

9 VIEWING AND PROCESSING DATA ON SHORE

After data have been received from the HydroDAS, either via satellite or USB transfer, software must decode the binary data packets (described in section 7.6) for display and subsequent processing.

We have implemented this software as an Add-In for Microsoft Excel (2002 or later), giving scientific users easy access to additional processing capability available from Excel. The Add-In is called *SAC-HOBI Tools*, and after installation appears as a standard Excel toolbar.

SAC-HOBI Tools consists of two main components, an XLA file that contains most of the executable code, and a workbook template that has been specially structured to support the code and receive the loaded data.

9.1 INSTALLING THE EXCEL ADD-IN

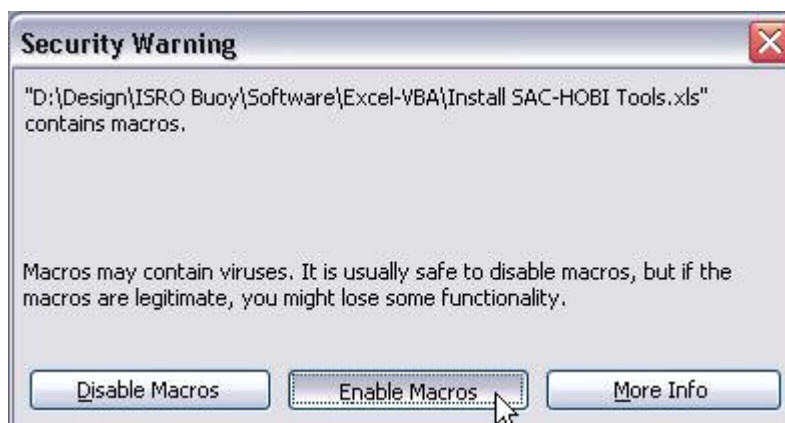
The exact installation procedure required depends on the Macro security level set within Excel. You can view and set the security level by selecting **Macro->Security...** from the **Tools** menu. For best results we recommend a security setting of Medium, which will allow you to run the Automatic Installation procedure. If the level is set above Medium, you must use the Manual Installation procedure below, and some features may be disabled.

First, copy the following files to a directory on your computer. If you later move these files to a different directory, you will need to run the installation again.

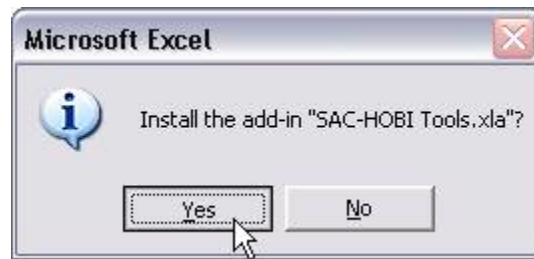
- SAC-HOBI Tools.xla
- SAC-HOBI Tools.xlt
- Install SAC-HOBI Tools.xls

9.1.1 Automatic Installation

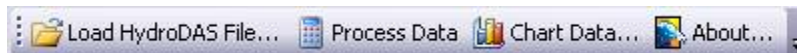
Copy the files listed above. Double-click on “Install SAC-HOBI Tools.xls”. If Excel displays a message warning that the file contains macros, click “Enable Macros”:



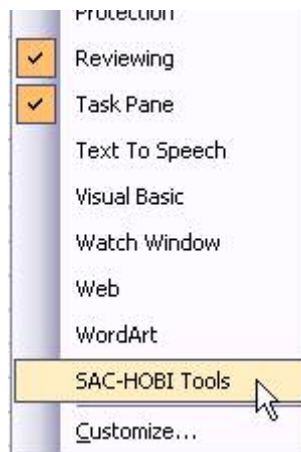
When asked if the file should be installed, click “Yes”:



A toolbar like the one shown below should then appear.



If the tool bar does not appear, pull down the **View** menu and look for the SAC-HOBI Tools item. If it appears without a check mark next to it, select it and the toolbar should appear.



