SWIVT – GUI User Manual

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1 General overview

1.1 Motivation for a SWAN Instrument for Validation & Testing

SWAN (**S**imulating **WA**ves **N**earshore) plays a key role in many coastal climate studies and in the computation of the Hydraulic Boundary Conditions to assess the required level of protection of the Dutch primary coastal structures. Therefore, quality assessment of SWAN in the form of validation is important. Validation of a numerical model such as SWAN requires comparison of a large number of simulation results against objective data sets. These sets consist of high–quality wave data (integral wave parameters, 1D and 2D spectra) obtained by analytical means or by means of observations in the laboratory or in the field. Comparing simulation results against objective data is done quantitatively (tables, statistics, etc.) and qualitatively (figures, etc.). Validation of a complex and broadly applicable model such as SWAN is a time–consuming task. This is caused by the large amount of model runs and related post–processing tasks that need to be executed. Fortunately, a lot of steps in a validation process can be automated to a large extent. This reduces the amount of human workload significantly.

The need for an efficient and flexible validation tool has led to the development of SWIVT (**SW**an **I**nstrument for **V**alidation and **T**esting).

1.2 Objectives of SWIVT

SWAN is a third–generation wave model that computes random, short–crested wind–generated waves in coastal regions and inland waters. The purpose of SWIVT is to validate SWAN in stationary and nonstationary mode in a flexible, efficient and effective way. This is achieved by offering the possibility to compare SWAN simulation results against observed data as well as against other simulations results (for example obtained with another version of SWAN or with different SWAN model settings). SWIVT includes validation cases, which are all taken from well–documented laboratory and field data and from analytical solutions. SWIVT is flexible in the sense that it offers the user the possibility to include new validation cases, to change physical model settings and to adjust the presentation of the results. SWIVT is freeware, under LGPL conditions. SWIVT is developed for experienced SWAN users.

1.3 Comparison with the existing ONR Testbed

The ONR Testbed, see **Ris et al 2002**, provides an automated run environment for validation yielding graphics and statistical scores. The validation testcases in the ONR Testbed are fixed in number and form. Its primary use therefore is that of a regression testbed. Based on a static set of testcases it gives insight into the development from one SWAN version to another. SWIVT aims at being a dynamic system requiring interaction with the user:

- The user can select either all or a part of the available validation cases. One set of available validation cases will be the ONR Testbed cases. Therefore, SWIVT is backward compatible with the ONR Testbed.
- Besides the availability of certain standard graphs (some possible graphs are included here in Figure 1.1 to illustrate the point), it is possible to create tailor–made figures.
- To facilitate user–interaction, SWIVT is provided with a GUI.
- The user can apply the SWIVT functionalities (ie execution and post–processing) to new SWAN cases made by him/herself. This assists the user in the execution of new hindcast studies and sensitivity analysis (ie, studying the influence of variations in the input parameters).
- The maintenance party has the possibility to include new validation cases in SWIVT. This may include recent SWAN hindcast studies and cases in which newly developed physical and numerical options in

SWAN are tested. This keeps the set of available validation cases up–to–date and discloses at the same time these cases to a broader public (the SWIVT users group).

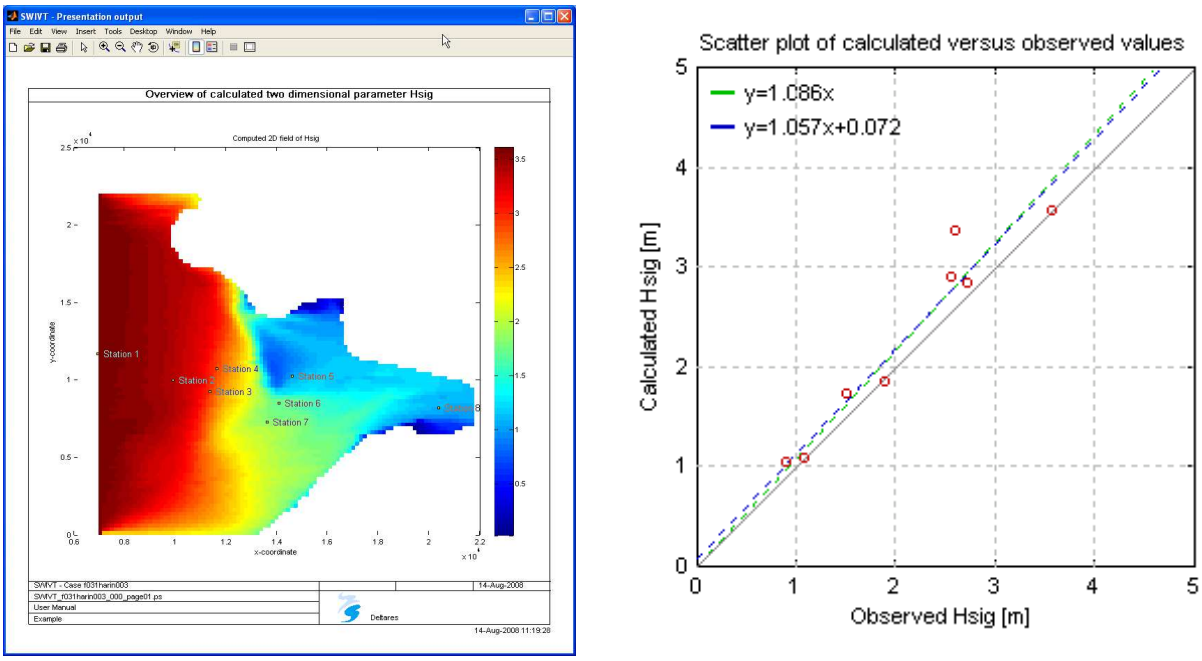


Figure 1.1 Illustrative figures produced by SWIVT

1.4 Validation versus hindcast

SWIVT is a tool to perform a validation study. Validation means comparing computed results with either

- observed data, or
- computed results obtained with another SWAN version, or
- computed results obtained with different SWAN parameter settings.

A validation study then comprises validation of SWAN for a selected set of test cases with suitably chosen model settings. The validation cases delivered along with SWIVT have been used at some time in the past in hindcast studies. In such a study, SWAN was applied to determine a historical wave field. Known or closely estimated inputs for past events were entered into the model to investigate to which extend the SWAN output matched the observed data. Validation studies and hindcast studies have in common the need to go through the process of validation: comparing SWAN results with observed data.

Validation studies and hindcast studies differ in the following aspects:

- An important part of a hindcast study is the construction of a SWAN model by the user. This consists of, among others, judging available observed data, creation of required model input (e.g., grid, bathymetry, wind field and flow field) and selecting suitable parameter settings. A validation study, on the other hand, uses already available SWAN models (validation cases), in which typically only the model settings can be adjusted.
- Hindcast studies typically aim at studying a limited number of events, for example a number of instants during a storm in a given geographical region. Validation studies, on the other hand, are typically performed using a large number of validation cases. This selection of validation cases should contain a wide variety of different storm events, laboratory cases and analytical cases, to ensure that the physics in the model is tested thoroughly.

- Hindcast studies always involve comparison of SWAN data with observed data, while in validation studies also SWAN data may be compared with SWAN data obtained with another SWAN version or different parameter settings.

SWIVT facilitates, briefly speaking, the selection of a number of validation cases, the insertion of parameter settings in SWAN command files, the running of SWAN and the validation by generating tables and graphs.

1.5 SWIVT cases

A SWIVT case consists of a set of SWIVT files and a set of SWAN files which belong to one SWAN simulation. There are two types of SWIVT files, both in xml format:

- one containing information for the simulation of the physical processes from which a selection can be made by the user.
- one containing information on how to present the results in graphs and/or tables.

The set of SWAN files is described in detail in the SWAN User Manual [**SWAN team 2022**]. An example is the set of SWAN files for simulation of the Friesche Zeegat at 5h00m, on October 9th, 1992. Another example, a different case, is the set of SWAN files for simulation of the Friesche Zeegat an hour later, at 6h00m, on October 9th, 1992.

Note that two cases are different if the SWAN files (input files and/or SWAN executable) are different, even if they aim at simulating the same situation. For example, a change in the parameter setting, grid, bathymetry or wind field, as well as SWAN executable, for the simulation of the Friesche Zeegat at 5h00m, on 9 October 1992, is a different case. Also two cases are different if they use a different SWAN version.

A SWIVT case is identified by a code, which is described in detail in the Technical Reference [**Dekker et al 2022a**] and summarised in the Glossary in Chapter 4. Minor changes to a case may result in a subcase, rather than a new case with a new code.

The first set of SWIVT cases available from the SWIVT server, contains the ONR Testbed cases. It should be noted that the SWIVT cases incorporate a small number of improvements.

1.6 Important

It is important to realise that SWIVT is an automatic system which is very strict in the setup of a case. The user is strongly advised not to edit any of the SWIVT (including the Physical Process definitions and the Output section of the **.swn* file) files by hand or otherwise outside SWIVT. Furthermore, in case of the m–code, making changes via the Matlab window may result in SWIVT not working correctly.

In order to be able to retrieve the cases from the SWIVT server, ensure that your firewall is not blocking the internet access from Matlab.

1.7 Documentation

SWIVT documentation consists of five documents, which are written in English:

- SWIVT Installation Guide
- SWIVT User Manual (this document)
- SWIVT Technical Reference Documentation
- SWIVT Programmers Manual
- SWIVT Management and Maintenance Manual

This document is a user manual for the interface of SWIVT. Release Notes are issued in addition to these documents.

1.8 Free software, LGPL

1.9 Acknowledgements

The development of SWIVT was part of the SBW (Strength and Loads on Water Defences) study commissioned by the RijksWaterStaat, department of the Ministry of Public Works in the Netherlands. In 2022 it is part of the project KPP 2022 – Hydraulics Software.

2 Getting Started

2.1 Installation of SWIVT

Important: to run SWAN4120A and higher, the MPICH software has to be installed. See the **SWAN website** for more details.

2.1.1 Matlab version

The SWIVT GUI and the accompanying Manuals in Adobe pdf format can be downloaded from https://swivt.deltares.nl/. The zip–file with the Matlab m–code is protected with a password.

