATION STATUS

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISSSITE	VED	C	40	0	REMARKS ON VEGET. & LAND USE
ISSSITE	ADPC	L	1	0	LABORATORY DATA AVAILABLE
ISSSITE	ADMM	L	1	0	MICRO MORPHOLOGY AVAILABLE
ISSSITE	REMARKS	M	10	0	GENERAL REMARKS ON MONOLITH
ISSSITE	EDITDATE	D	8	0	DATE LAST UPDATE SITE DATA
ISSSITE	FG_VERSION	C	5	0	CODING SYSTEM
ISSSITE	VERIFIED	L	1	0	PERSON RESP.SITE & PROF.DATA
ISISMORP	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISISMORP	HORI	N	4	1	HORIZON NUMBER
ISISMORP	SYMBOL	C	5	0	HORIZON DESIGNATION
ISISMORP	TOP	N	3	0	DEPTH TOP HORIZON
ISISMORP	BOT	N	3	0	DEPTH BOTTOM HORIZON
ISISMORP	WID	C	1	0	HORIZON BOUNDARY WIDTH
ISISMORP	TPG	C	1	0	HORIZON BOUNDARY TOPOGRAPHY
ISISMORP	HUED	C	7	0	DRY COLOUR HUE
ISISMORP	VALD	N	3	1	DRY COLOUR VALUE
ISISMORP	CHROMD	N	3	1	DRY COLOUR CHROMA
ISISMORP	HUE	C	7	0	WET COLOUR HUE
ISISMORP	VALUE	N	3	1	WET COLOUR VALUE
ISISMORP	CHROMA	N	3	1	WET COLOUR CHROMA
ISISMORP	FORM	C	2	0	STRUCTURE 1 FORM
ISISMORP	FORM2	C	2	0	STRUCTURE 2 FORM
ISISMORP	SIZE	C	2	0	STRUCTURE 1 SIZE
ISISMORP	SIZE2	C	2	0	STRUCTURE 2 SIZE
ISISMORP	GRADE	C	2	0	STRUCTURE 1 GRADE
ISISMORP	GRADE2	C	2	0	STRUCTURE 2 GRADE
ISISMORP	FORE	C	1	0	RELATION STRUCTURE 1 AND 2
ISISMORP	FIELDTX	C	4	0	FIELD TEXTURE <2MM
ISISMORP	TXMOD	C	2	0	FIELD TEXTURE >2MM
ISISMORP	ORGK	C	1	0	ORGANIC MATTER KIND
ISISMORP	ORGD	C	1	0	ORGANIC MATTER DECOMPOSITION
ISISMORP	COND	C	3	0	CONSISTENCE DRY
ISISMORP	CONM	C	3	0	CONSISTENCE MOIST
ISISMORP	CONWS	C	2	0	STICKINESS
ISISMORP	CONWP	C	2	0	PLASTICITY
ISISMORP	CONO	C	2	0	CONSISTENCE OTHER
ISISMORP	PORQ	C	1	0	PORES 1 QUANTITY (.1)
ISISMORP	PORQ1	C	1	0	PORES 1 QUANTITY (.1)
ISISMORP	PORQ2	C	1	0	PORES 2 QUANTITY (.2)

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISMORP	PORQ21	C	1	0	PORES 2 QUANTITY (.2)
ISISMORP	PORS	C	2	0	PORES 1 SIZE (1.)
ISISMORP	PORS1	C	2	0	PORES 1 SIZE (.1)
ISISMORP	PORS2	C	2	0	PORES 2 SIZE (2.)