9.1.2 Manual Installation

Use this procedure if your Excel security setting is too high to permit the automatic procedure described above. Note however that a high security setting may also block some features of workbooks you create with the Add-In.

- Start Excel
- Select **Macro->Security...** from the **Tools** menu.
- On the “Trusted Publishers” tab (if it is present), select “Trust all installed add-ins and templates”. Click **OK**.
- Select **Add-ins...** from the **Tools** menu. If this command is disabled and there are no workbooks open in Excel, select **New** from the **File** menu, and open a blank workbook. Then select **Add-ins...** from the **Tools** menu.
- Click **Browse...**

- Navigate to the directory containing the add-in files, and select the file “SAC-HOBI Tools.xla”.
- Excel may ask whether you wish to copy the file to the Add-ins folder. Click **No**.
- The file you selected should now appear in the add-ins list, with a checkmark. Click **OK**.



You should see a dialog announcing the presence of the Add-in, and its toolbar should appear. If you do not see the tool bar, select **Toolbars->SAC-HOBI Tools** from the **View** menu.

9.1.3 Reversing Installation

Once you have installed the Add-In, it will automatically load every time you start Excel, unless you move or rename the Add-In file. To uninstall the Add-in, open the Add-Ins dialog box as described above, and uncheck **Sac-Hobi Tools**.

9.2 TEMPLATE FILE

The file SAC-HOBI Tools.xlt contains a number of worksheets set up specifically for the HydroDAS data, as well a various features that are not visible to the user but facilitate the handling of HydroDAS data. These include specially named cells and ranges of cells, hidden cells and sheets, and executable code. Because of the executable code, Excel may present a warning that the sheet contains macros.

The first sheet in the template is reserved for summary information about the data that will be loaded. This sheet shows the name of each file from which data are loaded, and the number of samples from each. It also displays the array of wavelength bands applied to the data, and cells for entry of information about the buoy location, which is needed for calculation of the normalized water-leaving radiance.

The template includes one worksheet for each channel of instrument data: 7 Hydrorad channels and 1 flourometer. These sheets are named for the parameters they

represent, for example Es (the first HydroRad channel), Ed1, Lu1, etc., and Fl (the fluorometer). A second group of sheets is reserved for the derived parameters such as Kd1.

IMPORTANT NOTE: Though you may add any number of new worksheets and charts to workbooks created by *SAC-HOBI Tools*, do not change the order or names of the original sheets if you intend to load more data later.

9.3 LOADING HYDRODAS DATA

The **Load HydroDAS File...** command on the *SAC-HOBI Tools* toolbar loads files containing binary packets generated by the HydroDAS's processing firmware. These files may be received via the satellite transceiver or USB offload from the HydroDAS's hard disk. Files received via satellite may contain text messages and other characters that are not part of the HydroDAS format, but the Add-In will ignore these and seek only properly-formatted binary packets.

The command first opens a copy of the SAC-HOBI Tools template workbook, if none is yet open. If a SAC-HOBI workbook is already open and is active when you start the command, the data loaded will be appended to any data already in the workbook. This allows you assemble data from several files. If you do not wish data to be appended to an open workbook, either close it or open another blank workbook in front of it. This will cause the command to open a new copy of the SAC-HOBI template.