For the installation of the Matlab GUI follow these steps:

1. Create a directory on your local system, eg **C:\projects\swivt** and download the zip file there
2. Extract this zip–file in this **swivt** directory, retaining its directory structure
3. Locate the *matlab.exe* file. This can be found for instance in **C:\Program files\MATLAB\R2018a\bin\win64**, and create a shortcut to it on your desktop.
4. Right click on the Matlab icon, select `[Properties]` and change the path (`Start in`) into **C:\projects\swivt**
5. Select as icon the SWIVT icon in **C:\projects\swivt**
6. Double click the icon: Matlab will start and the correct paths are set.

Alternative:

1. Create a directory on your local system, eg **C:\projects\swivt** and download the zip file there
2. Extract this zip–file in this **swivt** directory, retaining its directory structure
3. Start Matlab
4. Go to **C:\projects\swivt** by typing:

```
>> cd C:\projects\swivt
```

5. Type

```
>> startup
```

which ensures that the correct paths are set.
Please note that in the alternative method steps 4 and 5 need to be carried out each time SWIVT is started. The first method, therefore, is more user friendly.

2.1.2 Standalone version

The SWIVT Standalone version can be downloaded from https:// swivt.deltares.nl/ as a zip file. In addition the required Matlab engine can also be downloaded as a zip file.
For the installation of the Matlab GUI follow these steps:

1. Create a directory on your local system, eg **C:\projects\swivt** and download the zip files there.
2. Extract these zip–files in this **swivt** directory, retaining their directory structure.

3. Start the program with the *swivt.bat* file (in our example the command is `C:\projects\swivt\swivt.bat`) . This ensures that the required libraries will be found by the executable. In our example the contents looks like this:

```
PATH=v94\bin\win64;v94\runtime\win64;C:\windows;
start swivt.exe
```

A limited number of graph editing features are available in Matlab Standalone 7.0 and above:

- zoom in and out
- panning
- 3D rotation
- use data cursor to request x, y and z position in axes
- colour bar
- legend

however, this is less than is available with the Matlab *.m* files.

Please note: The standalone version of SWIVT does not include Matlab source files. The Matlab engine does not need to be downloaded if the SWIVT application is upgraded, unless this is specifically mentioned on the download site. The Matlab engine version number is used as the name of the directory (eg v94).

2.2 Start a SWIVT session

The program can be started from the Matlab prompt with:

```
>> swivt
```

or

```
>> swivt('new')
```

In the first instance the last session will be restored, the latter uses the default settings. In this context default settings mean:

- No cases available at start–up. **This implies that all locally stored previous sessions will be erased!**
- Default SWIVT web server URL is used.

When a new session is created, either by using the second option to start SWIVT, by using the new button or the open button on the main window (see Chapter 3), a new subdirectory is generated in the **sessions** directory (which is also generated if it doesn't already exist) called **sessioniii**, where **iii** is the session identifying counter (3 integers). The only exception to this is when a directory **sessioniii** , being a subdirectory of **sessions** is reopened, in which case the old session identifying counter (**iii**) is used.

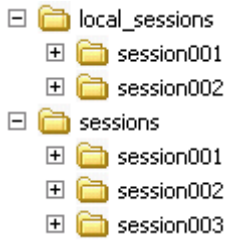


Figure 2.1 Example sessions directory

For example, in Figure 2.1 the options work as follows:

1. `swivt('new')` removes **session001**, **session002** and **session003** from the **sessions** directory, and creates a new **session001** subdirectory in **sessions**.
2. assuming swivt was started without the `('new')` addition:
    a. the new button results in the creation of the subdirectory **session004** in the **sessions** directory
    b. the open button:
        i. opening **sessions/session002** will use the existing directory
        ii. opening **local_sessions/session002** will create and use **sessions/sessions004**. In this case the results will also be stored in **session004**, and if they need to be preserved with the original data, they will need to be explicitly saved in the original directory.

Please note that the **sessioniii** directories may not be created in the **sessions** directory outside SWIVT, this will result in an internal error in SWIVT, as it will be unable to locate the cases stored in these directories.

Once a case is downloaded from the server, it will be stored in a subdirectory of **sessioniii**, in the directory with the appropriate swanversion number (eg **SWAN4041A**, **SWAN4051A**, **SWAN4072A**, etc), called **code_subcode** where subcode 000 indicates that the case has been retrieved from the server. For example:

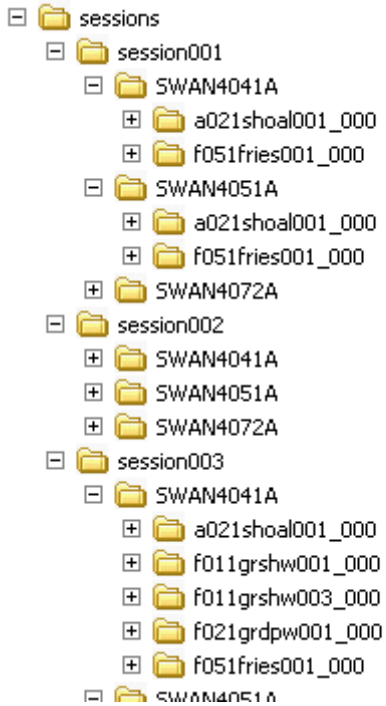


Figure 2.2 Session directory example

Each **code_subcode** directory contains two, three or four subdirectories:

- **model_io**, containing the input files for both SWIVT and SWAN. This is also the location where the (non–presentation) output files will be stored.
- **observ**, containing the files with the observed data.
- **presentation**, created when presentation output is generated by SWIVT.
- **swivt_ci_pres_set**, created when presentation output is generated by SWIVT. This directory is only relevant in conjunction with the Calibration Instrument developed at Deltares.

For more information on input and output files please refer to the Technical Reference (**Dekker et al 2022a**).

Once the program is started the splash window will appear:

Figure 2.3 Splash window

After clicking in the SWIVT splash window, or using the `[Ctrl] + [O]` shortcut, the SWIVT main window appears. This window is described in Chapter 3.

2.3 General navigation rules

This section describes rules which are applicable for all the SWIVT windows, unless it is stated otherwise in the appropriate section.

2.3.1 Menu's and shortcuts

Most navigation commands can be found in the menu's provided at the top of the window. Menus can be accessed by using the `[Alt]` key, for example `[Alt]+F` for the **F**ile menu. The items in the menu list often provide a shortcut. In addition to this some windows display the Accelerator(s) menu. This is a list with shortcuts which are used in that particular window, these shortcuts are combined with the `[Ctrl]` key. The menus are listed in Table 2.1 together with the associated items and, where appropriate, shortcuts and toolbar buttons.

Table 2.1 Description of Menu's

MENU	MENU ITEM/FUNCTION	SHORTCUT	TOOLBAR BUTTON	WINDOW
Accelerator	Open SWIVT	Ctrl + O		Splash window
	Cancel	Ctrl + N		Case identification window
	OK	Ctrl + O		Case identification window
File	New session	Ctrl + N		Main window
	Open session	Ctrl + O		Main window
	Save session	Ctrl + S		Main window
	Export ➢ Export data in observed locations (Matlab format) ➢ Export SWAN field data and data in observed locations (Matlab format)			Main window
	Clear all sessions			Main window
	Clear all log files			Main window
	Close all presentation output windows			Main window
	Preferences	Ctrl + F		Main window
	Exit	Ctrl + X		Main window
Edit	Add case	Ctrl + A		Main window
	Remove case	Ctrl + R		Main window
	Edit case	Ctrl + E		Main window
	Run case	Ctrl + U		Main window
	Present case	Ctrl + T		Main window
Help	Help (html)			Main window
	Help (pdf)	Ctrl + H		Main window
	SWIVT website			Main window
	Info	Ctrl + I		Main window

2.3.2 Toolbar

A toolbar is available for general actions:

Figure 2.4 Toolbar

The function of each of the buttons is described in Table 2.2.

Table 2.2 Description of Toolbar buttons

BUTTON	FUNCTION	WINDOW/MENU
	Close all presentation windows	Main window/File

BUTTON	FUNCTION	WINDOW/MENU
	Close all presentation windows	Presentation
	Close all presentation windows	Present Case
	New session	Main window/File
	Open the default template *default.spt*	Presentation
	Open an existing session	Main window/File
	Open an xml file with user–defined parameters	Edit Case
	Open a template	Presentation
	Save the current session	Main window/File
	Save the user–defined parameters to an xml file	Edit Case
	Save the current settings in a template	Presentation
	Show case list as HTML table	Main window

2.3.3 Light and dark grey fields

In selection areas dark grey fields denote that a selection is possible, light grey fields denote that the selection option is disabled.

2.3.4 Mouse usage

When the user is advised to click using the mouse, the left mouse button needs to be used. If an action requires the right hand mouse button, this will be stated explicitly. Selecting using the mouse implies pressing the left mouse button whilst moving the mouse. There are two ways of selecting more than one item from a list:

- click on the first item, next keep the `[Shift]` key down whilst clicking on the second item. This will result in selecting both items as well as those in between
- click on the first item, next keep the `[Ctrl]` key down whilst clicking on one or more additional items. This will result in selecting the 'clicked' items.

On most windows it is possible to use the mouse to find out more about an item. For example, hover above a button and a tooltip should appear explaining the purpose of the button.

2.3.5 Checking a checkbox

Click on a checkbox (white square) to add a tick mark. By clicking again the tick mark is removed. A list may contain more than one tick mark.

2.3.6 Radio buttons

A list of items preceded by radio buttons is a list from which only one item may be chosen. Radio buttons can be recognised by a white circle whereby in front of the selected item a black dot is placed in the middle. By clicking a different white circle the black dot will move to that circle.

2.3.7 Directory and file selector

On certain windows the  button is available for selecting a file or a directory which opens the standard directory selection window or file open window of the current platform (Windows or UNIX).