ISISMORP	PORS21	C	2	0	PORES 2 SIZE (.2)
ISISMORP	PORC	C	1	0	PORES CONTINUITY 1
ISISMORP	PORC2	C	1	0	PORES CONTINUITY 2
ISISMORP	PORD	C	1	0	PORES DISTRIBUTION 1
ISISMORP	PORD2	C	1	0	PORES DISTRIBUTION 2
ISISMORP	PORF	C	1	0	PORES FORM 1
ISISMORP	PORF2	C	1	0	PORES FORM 2
ISISMORP	PORO	C	1	0	PORES ORIENTATION 1
ISISMORP	PORO2	C	1	0	PORES ORIENTATION 2
ISISMORP	PORT	C	1	0	TOTAL POROSITY
ISISMORP	ROQ	C	1	0	ROOTS QUANTITY 1
ISISMORP	ROQ2	C	1	0	ROOTS QUANTITY 2
ISISMORP	ROS	C	2	0	ROOTS SIZE 1
ISISMORP	ROS2	C	2	0	ROOTS SIZE 2
ISISMORP	ROL	C	1	0	ROOTS LOCATION 1
ISISMORP	ROL2	C	1	0	ROOTS LOCATION 2
ISISMORP	EFFA	C	1	0	EFFERVESCENCE AGENT
ISISMORP	EFFC	C	2	0	FREE CaCO3 CONTENT
ISISMORP	EFFL	C	1	0	EFFERVESCENCE LOCACATION
ISISMORP	PHVAL	N	3	1	FIELD PH
ISISMORP	MOTTA	C	1	0	MOTTLES ABUNDANCE 1
ISISMORP	MOTTA2	C	1	0	MOTTLES ABUNDANCE 2
ISISMORP	MOTTS	C	1	0	MOTTLES SIZE 1
ISISMORP	MOTTS2	C	1	0	MOTTLES SIZE 2
ISISMORP	MOTTC	C	1	0	MOTTLES CONTRAST 1
ISISMORP	MOTTC2	C	1	0	MOTTLES CONTRAST 2
ISISMORP	MOTTB	C	1	0	MOTTLES BOUNDARY 1
ISISMORP	MOTTB2	C	1	0	MOTTLES BOUNDARY 2
ISISMORP	MOTTHUE	C	7	0	MOTTLES COLOUR HUE 1
ISISMORP	MOTTVAL	N	3	1	MOTTLES COLOUR VALUE 1
ISISMORP	MOTTCH	N	3	1	MOTTLES COLOUR CHROMA 1
ISISMORP	MOTTHU2	C	7	0	MOTTLES COLOUR HUE 2
ISISMORP	MOTTVA2	N	3	1	MOTTLES COLOUR VALUE 2
ISISMORP	MOTTCH2	N	3	1	MOTTLES COLOUR CHROMA 2
ISISMORP	CUTC	C	1	0	CUTANS QUANTITY

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISMORP	CUTT	C	1	0	CUTANS THICKNESS
ISISMORP	CUTK	C	2	0	CUTANS KIND
ISISMORP	CUTL	C	2	0	CUTANS LOCATION
ISISMORP	INCQ	C	1	0	INCLUSION QUANTITY 1
ISISMORP	INCQ2	C	1	0	INCLUSION QUANTITY 2
ISISMORP	INCT	C	1	0	INCLUSION TYPE 1
ISISMORP	INCT2	C	1	0	INCLUSION TYPE 2
ISISMORP	INCS1	C	1	0	INCLUSION SIZE 1
ISISMORP	INCS12	C	1	0	INCLUSION SIZE 2
ISISMORP	INCH	C	1	0	INCLUSION HARDNESS 1
ISISMORP	INCH2	C	1	0	INCLUSION HARDNESS 2
ISISMORP	INCSH	C	1	0	INCLUSION SHAPE 1
ISISMORP	INCSH2	C	1	0	INCLUSION SHAPE 2
ISISMORP	INCC	C	2	0	INCLUSION COMPOSITION 1
ISISMORP	INCC2	C	2	0	INCLUSION COMPOSITION 2
ISISMORP	ROCKQ	C	1	0	FRAGMENTS QUANTITY 1
