Apertum

<u>Airviro 4.0.</u> Appendix 3C: Waved

3.C.1 Introduction

3.C.1.1 What is Waved?

Waved is a tool that integrates the Airviro time series database into MS Excel®. The following tasks can be easily performed:

- With Waved you can use the whole power of MS Excel® with data from the fast and compact time series database of Airviro. Once you have the data in your MS Excel® workbook, you can either use the excellent reporting features of MS Excel® or easily cut and paste the data to other reporting tools.

- With Waved you can store any time series data in the Airviro database. You are not limited to the storage of data collected with Airviro.

- With Waved it is easier to edit data. You just export the data to MS Excel®, make the changes there and import the data back to Airviro.

3.C.1.2 How does it work?

Dialogs for Airviro time series database access are added to the MS Excel® interface. Just choose import or export, select a number of time series from Airviro and the transfer will take place instantly. No storage device, no difficult commands to get data to and from Airviro, just a few clicks. The transfer of data between MS Excel® and Airviro is done either directly through the local area network or by a dial-up network modem connection.

3.C.2.Overview and definitions

Waved uses the same structure as the time series database of Airviro. The Airviro time series database consists of four sub tables: Station, parameter, instance and value type as well as the time series database itself. Each value in the Airviro time series database references these tables. A set of measurement values in the time series database that references the same station, parameter, instance and value type is called an existing time series.

Example: All the measurement values for the station Femman, parameter NOX, instance 010 [M] and value type Status is a time series. The values referencing the station Femman, parameter NOX instance 010 [M] and the value type Value is another time series.

When Waved is started, all the existing times series are loaded into Waved. All the stations, parameters, instances and value types are loaded as well. MS Excel®, a registered trademark by Microsoft Corporation, will be referred to as Excel in the rest of the document.

3.C.3.Getting Started

The following steps are needed in order to use Waved:

- Install Waved on your computer.

- Start Excel. Click on **Complements**.

- To transfer data from Airviro to Excel click on the **Import to Excel from Airviro** in the **Waved** drop down menu. The **Login** dialog will appear the first time Waved is used in a working session in order to allow the user to enter the Airviro user and password.

The procedure to transfer data from Excel to Airviro is very similar.

### 3.C.4. The Waved menu in Excel

When Waved is installed the Waved menu is added in the Excel menu bar.

The following menu items are available:

- Import to Excel from Airviro: Displays the import dialog.

- Export from Excel to Airviro: Shows the export dialog.

- Host: shows the IP adress from server to connect to.

- About: Displays information about Waved. (Current Version, Developer, etc.)

3.C.5. Database and time resolution

Click on the database you want to select. The existing time resolutions for that database are shown in the time resolution list. Select one of the time resolutions. See *Figure 3C.1. Database and Time Resolution.*
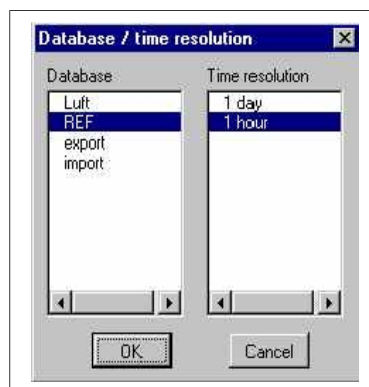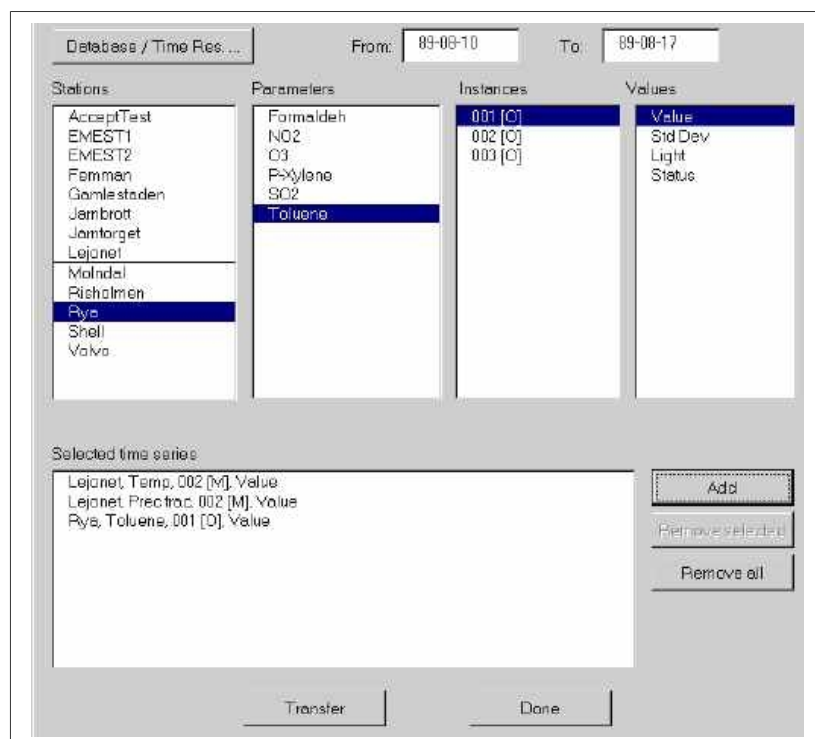