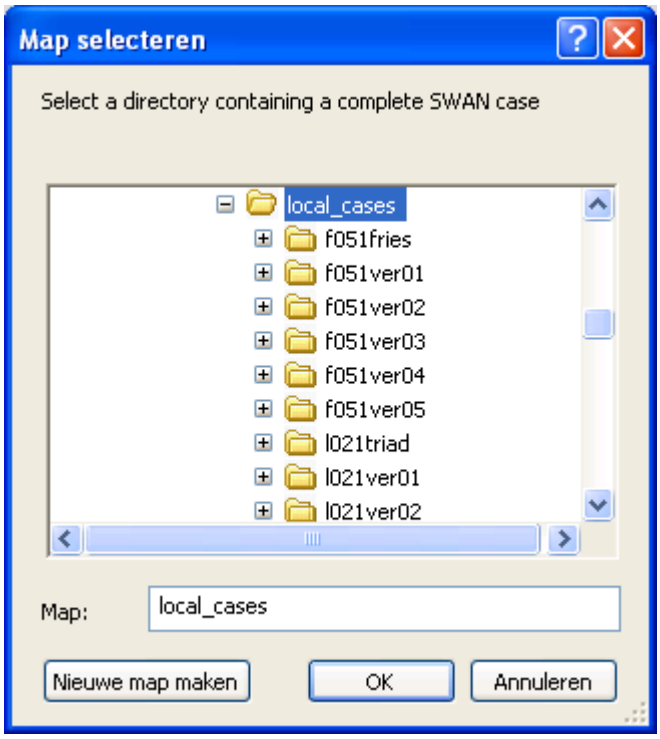


Figure 2.5 Directory selector (Windows)

2.3.8 Trying to do the impossible

When you try to do the impossible you may come across a window like this.....

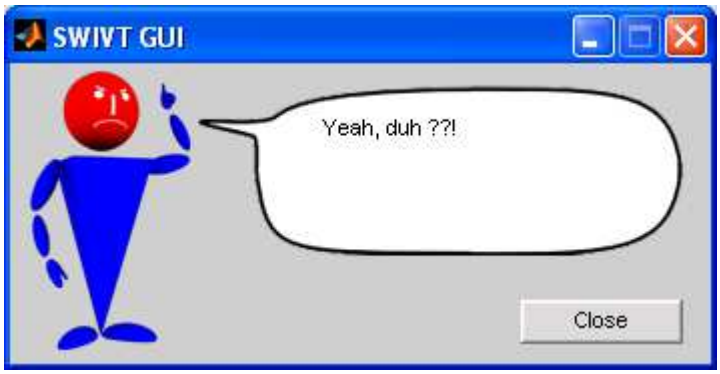


Figure 2.6 Trying to do the impossible

2.3.9 Close

The SWIVT application, and also most windows, can be closed by clicking the cross in the top right hand corner. All changes made in that part of SWIVT will be lost!

A confirmation window will appear upon closing the SWIVT application, see Figure 2.7:

Figure 2.7 Closing confirmation window

3 SWIVT Main Window

3.1 Introduction

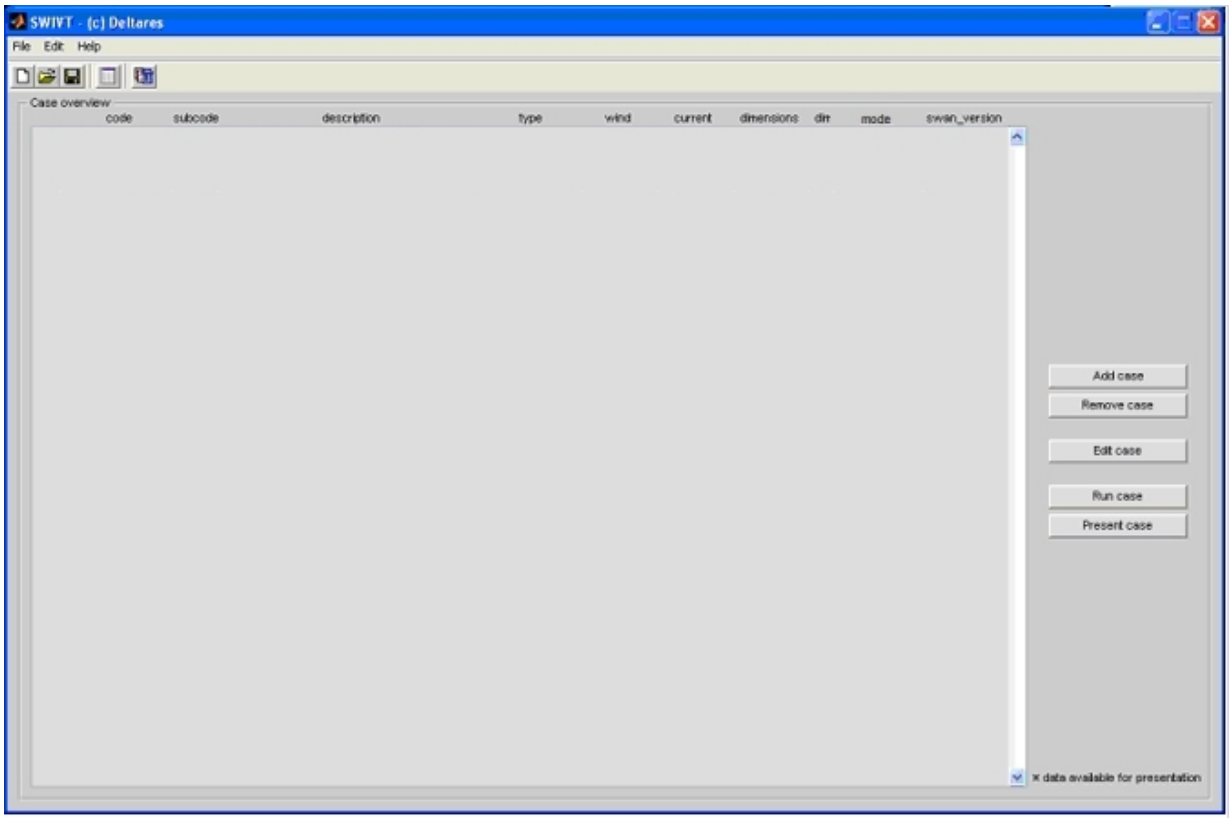


Figure 3.1 SWIVT main window

The key function of this window is to offer access to the main characteristics, called *properties*, with regard to the SWAN cases. At the start of a new session no SWAN cases are available in the case overview list. The overview section will be empty as shown in Figure 3.1.

The open and save a session buttons are described in Section 3.2. A short description of the functionality of each of the buttons on the right hand side is given in Table 3.1. The windows behind the buttons are described in turn in the next sections. The only exception is the `[Remove case]` button, which just removes the selected case, and whereby no further windows are used.

In the event of absence of an internet connection to the server, the `[Add case]` button will be disabled. This button can be enabled by entering the correct server name (if available) in the File/Preferences menu. Entering a server name to which SWIVT cannot connect will result in an error message.

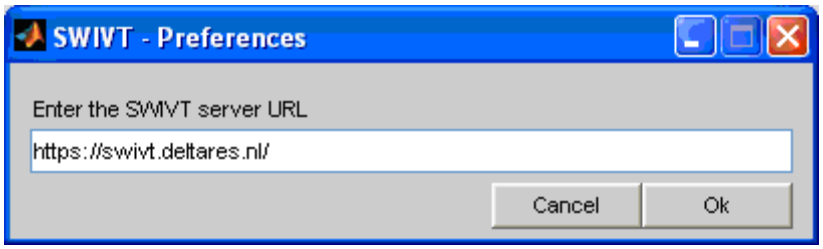


Figure 3.2 SWIVT Preferences window for editing the SWIVT server URL

Table 3.1 Buttons on the main screen

BUTTON	DESCRIPTION
Add case	Add one or more SWAN cases to the overview list. Cases can be retrieved from the SWIVT server or loaded from the local system. This functionality is described in detail in Section 3.2.
Remove case	Remove one or more selected SWAN cases from the overview list.
Edit case	Edit the parameter settings of a SWAN case. This functionality is described in detail in Section 3.5.
Run case	Run one or more SWAN cases *with their associated SWAN executable*. Note that cases are by definition different (even if the input files are identical) if they are associated with another SWAN executable (Section 3.5.3).
Present case	Plot the results and compute the statistical scores. A predefined or user–defined set of graphs and tables is plotted (Section 3.7).

A legend indicating that data is available for presentation if the casename is preceded by a is placed on the bottom right of the page. An example is given in Section 3.4.1.

Please note that in the remainder of this chapter terms are used like casename, code, subcode, etc. These are explained in detail in the Technical Reference (**Dekker et al 2022a**) and summarised in Chapter 4.

3.2 Open and save an existing SWIVT session

As described in Section 2.2 SWIVT will, unless explicitly specified otherwise, reopen the last session during start–up. Once SWIVT is started the new button on the top left of the main window can be used to start a new session.

The save button on the toolbar can be used to save a SWIVT session. The user is prompted to select an existing directory, or to make a new directory to save the session in. The **code_subcode** subdirectories, their contents and a **.set* file (a Matlab file) with the internal SWIVT parameters will be saved in this directory. The user is free to choose the name of the directory.

IMPORTANT: Any existing sessions in a directory will be deleted when a new session is saved in this directory. This implies that a directory can only contain at most one saved session. Furthermore this directory should not be a subdirectory of **sessions**, as the **sessions** directory will be emptied when the `swivt('new')` command is used.

To reopen a session, use the open button on the toolbar of the main window. The Session Selector will appear (see Figure 3.3) after the session number has been selected on the left. The case(s) enclosed in a session can

be seen on the right once an appropriate directory has been selected. When the session is selected the whole session is copied to a new **sessioniii** directory and the cases will appear on the overview screen.