ISISMORP	ROCKQ2	C	1	0	FRAGMENTS QUANTITY 2
ISISMORP	ROCKS	C	2	0	FRAGMENTS SIZE 1
ISISMORP	ROCKS2	C	2	0	FRAGMENTS SIZE 2
ISISMORP	ROCKW	C	1	0	FRAGMENTS WEATHERING 1
ISISMORP	ROCKW2	C	1	0	FRAGMENTS WEATHERING 2
ISISMORP	ROCKC	C	15	0	FRAGMENTS COMPOSITION
ISISMORP	ROCKC2	C	15	0	FRAGMENTS COMPOSITION 2
ISISMORP	PANK	C	2	0	PANS KIND
ISISMORP	PANC	C	1	0	PANS CEMENTATION
ISISMORP	PANY	C	1	0	PANS CONTINUITY
ISISMORP	PANS	C	1	0	PANS STRUCTURE
ISISMORP	BIOA	C	1	0	BIOLOGICAL ACTIVITY
ISISMORP	BIOK	C	2	0	BIOLOGICAL ACTIVITY KIND 1
ISISMORP	BIOK2	C	2	0	BIOLOGICAL ACTIVITY KIND 2
ISISMORP	EDITDATE	D	8	0	DATE LAST UPDATE MORP. DATA
ISISCLAS	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISISCLAS	FAO_74	C	3	0	FAO SOIL UNIT '74
ISISCLAS	PHA_74	C	2	0	FAO SOIL PHASE '74
ISISCLAS	USGG_75	C	3	0	USDA GREAT GROUP '75
ISISCLAS	USSG_75	C	4	0	USDA SUB GROUP '75
ISISCLAS	USTX	C	3	0	USDA TEXTURE CLASS
ISISCLAS	USMIN	C	2	0	USDA MINERALOGY
ISISCLAS	STR	C	2	0	SOIL TEMPERATURE REGIME

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISCLAS	SMR	C	2	0	SOIL MOISTURE REGIME
ISISCLAS	DHOR_74A	C	2	0	DIAGNOSTIC HORIZON 1 '74
ISISCLAS	DHOR_74B	C	2	0	DIAGNOSTIC HORIZON 2 '74
ISISCLAS	DHOR_74C	C	2	0	DIAGNOSTIC HORIZON 3 '74
ISISCLAS	DPRO_74A	C	2	0	DIAGNOSTIC PROPERTY 1 '74
ISISCLAS	DPRO_74B	C	2	0	DIAGNOSTIC PROPERTY 2 '74
ISISCLAS	FAOSTAT	L	1	0	FINAL CLASSIFICATION
ISISCLAS	FAO_88	C	3	0	FAO SOIL UNIT '88
ISISCLAS	FSUB_88	C	2	0	FAO SUB UNIT '88
ISISCLAS	PHA_88	C	2	0	FAO SOIL PHASE '88
ISISCLAS	FHOR_88A	C	2	0	FAO DIAGNOSTIC HORIZON 1 '88
ISISCLAS	FHOR_88B	C	2	0	FAO DIAGNOSTIC HORIZON 2 '88
ISISCLAS	FHOR_88C	C	2	0	FAO DIAGNOSTIC HORIZON 3 '88
ISISCLAS	FPRO_88A	C	2	0	FAO DIAGN. PROPERTY 1 '88
ISISCLAS	FPRO_88B	C	2	0	FAO DIAGN. PROPERTY 2 '88
ISISCLAS	USGG_92	C	3	0	USDA GREAT GROUP '92
ISISCLAS	USSG_92	C	4	0	USDA SUB GROUP '92
ISISCLAS	UHOR_92A	C	2	0	USDA DIAGN. HORIZON 1 '92
ISISCLAS	UHOR_92B	C	2	0	USDA DIAGN. HORIZON 2 '92
ISISCLAS	UHOR_92C	C	2	0	USDA DIAGN. HORIZON 3 '92
ISISCLAS	UPRO_92A	C	2	0	USDA DIAGN. PROPERTY 1 '92
ISISCLAS	UPRO_92B	C	2	0	USDA DIAGN. PROPERTY 2 '92