Figure 3C.1. Database and Time Resolution.

The database and time resolution can be set either from the import or the export dialog. If the database and/or time resolution is changed in the export dialog, it will change in the import dialog as well and vice versa.

3.C.6. Import to Excel from Airviro

In the **Import to Excel** from Airviro dialog the time series that are selectable are the existing time series. By selecting a station, all the parameters for existing time series for that station are shown. Then, by selecting a parameter, all the instances for existing time series for that station and parameter are shown. Finally, by selecting an instance, all the value types for existing time series for that station, parameter and instance are shown. See *Figure 3C.2. Import from TSDB.*

Figure 3C.2. Import from TSDB.

The **Import to Excel** from Airviro dialog of Waved is organised in three parts: The top, the middle and the bottom.

The top allows the user to select database and time resolution and to enter the time period that will be transferred from Airviro to Excel. The format of the from/to dates is the local Windows format that can be changed in the control panel.

An existing time series is specified in the middle part. A time series specification consists of a station, a parameter, an instance and a value. All of them must be selected in order to add the specification to the collection of selected time series. The specification is made from left to right. The stations shown are the ones that have data in the time series database. When a station is selected the parameters in the time series database for that station are shown. When a parameter is selected the instances in the time series database for that parameter and station is shown. Finally when an instance is selected the values in the time series database for that instance, parameter and station are shown.

The bottom part contains the selected time series. To add a specified time series to the selected ones press **Add.** To remove a selected time series, select it and press **Remove selected**, to remove all selected time series, press **Remove all**.

When **Transfer** is pressed the selected time series will be transferred from Airviro to Excel. The data is inserted into the active work sheet in Excel starting with the active cell.

The first row of the inserted data contains column heading for each imported time series. The following rows contain a date/time stamp and the data for each of the time series.

3.C.6.1. An example of import to Excel

The following example is from Gothenburg. Time series data from the DOAS station Järntorget, that is located in the middle of Gothenburg, is imported to Excel from Airviro. The imported time series are Value, Standard deviation, Light and Status for NO2.

1. Position the active cell in Excel where the data should be inserted.

2. Select **Waved** and **Import to Excel** from Airviro in the Excel menu bar.

3. If this is the first time Waved is used in the Excel session the **Login** dialog will be shown and the user must enter a password and optionally a user name.

4. The **Import to Excel from Airviro** dialog is shown.

5. Press **Database / Time Res** and select the database Luft and the time resolution 1 hour.

6. Enter 90-12-12 in the **From** text field and 90-12-14 in the **To** text field. NOTE: The format of the date is depending on your regional settings in the **Control panel**.

7. Select Järntorget in the station list, NO2 in the parameter list and 001 [O] in the instance list.

8. Select Value in the value list and click Add. Repeat the manoeuvre for Std Dev, Light and Status.

9. Press **Transfer** to import the data to Excel from Airviro.

3.C.6.2.Limitations

The number of rows in an Excel spreadsheet is limited to 65535. This corresponds to a little bit more than 7 years of hourly data.

3.C.7. Export from Excel to Airviro

In the **Export from EXCEL** to Airviro dialog the stations, parameters, instances and values that are shown in the lists are the ones from existing time series. It works just like the **Import to Excel** from Airviro with the following exception: By clicking **New station**, **New Parameter** and **New Instance** it is possible to select stations, parameters and instances that are not a member of any existing time

series. NOTE: It is not possible to create new stations, parameters or instances, only to select stations, parameters and instances that are not part of an existing time series.