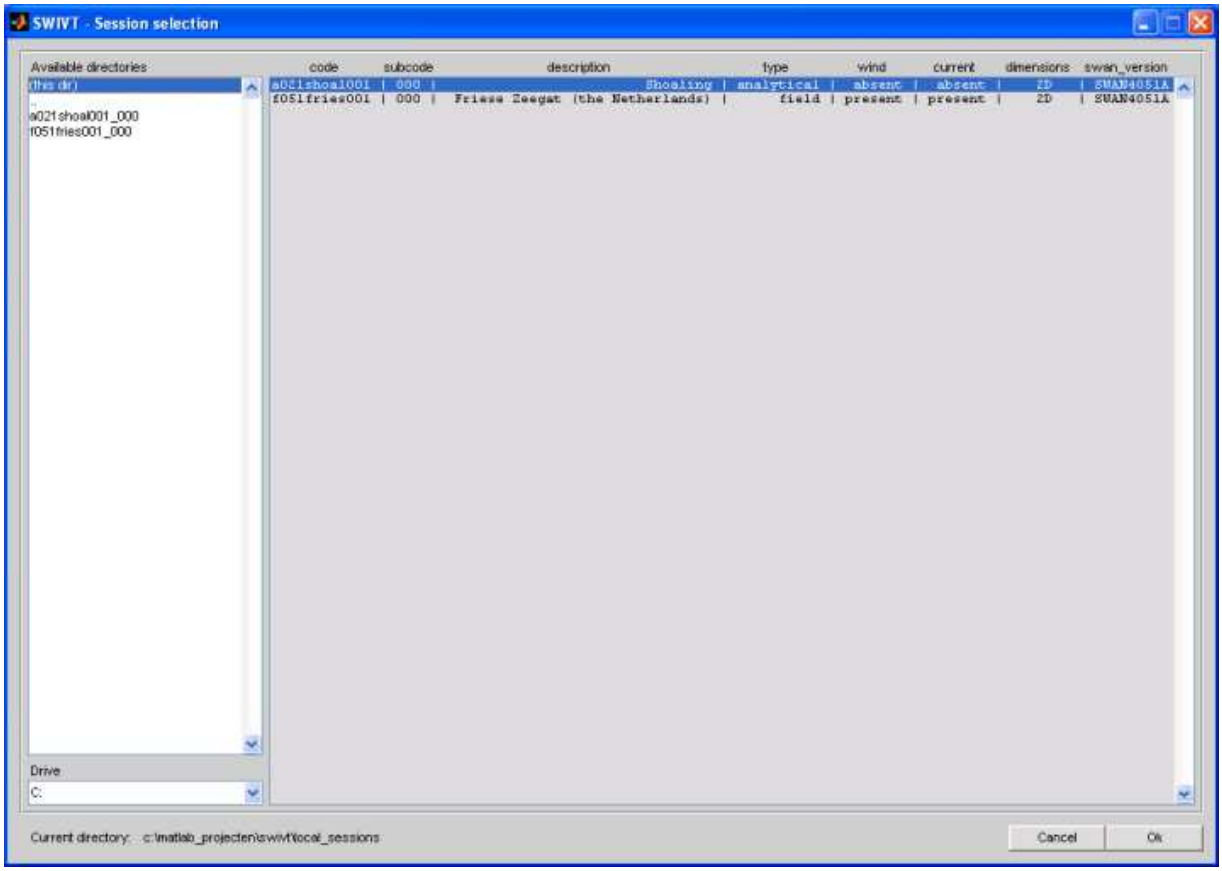


Figure 3.3 Session Selector

Selecting a previous session will result in transferring the
More information on the directories can be found in Section 2.2.

3.3 Clear all sessions or log files

Removing the old sessions from your computer can be done in two ways:

1. Start SWIVT using the following command (see also Section 2.2):

```
>> swivt('new')
```

2. Use the Clear all sessions option in the File menu on the main screen.

Removing the old log files can be done by using the Clear all log files option in the File menu on the main screen. (Log files are described in Section 3.6.1)

3.4 Add case

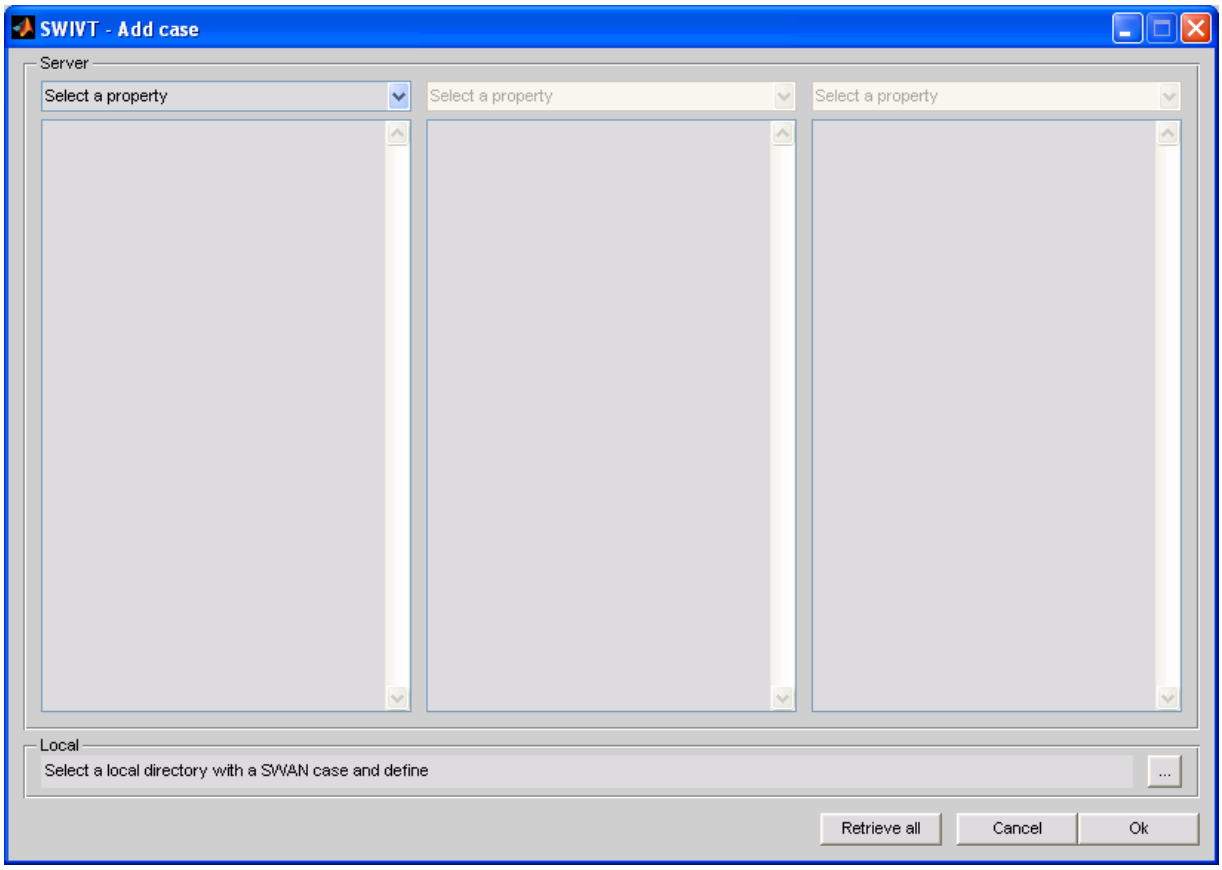


Figure 3.4 Add case window

The Add case window offers the user two, mutually exclusive, options:

1. Server (top part of the screen)
   Browse through all available SWAN cases on the SWIVT server. When this window is opened the SWIVT GUI automatically retrieves all browsable properties from the SWIVT server.
2. Local (bottom part of the screen)
   The user can browse his or her local system and select a SWAN case directory. Consequently he has to describe this case with the same properties as are used for the SWAN cases on the SWIVT server. Only in this way all cases, whether they are locally or remotely selected, can be treated in a uniform way by the SWIVT GUI.

3.4.1 Adding cases from server

For the moment, up to three properties (cf. with the columns in the Add case window) can be chosen to reduce the number of cases that will be selected from the server.
In the example below, the chosen properties are respectively wind, current and code (see Chapter 4).

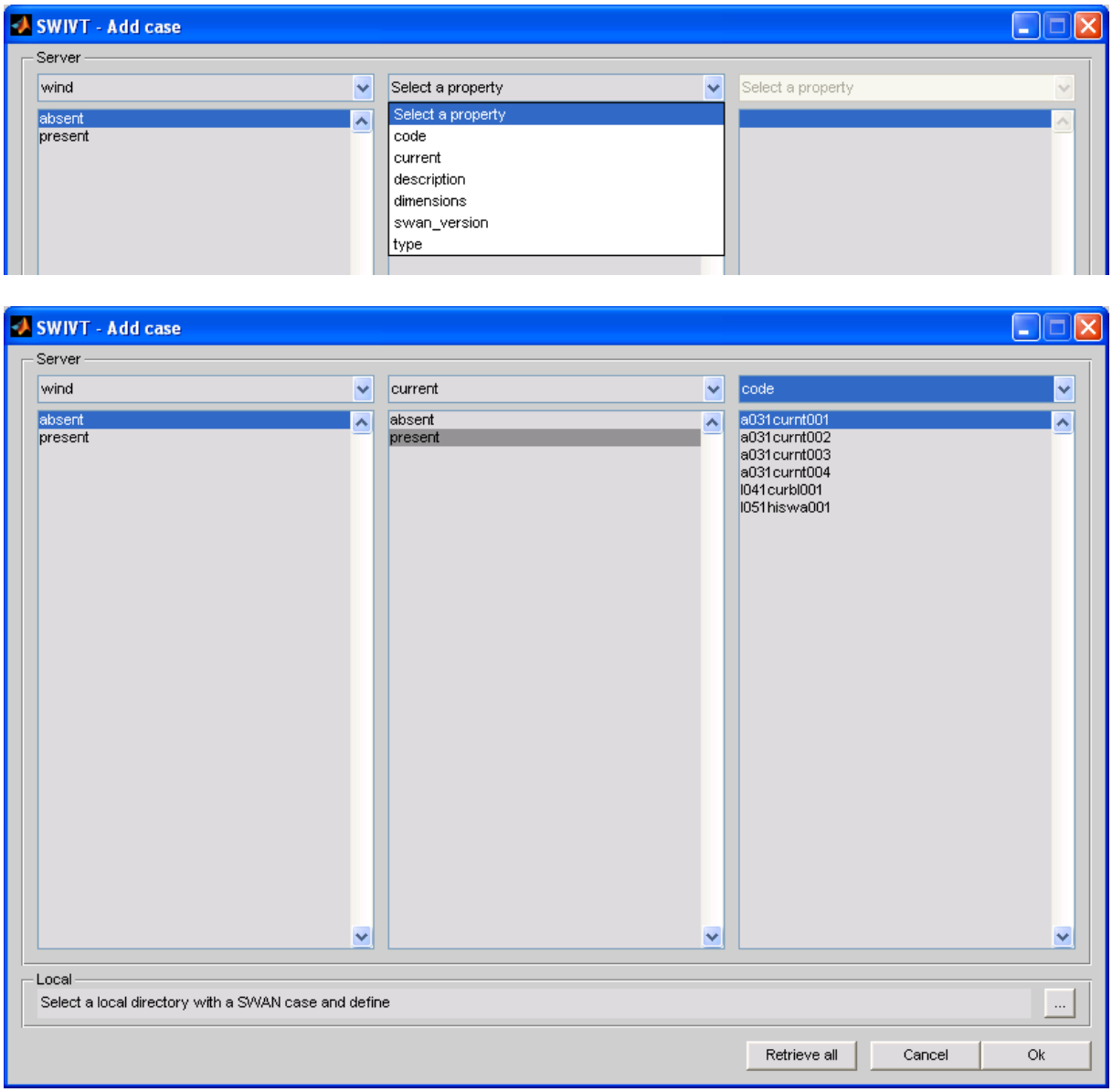


Figure 3.5 Add Case window

On pressing the `[Ok]`–button, all cases complying with the selected properties will automatically be retrieved from the SWIVT server and stored on the local system in the predefined directory structure. Note that it is possible to select cases from the complete list of codes, in other words, from the complete list of available validation cases. Only one item per list can be selected at the time, *except for the third (most right) list which is multiple selectable* (see Section 2.3.4).