ISISCLAS	LOCAL	C	30	0	LOCAL CLASSIFICATION
ISISCLAS	REMARKS	M	10	0	REMARKS ON CLASSIFICATIONS
ISISCLAS	EDITDATE	D	8	0	DATE LAST UPDATE CLAS. DATA
ISISPHYS	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISISPHYS	HORI	N	4	1	HORIZON NUMBER
ISISPHYS	TOP	N	3	0	DEPTH TOP SAMPLE
ISISPHYS	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISISPHYS	SAMPLENO	C	6	0	SAMPLE NUMBER
ISISPHYS	GRAVEL	N	2	0	COARSE FRACTION >2mm
ISISPHYS	S1	N	4	1	VERY COARSE SAND 2000-1000µm
ISISPHYS	S2	N	4	1	COARSE SAND 1000-500µm
ISISPHYS	S3	N	4	1	MEDIUM SAND 500-250µm
ISISPHYS	S4	N	4	1	FINE SAND 250-100µm
ISISPHYS	S5	N	4	1	VERY FINE SAND 100-50µm
ISISPHYS	TSA	N	4	1	TOTAL SAND FRACTION
ISISPHYS	S11	N	4	1	COARSE SILT 50-20µm
ISISPHYS	S12	N	4	1	FINE SILT 20-2µm

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISPHYS	TSI	N	4	1	TOTAL SILT
ISISPHYS	CLAY	N	4	1	CLAY <2 μ m
ISISPHYS	DISPCL	N	4	1	DISPERSABLE CLAY
ISISPHYS	BULK	N	6	3	BULK DENSITY
ISISPHYS	PF0	N	4	1	pF 0
ISISPHYS	PF1	N	4	1	pF 1
ISISPHYS	PF15	N	4	1	pF 1.5
ISISPHYS	PF2	N	4	1	pF 2
ISISPHYS	PF23	N	4	1	pF 2.3
ISISPHYS	PF27	N	4	1	pF 2.7
ISISPHYS	PF34	N	4	1	pF 3.4
ISISPHYS	PF42	N	4	1	pF 4.2
ISISPHYS	EDITDATE	D	8	0	DATE LAST UPDATE PHYS. DATA
ISISPHYS	PHYSREM	C	80	0	REMARKS ON PHYSICAL DATA
ISISPHYS	VERIFIED	C	3	0	PERSON RESPON.S.FOR PHYS.DATA
ISISCHEM	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISISCHEM	HORI	N	4	1	HORIZON NUMBER
ISISCHEM	TOP	N	3	0	DEPTH TOP SAMPLE
ISISCHEM	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISISCHEM	SAMPLENO	C	6	0	SAMPLE NUMBER
ISISCHEM	PHH2O	N	4	1	pH H2O
ISISCHEM	PHKCL	N	4	1	pH KCl
ISISCHEM	CACO3	N	4	1	FREE CaCO3
ISISCHEM	ORGC	N	5	2	ORGANIC C
ISISCHEM	ORGN	N	5	2	ORGANIC N
ISISCHEM	CA	N	5	1	Ca
ISISCHEM	MG	N	5	1	Mg
ISISCHEM	NA	N	5	1	Na
ISISCHEM	K	N	5	1	K
ISISCHEM	SUM	N	5	1	SUM CATIONS
ISISCHEM	EXACID	N	5	1	EXCHANGEABLE ACIDITY
ISISCHEM	EXAL	N	5	1	EXCHANGEABLE Al
ISISCHEM	CECSOIL	N	5	1	CEC SOIL
ISISCHEM	CECCLAY	N	3	0	CEC CLAY
ISISCHEM	CECORG	N	5	1	CEC ORGANIC MATTER
ISISCHEM	ECEC	N	5	1	ECEC
ISISCHEM	BS	N	3	0	BASE SATURATION
ISISCHEM	ALS	N	3	0	Al SATURATION
ISISCHEM	EC	N	5	2	E.C.