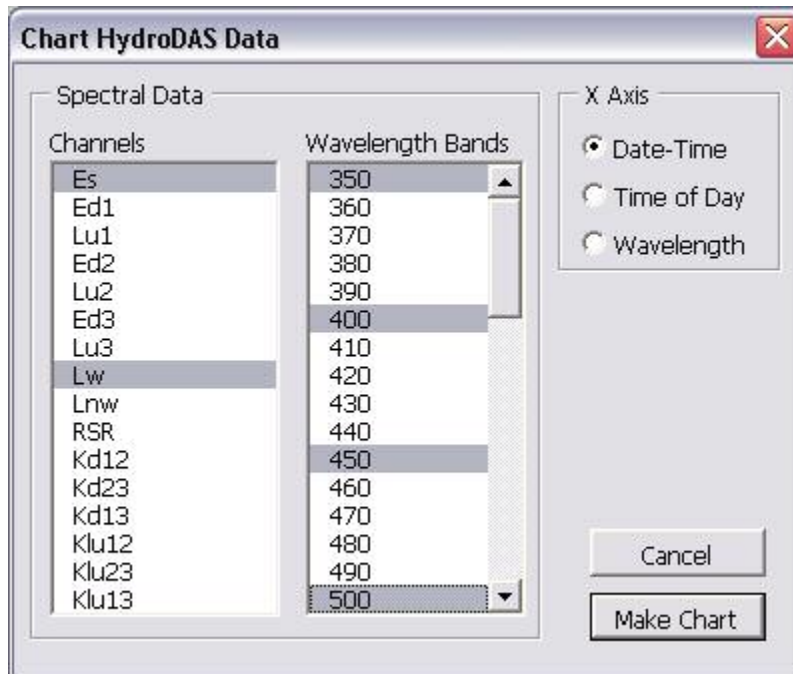
Once an appropriate workbook is open, the **Load** command presents a standard Windows file selection dialog box. You may select any number of files by using the control or shift keys in combination with the mouse. When you click OK, the program will scan each file for HydroDAS data packets. Note that it is possible to select files of any type, including those that do not actually contain appropriate data. The program will simply scan such files and show no loaded packets. The name of each file scanned, and the number of packets it contained, will be listed on the summary sheet.

The data loaded include not only the spectral radiometric data, but also housekeeping information including temperatures, supply voltages and integration times, as well as quality-control information such as the number of integrations averaged into each sample, and the number of integrations rejected due to excessive tilt or roll.

9.4 CHARTING DATA

The **Chart Data...** button opens a dialog box in which you can select any of the radiometer channels and derived parameters to plot. If you select the **Wavelength** option for the X Axis, the **Wavelength Bands** list is disabled. The chart will display a complete spectrum of each of the parameters you select, and a scroll bar on the chart will allow you to scan through all the time samples in the dataset.

If you select the **Time of Day** or **Date-Time** option, the **Wavelength Bands** list is enabled, and you can select an arbitrary set of wavebands to chart. In **Time of Day** mode, the x-axis will have a 24-hour range and if the dataset includes multiple days of data, the days will be overlaid.



While this command offers a convenient way to generate the most commonly-used views of the data, you are completely free to use standard Excel commands to chart any data, in any way you choose.

Note that the charts generated by this command are based on a template chart that is normally hidden within the workbook. You can use Excel's **Unhide** command to make this chart visible and change its style for future charts. If you do, first make a backup copy of the template worksheet in case you inadvertently make a change that interferes with the automated charting.

9.5 CALCULATING DERIVED PARAMETERS

The **Calculate** button triggers calculation of the derived parameters from the instrument input data. This calculation is configured so as to allow users to modify the equations used. To enter the equation for a particular parameter, find the cell in its corresponding sheet below the label "Spectral Data". Enter the formula as you normally would in Excel, making references to cells in other sheets as appropriate. When the calculate command is executed, it will automatically apply this formula to all wavelengths and all time samples in the sheet where you entered it. For example, the screen below shows the formula being entered in the "RSR" (remote-sensing reflectance) sheet.

Microsoft Excel - SAC-HOBI Tools1

File Edit View Insert Format Tools Data Window Help

Load HydroDAS File... Process Data Chart Data... About...

SUM \times \checkmark f_x =Lnw/E2/EsIS2

	A	B	C	D	E	F	G	H
1	Sample #	Date	Time	Spectral Data				
2	0	1/0/1900	0:00:00	E2/EsIS2				
3								
4								
5								
6								
7								

Lu2 / Ed3 / Lu3 / Fl / Lw / Lnw / RSR / Kd12

Edit NUM