Example: The parameters NOX and NO2 exist in the parameter database. The stations Femman and Järntorget exists in the station database. Two time series exists: Femman, NOX,010 [M], Value and Järntorget, NO2, 010 [M], Value. The stations shown in the station list are Femman and Järntorget. By clicking Femman in the station list, NOX is shown in the parameter list. NO2 does not appear in the parameter list because it does not exist a time series for the station Femman that contains NO2. However, by clicking on **New station**, a dialog is shown that contains all the parameters in the parameter database, i e NOX and NO2. By selecting NO2 and click **OK** the parameter NO2 is added to the parameter list in the **Export from EXCEL** to Airviro dialog. No instances are shown because no time series exist with the station Femman and the parameter NO2. It is necessary to choose New Instance in order to add one.
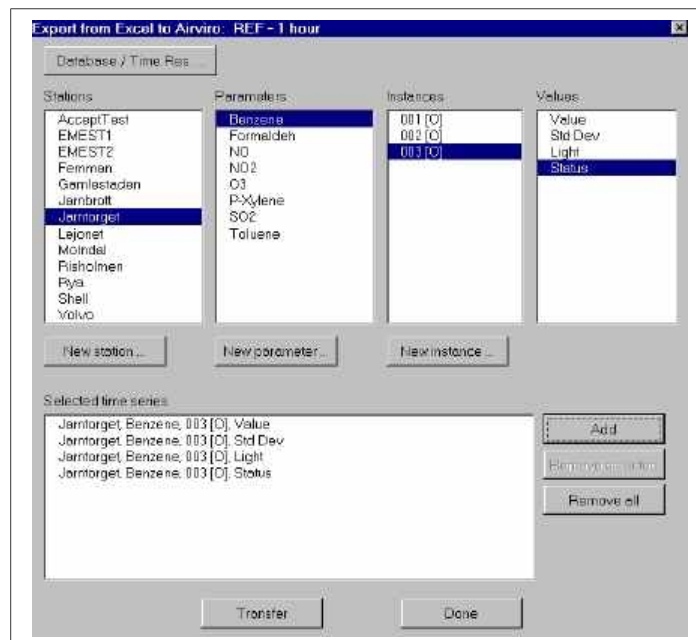

Figure 3C.3. Export from TSDB.

The **Export from Exce**l to Airviro dialog of Waved is organized in three parts: The top, the middle and the bottom.

The top allows the user to select the Airviro database to export to and the time resolution.

A time series is specified in the middle part. A time series specification consists of a station, a parameter, an instance and a value. All of them must be selected in order to add the specification to the collection of selected time series. The specification is made from left to right. The stations shown are the ones that have data in the time series database. If **New station** is clicked a dialog is shown where the user can select any existing station. When a station is selected the parameters in the time series database for that station are shown. A parameter in an existing time series for the selected station can be chosen in the parameter list or the user can click on New Parameter in order to choose any parameter in the parameter database. When a parameter is selected the instances in the time series database for that parameter and station are shown. The instance can be selected from instance list of from the **New Instance** where any instance can be chosen. Finally, when an instance is selected the values in the time series database for that instance, parameter and station are shown.

The **New station**, **New parameter** and **New Instance** allow the creation of time series that do not exist in the time series database. See *Figure 3C.3. Export from TSDB.*

The bottom part contains the selected time series. To add a specified time series to the selected ones press **Add**. To remove a selected time series, select it and press **Remove selected**, to remove all selected time series, press **Remove all**.

When **Transfer** is pressed, the selected time series will be transferred from Excel to Airviro. The *active cell* in the Excel document must be the *first* date / time cell. The second column should contain the data of the first selected time series and so on.
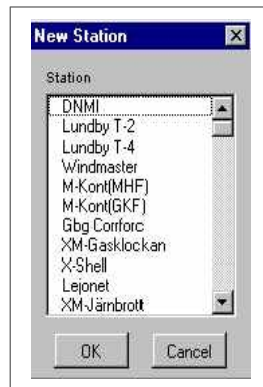
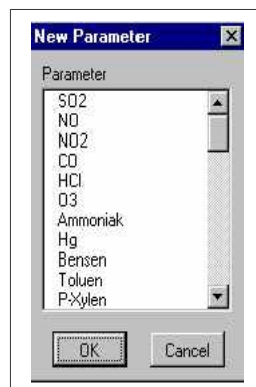**NOTE:** The date / time column must be in the Excel date format.