It is also possible to retrieve all cases available from the server by using the `[Retrieve all]` button. A confirmation window (see Figure 3.6) will be displayed before the data is downloaded.

Please note that if the SWAN version is not explicitly chosen, all cases with the same casename and subtype, but different SWAN versions, will be retrieved.

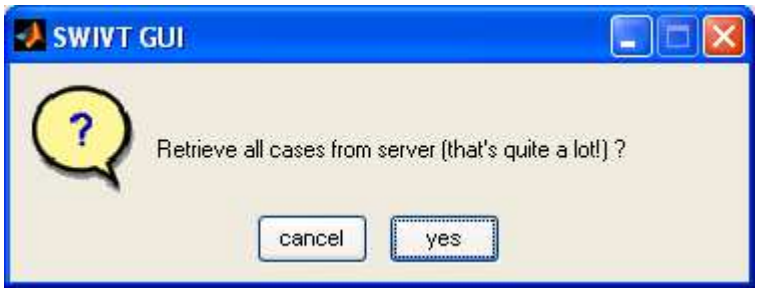


Figure 3.6 Confirmation window for retrieving all cases from the server

Retrieving the data may take a little time, depending on the amount of data requested, the window in Figure 3.7 will be displayed during this process.

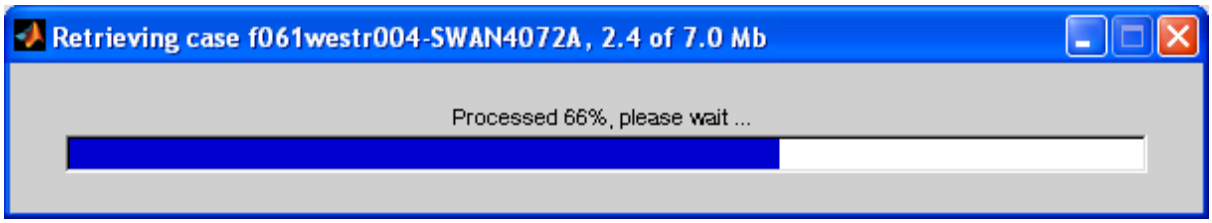


Figure 3.7 Retrieving case window

Subsequently an overview of the, now locally available, cases will be presented on the main window. Please note that in the example below properties other than those in the example above have been used.

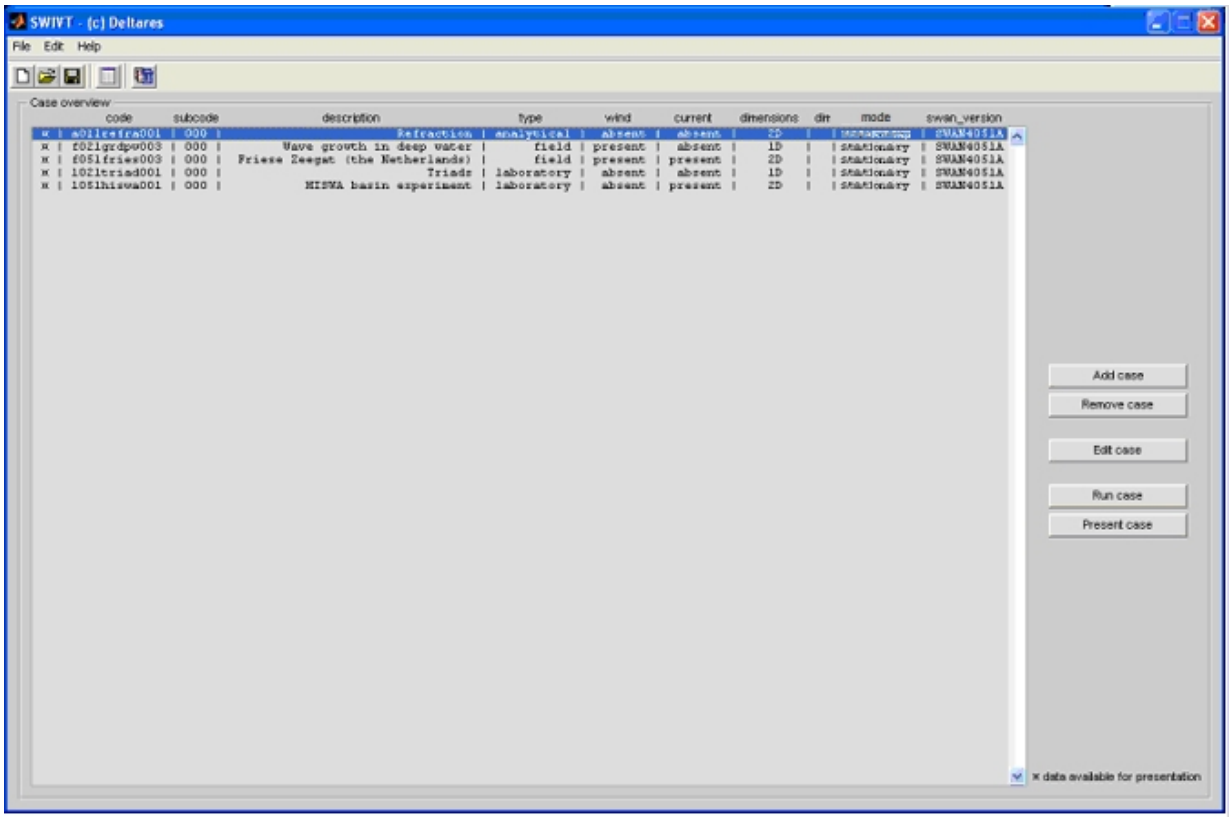
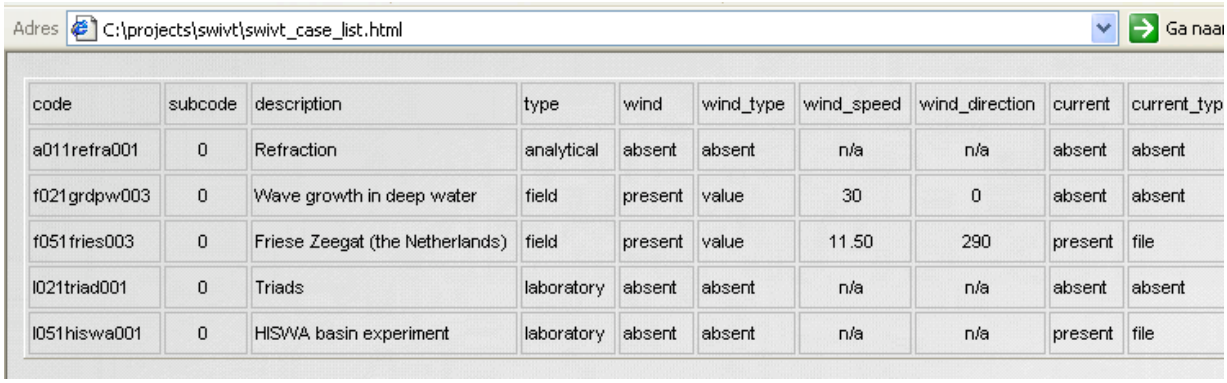


Figure 3.8 Case overview

The  button in the toolbar will generate an HTML–table with meta information on the cases: the properties, whether processes are switched on or off, where appropriate, the values of the parameters and the session location of the files associated with the cases. Part of this list is given in , as an example.



code	subcode	description	type	wind	wind_type	wind_speed	wind_direction	current	current_typ
a011refra001	0	Refraction	analytical	absent	absent	n/a	n/a	absent	absent
f021grdpw003	0	Wave growth in deep water	field	present	value	30	0	absent	absent
f051fries003	0	Friese Zeegat (the Netherlands)	field	present	value	11.50	290	present	file
l021triad001	0	Triads	laboratory	absent	absent	n/a	n/a	absent	absent
l051hiswa001	0	HISWA basin experiment	laboratory	absent	absent	n/a	n/a	present	file

Figure 3.9 Html list of cases displaying associated meta information (left most part only)

Clicking with the right mouse button on a selected line in the Case overview list gives access to menu called `Show additional information` see Figure 3.10. This feature is only available for server cases.