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISCHEM	EDITDATE	D	8	0	DATE LAST UPDATE CHEM. DATA
ISISCHEM	CHEMREM	C	80	0	REMARKS ON CHEMICAL ANALYSIS
ISISCHEM	VERIFIED	C	3	0	PERSON RESPONS.FOR CHEM.DATA
ISSSALT	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISSSALT	HORI	N	4	1	HORIZON NUMBER
ISSSALT	TOP	N	3	0	DEPTH TOP SAMPLE
ISSSALT	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISSSALT	SAMPLENO	C	6	0	SAMPLE NUMBER
ISSSALT	CAS	N	6	2	SOLUBLE SALTS CA
ISSSALT	MGS	N	6	2	SOLUBLE SALTS MG
ISSSALT	KS	N	6	2	SOLUBLE SALTS K
ISSSALT	NAS	N	6	2	SOLUBLE SALTS NA
ISSSALT	SUMCAT	N	6	2	SOLUBLE SALTS SUM CATIONS
ISSSALT	CO3	N	6	2	SOLUBLE SALTS CO3
ISSSALT	HCO3	N	6	2	SOLUBLE SALTS HCO3
ISSSALT	CL	N	6	2	SOLUBLE SALTS CI
ISSSALT	SO4	N	6	2	SOLUBLE SALTS SO4
ISSSALT	NO3	N	6	2	SOLUBLE SALTS NO3
ISSSALT	SUMANI	N	6	2	SOLUBLE SALTS SUM ANIONS
ISSSALT	EC5	N	6	2	EC5
ISSSALT	ECE	N	6	2	ECe
ISSSALT	PHS	N	4	1	SOLUBLE SALTS PH
ISSSALT	SAR	N	6	2	SOLUBLE SALTS SAR
ISSSALT	EDITDATE	D	8	0	DATE LAST UPDATE SALT DATA
ISSSALT	SALTREM	C	80	0	REMARKS ON SALT DATA
ISSSALT	VERIFIED	C	3	0	PERSON RESPONS.FOR SALT DATA
ISISMIN	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISISMIN	HORI	N	4	1	HORIZON NUMBER
ISISMIN	TOP	N	3	0	DEPTH TOP SAMPLE
ISISMIN	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISISMIN	SAMPLENO	C	6	0	SAMPLE NUMBER
ISISMIN	KAOL	C	1	0	KAOLINITE
ISISMIN	MILL	C	1	0	MONTMORILLONITE/LLITE
ISISMIN	VERM	C	1	0	VERMICULITE
ISISMIN	CHLOR	C	1	0	CHLORITE
ISISMIN	SMEC	C	1	0	SMECTITE
ISISMIN	HALL	C	1	0	HALLOYSITE
ISISMIN	MIX	C	1	0	MIXTURE
ISISMIN	QUAR	C	1	0	QUARTZITE

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISMIN	FELD	C	1	0	FELDSPATE
ISISMIN	GIBB	C	1	0	GIBBSITE
ISISMIN	GOET	C	1	0	GOETHITE
ISISMIN	HEM	C	1	0	HEMATITE
ISISMIN	MINX	C	1	0	OTHER CLAY MINERAL 1
ISISMIN	MINY	C	1	0	OTHER CLAY MINERAL 2
ISISMIN	MINZ	C	1	0	OTHER CLAY MINERAL 3
ISISMIN	FE	N	5	2	Fe BY Na DITHIONITE
ISISMIN	AL	N	5	2	Al BY Na DITHIONITE
ISISMIN	AMMFE	N	5	2	Fe BY AMMONIUM OXALATE
ISISMIN	AMMAL	N	5	2	Al BY AMMONIUM OXALATE
ISISMIN	AMMSI	N	5	2	Si BY AMMONIUM OXALATE
ISISMIN	FEP	N	5	2	Fe BY PYROPHOSPHATE
ISISMIN	ALP	N	5	2	Al BY PYROPHOSPHATE
ISISMIN	PRET	N	3	0	P-RETENTION
ISISMIN	PHNAF	N	4	1	PH NAF
ISISMIN	EDITDATE	D	8	0	DATE LAST UPDATE CLAY DATA
ISISMIN	CMINREM	C	80	0	REMARKS ON CLAY DATA
ISISMIN	VERIFIED	C	3	0	PERSON RESPON.FOR CLAY DATA