3.C.7.1 New station

Only the stations with existing time series are shown in the station list of the Export from **Excel to Airviro** dialog. To export data to a station that does not have any data in the time series database click on **New station**. A dialog containing all the stations in the station database of Airviro is shown. Select the wanted station and click on **OK**. The selected station immediately occurs at the bottom of the station list in the **Export from Excel to Airviro** dialog. See *Figure 3C.4.New station.*

Figure 3C.4.New station.
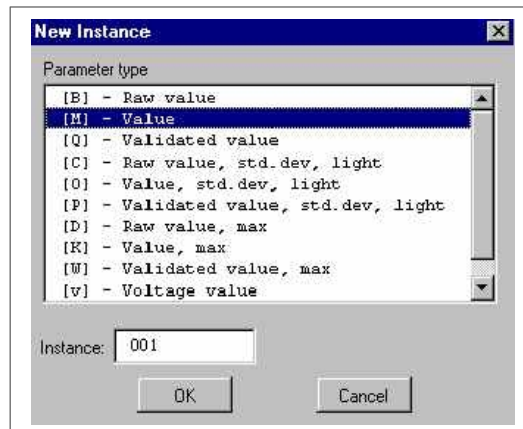
3.C.7.2. New parameter

Figure 3C.5. New parameter.

For the selected station only the parameters with existing time series are shown in the station list of the **Export from Excel to Airviro** dialog. To export data to a station and parameter combination that does not have any data in the time series database click on **New paramete**r. See *Figure 3C.5. New parameter.*

A dialog containing all the parameters in the parameter database of Airviro is shown. Select the wanted parameter and click on OK. The selected parameter immediately occurs at the bottom of the parameter list in the **Export from Excel to Airviro** dialog.

3.C.7.3. New instance

Figure 3C.6.New instance.

For the selected station and parameter only the instances of existing time series are shown in the station list of the **Export from Excel to Airviro** dialog. To export data to a station and parameter combination that does not have any data in the time series database click on **New instance**. A dialog containing all the possible instances in Airviro is shown. Select the wanted instance and click on OK. The selected instance immediately occurs at the bottom of the instance list in the **Export from Excel to Airviro** dialog. See *Figure 3C.6.New instance.*

Normally data should be imported to the [M] - Value parameter type. The table

below shows the use of the other parameter types:

Parameter type	Three step database only	OPSIS only	NILU only	Calibration database only	Number of parameters (excluding status)
[M] – Value					1
[B] – Raw value	X				1
[Q] – Validated value	X				1
[C] – Raw Value, std. dev, light	X	X			3
[O] – Value, std. dev, light		X			3
[P] – Validated value, std. dev, light	X	X			3
[D] – Raw value, max	X		X		2
[K] – Value max			X		2
[W] – Validated value, max	X		X		2
[v] – Voltage value				X	1
[V] – Voltage value, max			X	X	2

Figure 3C.7. Parameter types.

The table (*Figure 3C.7. Parameter types)* shows which parameter types that should be used only when the three step database is used, when OPSIS values are exported from Excel, when NILU values are exported from Excel and when the calibration database is used. The last column states the number of parameters that must be exported.

Example: For the [O] parameter type: value, standard deviation and light must be exported at the same time.