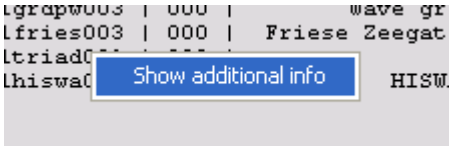
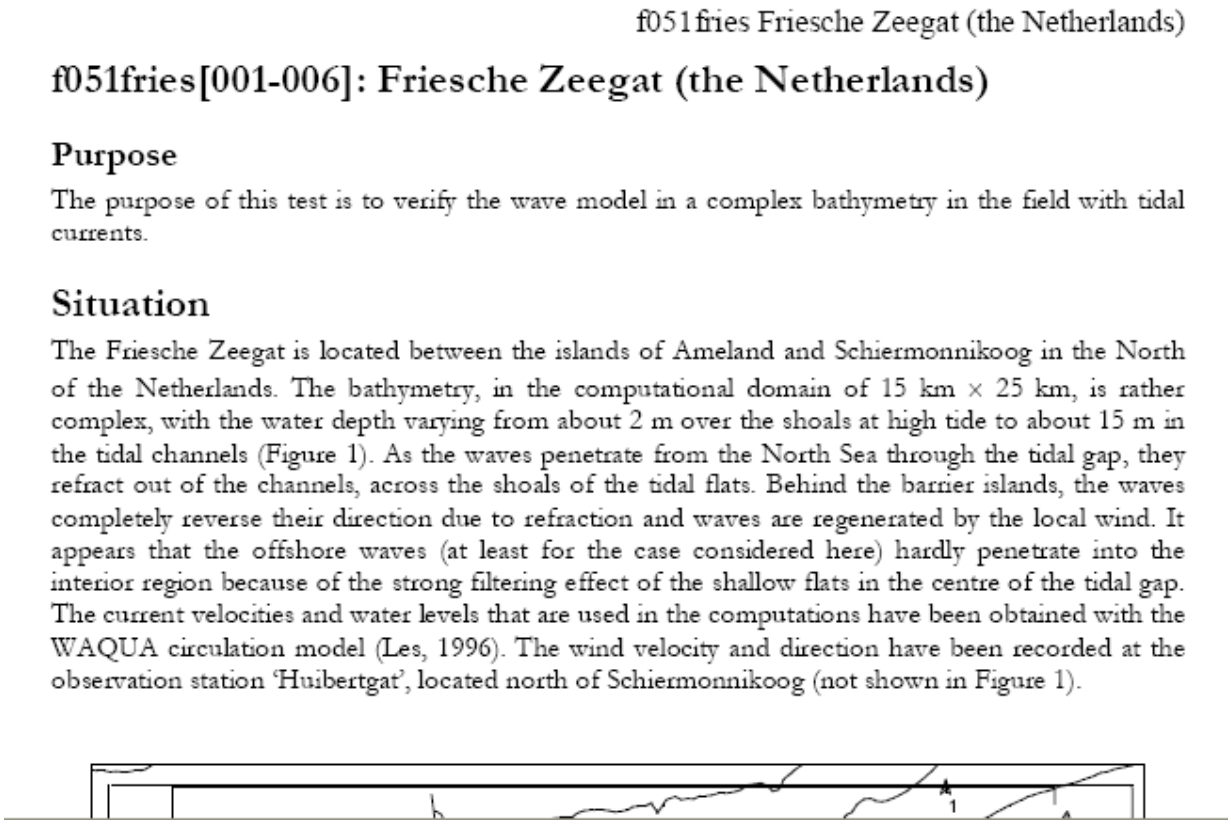


Figure 3.10 Show additional info

A document in pdf format with a description of the case will be retrieved from the SWIVT server and opened in a browser window. An example is given in Figure 3.11. Please note that, for each casename there is only one pdf, describing the case and the differences between the subtypes. These documents are also available from the download site. Click on Case meta data in the list on the top right.


f051fries Friesche Zeegat (the Netherlands)

f051fries[001-006]: Friesche Zeegat (the Netherlands)

Purpose

The purpose of this test is to verify the wave model in a complex bathymetry in the field with tidal currents.

Situation

The Friesche Zeegat is located between the islands of Ameland and Schiermonnikoog in the North of the Netherlands. The bathymetry, in the computational domain of 15 km × 25 km, is rather complex, with the water depth varying from about 2 m over the shoals at high tide to about 15 m in the tidal channels (Figure 1). As the waves penetrate from the North Sea through the tidal gap, they refract out of the channels, across the shoals of the tidal flats. Behind the barrier islands, the waves completely reverse their direction due to refraction and waves are regenerated by the local wind. It appears that the offshore waves (at least for the case considered here) hardly penetrate into the interior region because of the strong filtering effect of the shallow flats in the centre of the tidal gap. The current velocities and water levels that are used in the computations have been obtained with the WAQUA circulation model (Les, 1996). The wind velocity and direction have been recorded at the observation station 'Huibertgat', located north of Schiermonnikoog (not shown in Figure 1).

Figure 3.11 Example case description

3.4.2 Adding a case from the local system

Pressing the  button in the Local select section of the Add case window opens the standard directory selector of the current platform (Windows or UNIX). Select the required directory for which the structure should match the structure of the cases from the server.
Two subdirectories should be available:

- **model_io**
  containing both SWIVT and SWAN input files, etc.

- **observ**
  containing measurements

The content of the input files as well as their names need to satisfy certain conventions which are described in the Technical Reference document (**Dekker et al 2022a**).

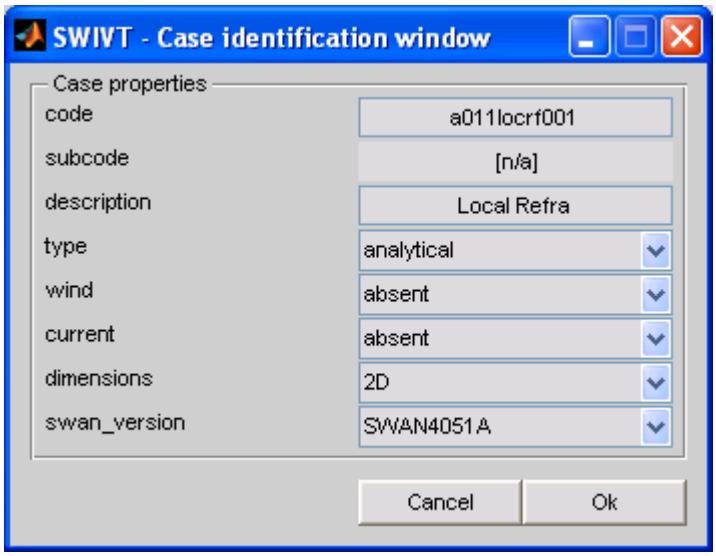


Figure 3.12 Case identification window

After the selection of a directory the Case identification window prompts the user for the definition of the selected case.

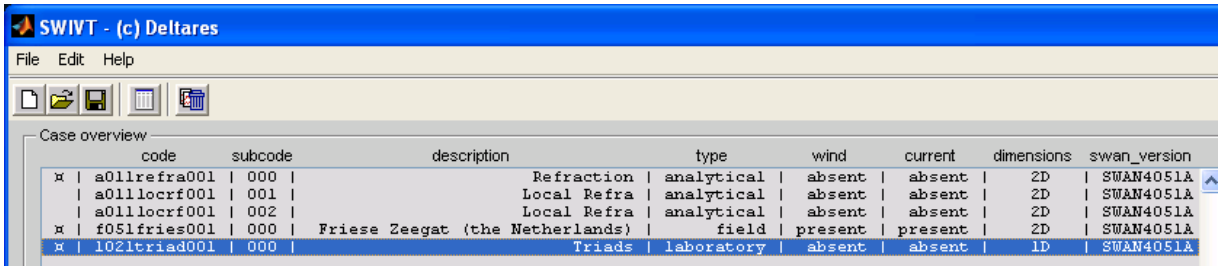


Figure 3.13 Case overview list

Subsequently the local case is added to the Case overview list of the main window. The data associated with the case is *copied* to the (local) SWIVT directory, the original data will therefore not be updated nor deleted by the SWIVT GUI in a later session.

From Figure 3.13 it is clear that the output files for the local cases are not available for presentation, as the casenames are not preceded by the ¤ mark. Once these cases have been run, the ¤ mark will be added to the overview. Output for presentation purposes is available for those cases that were retrieved from the server as these casenames are preceded by the ¤ mark.

3.5 Edit case

3.5.1 Introduction

The aim of Edit case is to introduce the facility to change the parameter settings that are supplied with the cases selected in the Case Overview window. These parameter settings comprise:

- a list of included (active) and excluded (inactive) physical processes
- the actual values of the parameters for the included physical processes
- an indication whether or not default numerical convergence parameters are to be used
- if user specified numerical convergence parameters are to be used, the actual values of these parameters

The physical processes and associated parameters, as well as the numerical convergence parameters are described in detail in the SWAN documentation [**SWAN team 2022** and **SWAN team 2022**].

In general SWIVT offers the following options for changing these parameter settings:

- edit individual parameter values.
- switch individual physical processes off or on.
- switch the use of user–specified numerical convergence parameters off or on
- select a set of predefined parameter values (ONR, HR2006, or SWAN default values).
- import a file with user–defined parameter values and (optional) switches.

Whether or not these options are available depends on the number and type of cases that are edited at the same time. A number of Edit case types are available:

- **Edit case: single case** – edit a single case at a time, see Section 3.5.2.
- edit more than one case at the same time (Edit all):
  - **Edit all case: single server case** – the case name (eg f051fries) is the same and the subcode is 000, see Section 3.5.3.
  - **Edit all case: multiple, distinct server cases** – at least one of the case names is different to the others, and the subcode is 000, see Section 3.5.4

Non–server cases, ie cases with subcodes other than 000, cannot be edited simultaneously; these cases need to be edited separately using the Single case option. A warning is issued when this is attempted:

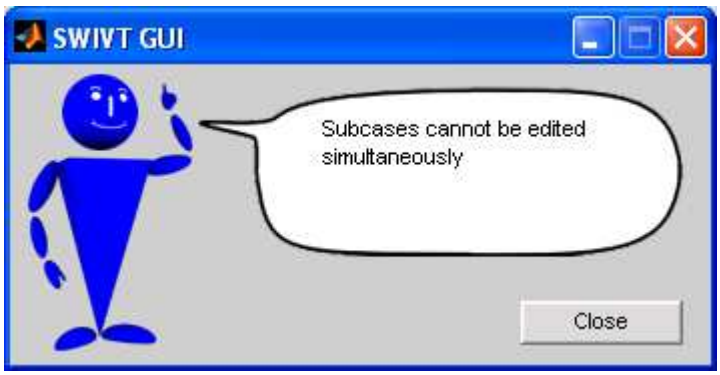


Figure 3.14 Warning issued upon attempt of simultaneously editing subcases

First select the case(s) that need to be edited. Next press the `[Edit case]` button upon which an Edit case window is displayed (see Figure 3.15, Figure 3.20 and Figure 3.21) on which the parameters can be set. This window is automatically built, based on:

- the number and type of cases to be edited
- the case properties list (upper part of window)
- the case parameter settings list (lower part of window), which are taken from the associated ***code.xml*** file (see Technical Reference (**Dekker et al 2022a**)).