ISSMIN	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISSMIN	HORI	N	4	1	HORIZON NUMBER
ISSMIN	TOP	N	3	0	DEPTH TOP SAMPLE
ISSMIN	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISSMIN	SAMPLENO	C	6	0	SAMPLE NUMBER
ISSMIN	HEAVY	N	4	1	HEAVY FRACTION SAND MINERALS
ISSMIN	LIGHT	N	4	1	LIGHT FRACTION SAND MINERALS
ISSMIN	QUARZ	N	3	0	QUARTZ
ISSMIN	K_FELDSPAR	N	3	0	FELDSPAR
ISSMIN	PLAGIOCLAS	N	3	0	PLAGIOCLASE
ISSMIN	REST	N	3	0	REST GROUP LIGHT FRACTION
ISSMIN	OPAQUE	N	3	0	OPAQUE
ISSMIN	MIN_A	N	3	0	OTHER SAND MINERAL 1
ISSMIN	MIN_B	N	3	0	OTHER SAND MINERAL 2
ISSMIN	MIN_C	N	3	0	OTHER SAND MINERAL 3
ISSMIN	MIN_D	N	3	0	OTHER SAND MINERAL 4
ISSMIN	MIN_E	N	3	0	OTHER SAND MINERAL 5
ISSMIN	MIN_F	N	3	0	OTHER SAND MINERAL 6
ISSMIN	MIN_G	N	3	0	OTHER SAND MINERAL 7
ISSMIN	MIN_H	N	3	0	OTHER SAND MINERAL 8

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISSMIN	MIN_I	N	3	0	OTHER SAND MINERAL 9
ISSMIN	MIN_J	N	3	0	OTHER SAND MINERAL 10
ISSMIN	MIN_K	N	3	0	OTHER SAND MINERAL 11
ISSMIN	MIN_L	N	3	0	OTHER SAND MINERAL 12
ISSMIN	MIN_M	N	3	0	OTHER SAND MINERAL 13
ISSMIN	MIN_N	N	3	0	OTHER SAND MINERAL 14
ISSMIN	MIN_O	N	3	0	OTHER SAND MINERAL 15
ISSMIN	SMINREM	C	100	0	REMARKS ON SAND DATA
ISSMIN	MINIDENT	C	250	0	KEY TO OTHER SAND MINERALS
ISSMIN	EDITDATE	D	8	0	DATE LAST UPDATE SAND DATA
ISSMIN	VERIFIED	C	3	0	PERSON RESPON.SFOR SAND DATA
ISSOEL	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISSOEL	HORI	N	4	1	HORIZON NUMBER
ISSOEL	TOP	N	3	0	DEPTH TOP SAMPLE
ISSOEL	BOT	N	3	0	DEPTH BOTTOM SAMPLE
ISSOEL	SAMPLENO	C	6	0	SAMPLE NUMBER
ISSOEL	SiO2	N	4	1	SiO2 SOIL
ISSOEL	Al2O3	N	4	1	Al2O3 SOIL
ISSOEL	Fe2O3	N	4	1	Fe2O3 SOIL
ISSOEL	CaO	N	5	2	CaO SOIL
ISSOEL	MgO	N	5	2	MgO SOIL
ISSOEL	K2O	N	5	2	K2O SOIL
ISSOEL	Na2O	N	5	2	Na2O SOIL
ISSOEL	TiO2	N	5	2	TiO2 SOIL
ISSOEL	MnO2	N	5	2	MnO2 SOIL
ISSOEL	P2O5	N	5	2	P2O5 SOIL
ISSOEL	IGN	N	4	1	IGNITION LOSS SOIL
ISSOEL	TOTAL	N	5	1	TOTAL OF ELEMENTS
ISSOEL	RATIOSIAL	N	6	1	SiO2/Al2O3 SOIL
ISSOEL	RATIOSIFE	N	6	1	SiO2/Fe2O3 SOIL
ISSOEL	RATIOSIR	N	6	1	SiO2/R2O3 SOIL
ISSOEL	RATIOALFE	N	6	1	Al2O3/Fe2O3 SOIL
ISSOEL	EDITDATE	D	8	0	DATE LAST UPDATE SOEL DATA
ISSOEL	SOELREM	C	80	0	REMARKS ON DATA ELEM.COMP.
ISSOEL	VERIFIED	C	3	0	PERSON RESPON.SFOR SOEL DATA
ISANAD	ISIS_ID	C	5	0	ISRIC Monolith identifier
ISANAD	ADD	M	10	0	ADDITIONAL ANALYSIS
ISANAD	EDITDATE	D	8	0	DATE LAST UPDATE ADD.ANAL.