3.C.7.4. An example of export from Excel

1. Position the active cell in Excel at the first row of the date / time column,

2. Select Waved and **Export from Excel to Airviro** in the Excel menu bar.

3. If this is the first time Waved is used in the Excel session the user must enter password and optionally a user name.

4. The **Export from Excel to Airviro** dialog is shown.

5. Press **Database / Time Res** and select the database Luft and the time resolution 1 hour.

6. Select Järntorget in the station list, NO2 in the parameter list and 001 [O] in the instance list.

7. Select Value in the value list and click **Add**. Repeat this step or Std Dev, Light and Status.

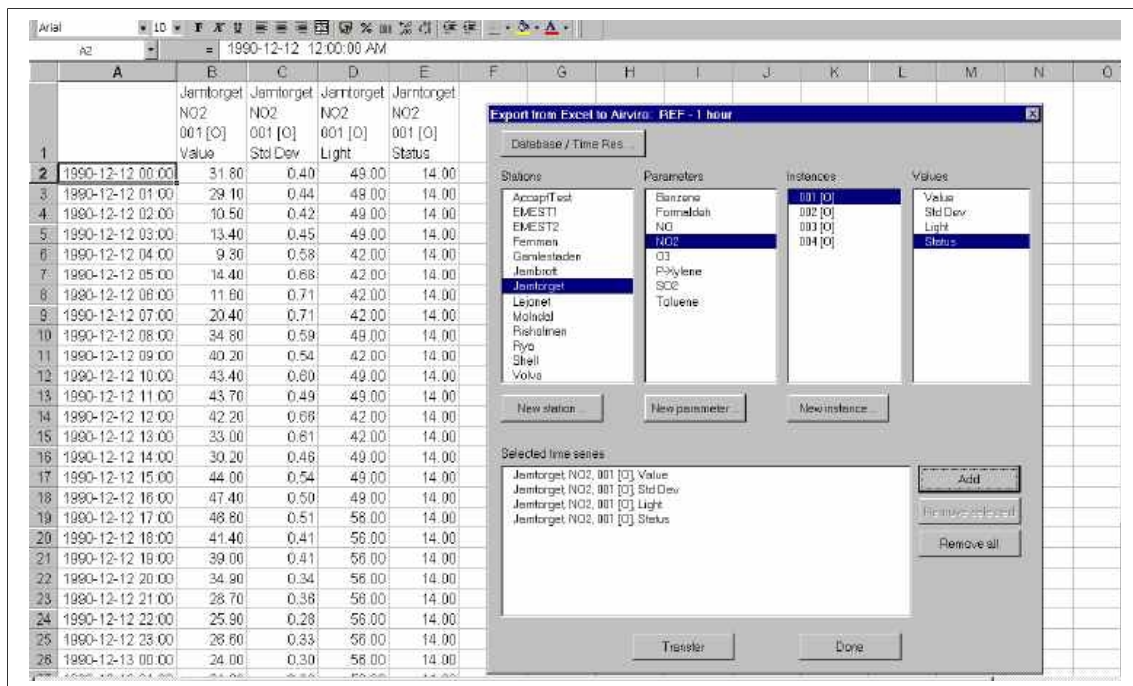8. Press **Transfer** to export the data from Excel to Airviro. See *Figure 3C.8.Example export.*

Figure 3C.8.Example export.

3.C.7.5. Limitations

All the values of a parameter type must be exported at the same time.

3.C.7.6. Setting up privileges for export from Excel

The same privileges are valid for Waved as for the Airviro time series editor. The privileges for the Airviro time series editor are set up in the file *priv.rf*, normally located in*/usr/airviro/rsrc*.

3.C.7.7. Pitfalls with export from Excel

These are the most common errors that are made when exporting data from Excel to Airviro:

1. The active cell in Excel must be the first row of the date / time column.

2. The date / time column must be in Excel date format.

3. The database that data was imported to, was not in the scan list of avdbm. Check it with *avstat.*

CAUTION: It is very easy to export data from Excel to the Airviro Time Series database using **Waved**. Care must be taken so that data is not corrupted. The best way to avoid corrupted databases is probably to set up a parallel import database.

3.C.8. Waved as a database editor

The design of Waved enables it to be used as a database editor. The selection of time series made in one of the dialogs (export, import) is transferred to the other dialog when it is opened.

The steps to perform in order to use Waved as a database editor are:

1. Open the **Import to Excel** from Airviro dialog.

2. Select the time series that you want to edit. Remember to export the status if you want to set it to status 15, manually changed.

3. Transfer the data to Excel by pressing **Transfer**.

4. Close the **Import to Excel from Airviro** dialog and make your changes to the data.

5. Set the first date /time row as the active cell in Excel.

6. Open the **Export from EXCEL** to Airviro dialog.

7. Press **Transfer.** The data is exported to Airviro.

3.C.9. Technical specification

Waved includes the following features:

- No installation of any programs on the Airviro workstation. The only installation of software is done in the client PC as a plug-in module to Excel.

- Extremely fast transfer of data due to the fact that the low level C interface of Excel is used. One year of hourly data for four stations is exported to Excel in a few seconds.

- Export of 32 simultaneous time series.

- Import of 32 simultaneous time series.

- Allows creation of new time series. A time series can be created for any existing station and parameter. New instances can be created.