The `Edit case: Single case` window is described in detail in Section 3.5.2, for the Edit all cases only the differences to the Single case are stipulated (see Sections 3.5.3 and 3.5.4).

3.5.2 Single case

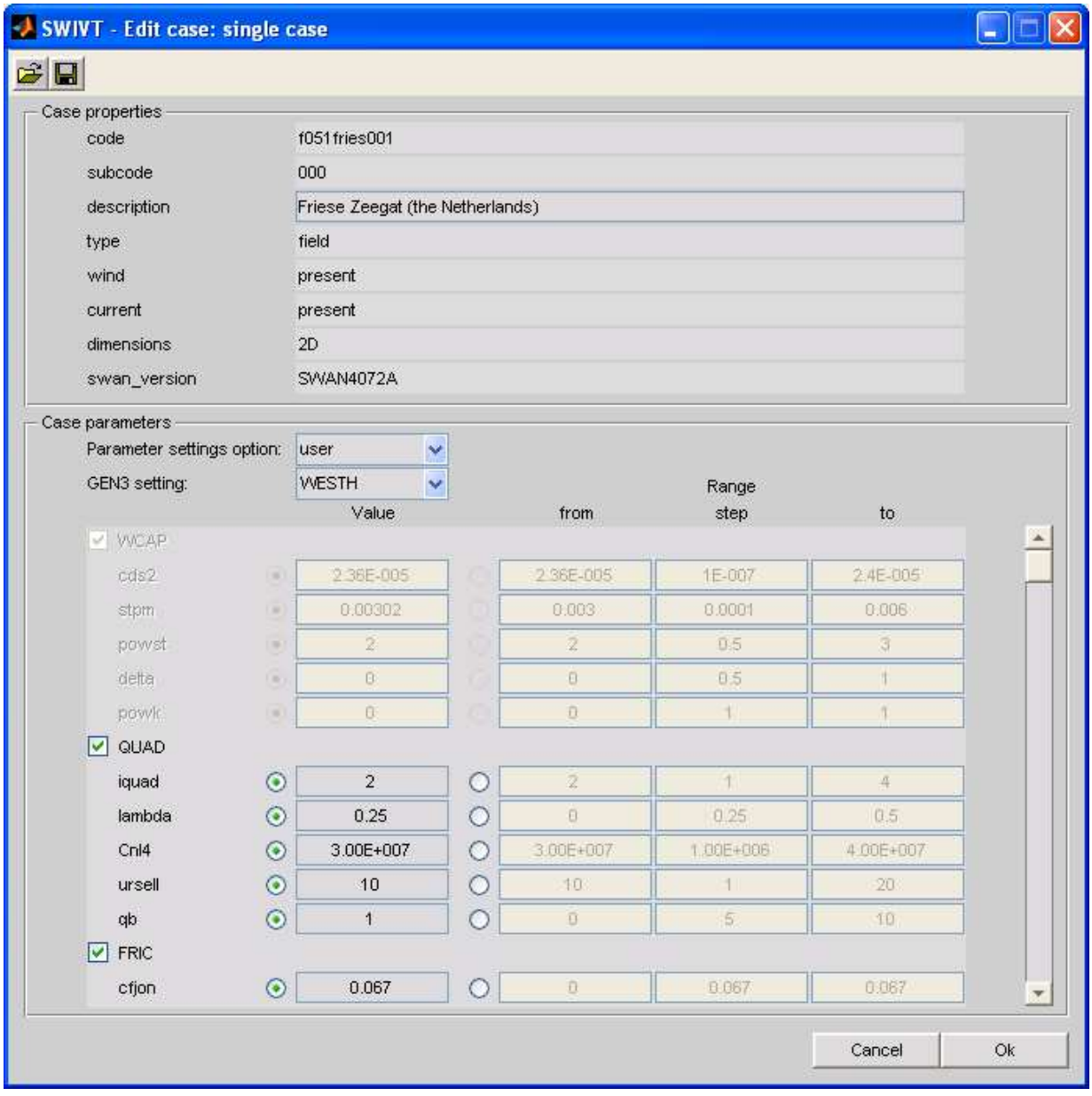


Figure 3.15 Edit case window

3.5.2.1 Case properties

Figure 3.16 Case properties

An overview of the items in the Case properties section is given in Table 3.2. The description can be edited in this window to aid in distinguishing subcases when case parameters are changed. Please note that a new subcase is generated as soon as the description is edited. Obviously this subcase will be assigned a new subcode.

Table 3.2 Case property items

PROPERTY	DESCRIPTION
code	this is the code (see Chapter 4)
subcode	this is the subcode (see Chapter 4)
description	a short description of the case
type	whether the case is an analytical, laboratory or field case
wind	whether the wind is absent or present
current	whether the current is absent or present
dimensions	whether the case is one (1D) or two (2D) dimensional
swan_version	which SWAN version is used in this case

3.5.2.2 Case parameters

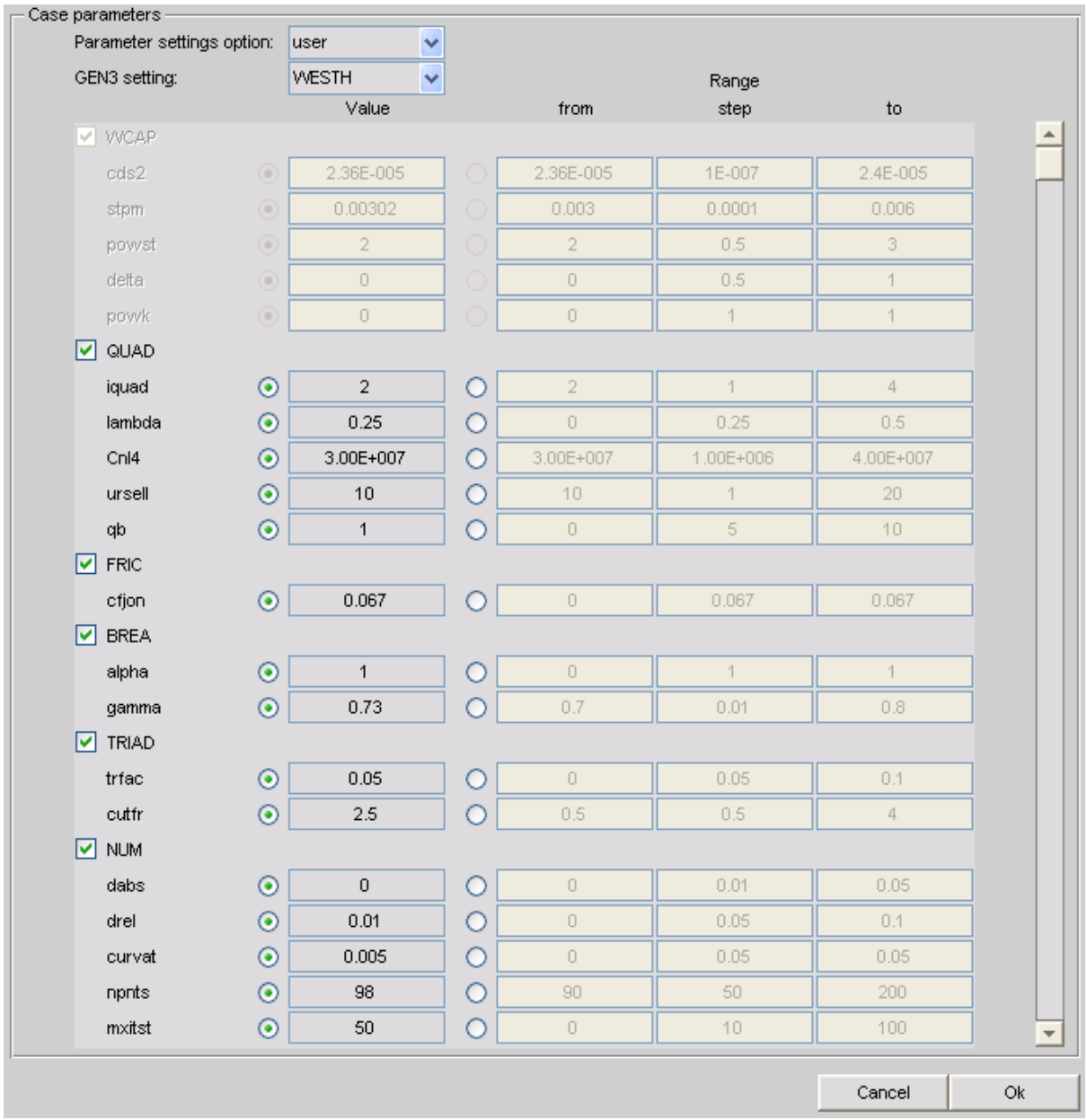


Figure 3.17 Case parameters

The user can choose predefined parameter settings for the selected case. If a physical process is switched off for the selected case, the corresponding parameters are not used, and similarly for the numerical parameters. Information on these settings and parameters is stored in an xml file (***code.xml***), which is part of the case data. For example, the physical process whitecapping is excluded from the case in Figure 3.13. In addition to the predefined parameter settings it is possible to provide user–defined settings. A description of the currently available options is given in Table 3.3.

Please note that in case of nesting, the parameter settings are identical for all nests.

Table 3.3 Description of the parameter settings options

OPTION	DESCRIPTION
user	The user can insert a new set of physical parameters through the SWIVT GUI. Please note that SWIVT issues a warning if physically unrealistic settings are chosen. User–defined settings can also be imported from an xml file (see Section 3.5.2.4).
SWAN**	This option ("SWAN defaults settings" columns in Table 3.5) comprises the SWAN default parameter settings for SWAN version ** for the included physical processes (which vary from case to case[1]).
ONR	This option refers to the settings as used in the ONR Testbed. The settings in the ONR Testbed vary from case to case, and are therefore not included in Table 3.5.
HR2006	This option (last column in Table 3.5) comprises the SWAN parameter settings as used for the computation of the Dutch Hydraulic Boundary Conditions in 2006 for the Holland Coast.

Once a predefined option is chosen (like eg ONR) and the OK button is pressed, a new subcase is created and the new values are stored in the `user` data block for this subcase. If this subcase is edited, the text `user` will again be displayed in the Parameter settings option box (and not ONR as may be expected).