ISISLST	ISIS_ID	C	5	0	ISRIC Monolith identifier

FILE NAME	FIELD				
	NAME	TYPE	LENGTH	DECIMALS	DESCRIPTION
ISISCLST	STATCODE	C	6	0	ISRIC STATION CODE
ISISCLST	DIST	N	3	0	DISTANCE FROM SITE
ISISCLST	DIR	C	3	0	DIRECTION FROM SITE
ISISCLST	REF	C	1	0	REFERENCE
ISISCLST	EDITDATE	D	8	0	DATE LAST UPDATE SITE-STAT.
CLIMSTAT	STATCODE	C	6	0	ISRIC STATION CODE
CLIMSTAT	WMOCODE	N	7	4	WMO CLIMATE STATION CODE
CLIMSTAT	STATION	C	20	0	STATION NAME
CLIMSTAT	ISO	C	2	0	COUNTRY
CLIMSTAT	LONEW	C	1	0	EASTERN/WESTERN HEMISPHERE
CLIMSTAT	LOND	N	3	0	LONGITUDE DEGREES
CLIMSTAT	LONM	N	2	0	LONGITUDE MINUTES
CLIMSTAT	LATNS	C	1	0	NORTHERN/SOUTHERN HEMISPHERE
CLIMSTAT	LATD	N	2	0	LATTITUDE DEGREES
CLIMSTAT	LATM	N	2	0	LATTITUDE MINUTES
CLIMSTAT	ALT	N	4	0	ALTITUDE
CLIMSTAT	EDITDATE	D	8	0	DATE LAST UPDATE STATION
CLIMDATA	STATCODE	C	6	0	ISRIC STATION CODE
CLIMDATA	TYPE	C	2	0	METEOROLOGICAL DATA TYPE
CLIMDATA	YEAR	C	2	0	NUMBER OF YEARS OF MEASUREM.
CLIMDATA	ANNUAL	N	7	1	MEAN ANNUAL YEAR
CLIMDATA	JAN	N	6	1	DATA JANUARY
CLIMDATA	FEB	N	6	1	DATA FEBRUARY
CLIMDATA	MAR	N	6	1	DATA MARCH
CLIMDATA	APR	N	6	1	DATA APRIL
CLIMDATA	MAY	N	6	1	DATA MAY
CLIMDATA	JUN	N	6	1	DATA JUNE
CLIMDATA	JUL	N	6	1	DATA JULY
CLIMDATA	AUG	N	6	1	DATA AUGUST
CLIMDATA	SEP	N	6	1	DATA SEPTEMBER
CLIMDATA	OCT	N	6	1	DATA OCTOBER
CLIMDATA	NOV	N	6	1	DATA NOVEMBER
CLIMDATA	DEC	N	6	1	DATA DECEMBER
CLIMDATA	EDITDATE	D	8	0	DATE LAST UPDATE METEO.DATA

APPENDIX B ISO 3166 COUNTRY CODES

AF	Afghanistan	GQ	Equatorial Guinea	MY	Malaysia	LK	Sri Lanka
AL	Albania	EE	Estonia	MV	Maldives	SH	St.Helena
DZ	Algeria	ET	Ethiopia	ML	Mali	KN	St.Kitts and Nevis
AS	American Samoa	FK	Falkland Islands	MT	Malta	PM	St.Pierre + Miquelon
AD	Andorra	FO	Faroe Islands	MH	Marshall Islands	VC	St.Vincent + Grenadine
AO	Angola	FJ	Fiji	MQ	Martinique	SD	Sudan
AI	Anguilla	FI	Finland	MR	Mauritania	SR	Suriname
AQ	Antarctica	FR	France	MU	Mauritius	SJ	Svalbard + Jan Mayen
AG	Antigua and Barbuda	GF	French Guiana	MX	Mexico	SZ	Swaziland
AR	Argentina	PF	French Polynesia	FM	Micronesia	SE	Sweden
AM	Armenia	TF	French Southern Terr	MD	Moldova, Republic of	CH	Switzerland
AW	Aruba	GA	Gabon	MC	Monaco	SY	Syrian Arab Republic
AU	Australia	GM	Gambia	MN	Mongolia	TW	Taiwan, Province of China
AT	Austria	GE	Georgia	MS	Montserrat	TJ	Tajikistan
AZ	Azerbaijan	DE	Germany, Fed. Rep. of	MA	Morocco	TZ	Tanzania, Unit. Rep. of
BS	Bahamas	GH	Ghana	MZ	Mozambique	TH	Thailand
BH	Bahrain	GI	Gibraltar	NA	Namibia	TG	Togo
BD	Bangladesh	GR	Greece	NR	Nauru	TK	Tokelau
BB	Barbados	GL	Greenland	NP	Nepal	TO	Tonga
BE	Belgium	GD	Grenada	NL	Netherlands	TT	Trinidad and Tobago
BZ	Belize	GP	Guadeloupe	AN	Netherlands Antilles	TN	Tunisia
BJ	Benin	GU	Guam	NT	Neutral Zone	TR	Turkey
BT	Bhutan	GT	Guatemala	NC	New Caledonia	TM	Turkmenistan
BO	Bolivia	GN	Guinea	NZ	New Zealand	TC	Turks + Caicos Islands
BW	Botswana	GW	Guinea-Bissau	NI	Nicaragua	TV	Tuvalu
BV	Bouvet Island	GY	Guyana	NE	Niger	SU	USSR
BR	Brazil	HT	Haiti	NG	Nigeria	UG	Uganda
IO	Brit. Indian. Ocea. Ter	HM	Heard + McDonald Islan	NU	Niue	UA	Ukraine
BN	Brunei Darussalam	HN	Honduras	NF	Norfolk Island	AE	United Arab Emirates
BG	Bulgaria	HK	Hong Kong	MP	North.Mariana Island	GB	United Kingdom
BF	Burkina Faso	HU	Hungary	NO	Norway	US	United States
BU	Burma	IS	Iceland	OM	Oman	UY	Uruguay
BI	Burundi	IN	India	PK	Pakistan	UM	Us.Minor Outl.Island
BY	Belarus	ID	Indonesia	PW	Palau	SU	Ussr (glinka)
CM	Cameroon	IR	Iran, Islamic Rep. of	PA	Panama	UZ	Uzbekistan
CA	Canada	IQ	Iraq	PG	Papua New Guinea	VU	Vanuatu
CV	Cape Verde	IE	Ireland	PY	Paraguay	VA	Vatican City State
KY	Cayman Islands	IL	Israel	PE	Peru	VE	Venezuela
CF	Central African Rep.	IT	Italy	PH	Philippines	VN	Viet Nam
TD	Chad	JM	Jamaica	PN	Pitcairn	VG	Virgin Islands UK.
CL	Chile	JP	Japan	PL	Poland	VI	Virgin Islands US
CN	China	JO	Jordan	PT	Portugal	WF	Wallis + Futuna Island
CX	Christmas Island	KH	Kampuchea, Democratic	PR	Puerto Rico	EH	Western Sahara
CC	Cocos Islands	KZ	Kazakhstan	QA	Qatar	YE	Yemen
CO	Colombia	KE	Kenya	RE	Reunion	YD	Yemen, Democratic
CG	Congo	KI	Kiribati	RO	Romania	YU	Yugoslavia
CK	Cook Islands	KR	Korea, Republic of	RU	Russian Federation	ZR	Zaire
CR	Costa Rica	KP	Korea, Dem. Peopl. Rep.	RW	Rwanda	ZM	Zambia
CI	Côte d'Ivoire	KW	Kuwait	LC	Saint Lucia	ZW	Zimbabwe
HR	Croatia	KG	Kyrgystan	WS	Samoa		
CU	Cuba	LA	Lao Peoples. Dem. Rep.	SM	San Marino		
CY	Cyprus	LB	Lebanon	ST	Sao Tome + Principe		
CS	Czechoslovakia	LS	Lesotho	SA	Saudi Arabia		
DK	Denmark	LR	Liberia	SN	Senegal		
DJ	Djibouti	LY	Libyan Arab Jamahiri	SC	Seychelles		
DM	Dominica	LI	Liechtenstein	SL	Sierra Leone		
DO	Dominican Republic	LT	Lithuania	SG	Singapore		
TP	East Timor	LU	Luxembourg	SB	Solomon Islands		
EC	Ecuador	MO	Macau	SO	Somalia		
EG	Egypt	MG	Madagascar	ZA	South Africa		
SV	El Salvador	MW	Malawi	ES	Spain		

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