Please note that a subtle, yet important, difference exists between application of the SWIVT parameter options SWAN4041A, SWAN4051A etc. as given above, and the various SWAN default settings as given in the SWAN User Manual. The same also holds for the HR2006 settings. This difference is as follows:

The SWAN User Manual and the HR2006 settings define **both** the in/exclusion of physical processes **and** the parameter values to be used. However, SWIVT **only** uses the specified parameter values from these sources. The in/exclusion of physical processes is based on the SWIVT case–specific settings, which are initially derived from the ONR testbed settings, and is defined in the xml file.

Table 3.5 gives an overview of the currently available predefined parameter settings. The physical process for which the parameter is defined, is given in the first column. A short description can be obtained by hovering over the parameter name with the mouse as displayed in Figure 3.18 (this only works if the associated physical process is selected, or if the numerical block is switched on).

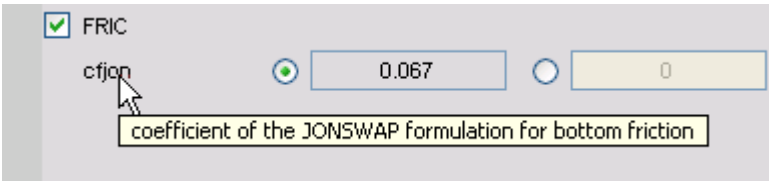


Figure 3.18 Extra information on a parameter name

For more information on an individual parameter please refer to the SWAN Technical Documentation [**SWAN team 2022**] and SWAN User Manual [**SWAN team 2022**]. However, as the definition of the whitecapping parameters, as described here, may not always be clear when referring to the SWAN documentation, it is clarified below:

[1] ie whether the physical process is included, not the default value of the SWAN parameter

The whitecapping source term in SWAN is given by:

$$S_{ds,w}(\sigma,\theta) = -\Gamma_{KJ}\tilde{\sigma}\frac{k}{\tilde{k}}E(\sigma,\theta),$$

where σ, $\tilde{\sigma}$, θ, k, $\tilde{k}$ and E denote the frequency, the mean frequency, the wave direction, the wave number, the mean wave number and 2D energy spectrum, respectively. The coefficient Γ_{KJ} is given by:

$$\Gamma_{KJ} = C_{ds2}\left[(1-\delta)+\delta\left(\frac{k}{\tilde{k}}\right)^{n_1}\right]\left(\frac{\tilde{s}}{\tilde{s}_{PM}}\right)^{2n_2}.$$

In this expression, $\tilde{s}$ stands for the overall wave steepness, and $\tilde{s}_{PM}$ is the value of $\tilde{s}$ for the Pierson–Moskowitz spectrum: $\tilde{s}_{PM} = \sqrt{3.02*10^{-3}}$. Parameters C_{ds2}, δ, n_1 en n_2 are tunable coefficients. These are given in the table below (third column), whereby it should be noted that the input parameter stpm is the squared value of s_{PM}. The parameters `powst` and `powk` are not listed in the SWAN User Manual, but can be tuned with SWIVT.

Table 3.4 Predefined key settings with list of associated parameters

PROCESS/KEY	PLACEHOLDER[2]	KEY ADDED IN SWIVT	ASSOCIATED PARAMETERS AVAILABLE IN SWIVT (MORE INFORMATION IN TABLE 3.5)
Mode	GEN3	GEN3	
Whitecapping	WCAPON	WCAP KOM	cds2, stpm, powst, delta, powk
	WCAPOFF	OFF WCAP	
	WCAP1ON	WCAP WESTH	cds2, br, p0, powst, powk, nldisp, cds3, powfsh
	WCAP1OFF	OFF WCAP	
Quadruplets	QUADON	QUAD	iquad, lambda, Cnl4
	QUADON	LIMITER	ursell, qb
	QUADOFF	OFF QUAD	
Breaking	BREAON	BREA CON	alpha, gamma
	BREAOFF	OFF BREA	
	BREA1ON	BREA WESTH	alpha, pown, bref , shfac
	BREA1OFF	OFF BREA	
Triads	TRIADON	TRIAD	trfac, cutfr
	TRIADOFF	$	
Bottom friction	FRICON	FRIC JONSWAP	cfjon
	FRICOFF	$	
Numerical refraction	NUMREFRLON	NUM REFRL	frlim, power
	NUMREFRLOFF	$	
Numerical convergence	NUMON	NUM STOPC	dabs, drel, curvat, npnts
	NUMON	NUM STAT	mxitst
	NUMOFF	$	

[2] The 'ON' placeholder is removed and the 'OFF' "placeholder is replaced by a '$' if the process is switched on and vice versa.

Table 3.5 Predefined parameter settings

PROCESS	COMMAND FILE PARAMETER	MATHEMATICAL SYMBOL IN SWAN DOCUMENTATION	SWAN DEFAULT SETTINGS				HR2006 SETTINGS
			40.41A 40.51A 40.72A	40.72 ABCDE	40.81	40.91 41.01 41.10 41.20A 41.31AB	
Whitecapping (WCAPON, WCAPOFF)	KOM						
	cds2[3]	C_{ds2}	2.36E–5	2.36E–5	2.36E–5	2.36E–5	2.36E–5
	stpm[3]	$\tilde{s}_{PM}^2$	3.02E–3	3.02E–3	3.02E–3	3.02E–3	3.02E–3
	powst[3]	n_2	2.0	2.0	2.0	2.0	2.0
	delta[3]	δ	0	0	0	0	1
	powk[3]	n_1	0.0	0.0	0.0	1.0	1.0
Whitecapping (WCAP1ON, WCAP1OFF)	WESTH						
	cds2	C_{ds2}	–	5.0E–5	5.0E–5	–	–
	br		–	1.75E–3	1.75E–3	–	–
	p0		–	4.0	4.0	–	–
	powst	n_2	–	0.0	0.0	–	–
	powk	n_1	–	0.0	0.0	–	–
	nldisp		–	0	0	–	–
	cds3		–	1.5	1.5	–	–
	powfsh		–	1.0	1.0	–	–
Quadruplets	QUAD						
	iquad	iquad	2	2	2	2	8
	lambda	λ_{nl4}	0.25	0.25	0.25	0.25	0.25
	Cnl4	C_{nl4}	3.0E7	3.0E7	3.0E7	3.0E7	3.0E7
	LIMITER						
	ursell	Ur	10.0	10.0	10.0	10.0	10.0
	qb	q_B	1.0	1.0	1.0	1.0	10.0
Bottom friction	JONSWAP						
	cfjon	$C_{ds,bot}$	0.067	0.067	0.067	0.067	0.038[4]
Breaking (BREAON, BREAOFF)	CON						
	alpha	α_{BJ}	1.0	1.0	1.0	1.0	1.0
	gamma	γ_{BJ}	0.73	0.73	0.73	0.73	0.73

[3] see above

[4] Note that the value for cfjon used in the HR2006 computations depends on the deepwater statistics peak period in location ELD: cfjon=0.038 if Tp>10s, and cfjon=0.067 if Tp<10s. This data is not available in SWIVT. Therefore, the user must select a suitable value.

PROCESS	COMMAND FILE PARAMETER	MATHEMATICAL SYMBOL IN SWAN DOCUMENTATION	SWAN DEFAULT SETTINGS				HR2006 SETTINGS
			40.41A 40.51A 40.72A	40.72 ABCDE	40.81	40.91 41.01 41.10 41.20A 41.31AB	
Breaking (BREA1ON, BREA1OFF)	WESTH						
	alpha	α_{BJ}	–	0.98	0.98	–	–
	pown		–	2.5	2.5	–	–
	bref		–	–1.3963	–1.3963	–	–
	shfac		–	500	500	–	–
Triads	TRIAD						
	trfac	α_{EB}	0.1	0.05	0.05	0.05	0.1[5]
	cutfr	$f_{\max,EB}$	2.2	2.5	2.5	2.5	2.2[5]
Numerical refraction	REFRL						
	frlim		–	0.2	0.0	0.0	–
	power		–	2	0	0	–
GEN3 setting			KOM	KOM	KOM	KOM	KOM
Numerical convergence criteria	STOPC						
	dabs		0	0	0	0	0
	drel		0.01	0.01	0.01	0.01	0.01
	curvat		0.005	0.005	0.005	0.005	0.005
	npnts		98	98	98	98	98
	STAT						
	mxitst		15	15	15	15	15
	mxitns					15	

Please note that :

- the options `User` and `ONR` (see Table 3.3) are not included in Table 3.5:
  - The option `ONR` implies that the parameter settings as used in the ONR Testbed are taken. These parameter settings, including the in/exclusion of physical processes, vary from case to case, and can therefore not be included in Table 3.4. In addition, the `ONR` option can only be selected for cases that were originally present in the ONR Testbed. It is not defined for other cases.
  - The option `User` means that the user is free in providing the parameter values and physical processes. Please note, that as soon as one parameter or physical process setting is changed, the `User` option is switched on, even if a different option was selected in the first place.
- the use of WESTH whitecapping and breaking was introduced in SWAN4072ABCDE, but removed from SWAN 4091.
- if the third generation mode for wind input, quadruplet interactions and whitecapping (GEN3) is set to WESTH, the whitecapping is automatically set to WCAP WESTH, if it is set to KOM the whitecapping is

[5] in the original HR2006 settings, the process triad interaction was excluded. This means that there were no HR2006 values for the triad parameters trfac and cutfr. When applying SWIVT however, a user may want to employ the HR2006 parameter values **and** activate the process triad interaction at the same time. In that particular case SWIVT needs to propose default values for trfac and cutfr. We have selected the SWAN 40.41 default values for these parameters, since the HR2006 computations were performed with SWAN version 40.41.

set to KOM. Obviously if whitecapping was switched off in the first place, it stays off. For more information on these modes please refer to **SWAN team 2022**.

For a discussion of the above described theory in conjunction with some examples please refer to Appendix A.1.1.

3.5.2.3 Range of values

The option to switch from one value to a range of values is also available for each parameter. Using this option will result in a **new subcase for each value in the range**. Choosing this option for a number of parameters might therefore generate a huge amount of cases, and it should be used with care! This option is not available for the Edit all cases.

In the example given in Figure 3.19, four subcases are generated, using the values 0, 0.022, 0.044 and 0.066 for `cfjon`. Please note that the end value is not used, it only marks the end of the range. Edit the case again if you want a case with this value to be included. These subcases will be displayed in the case overview section of the main window.

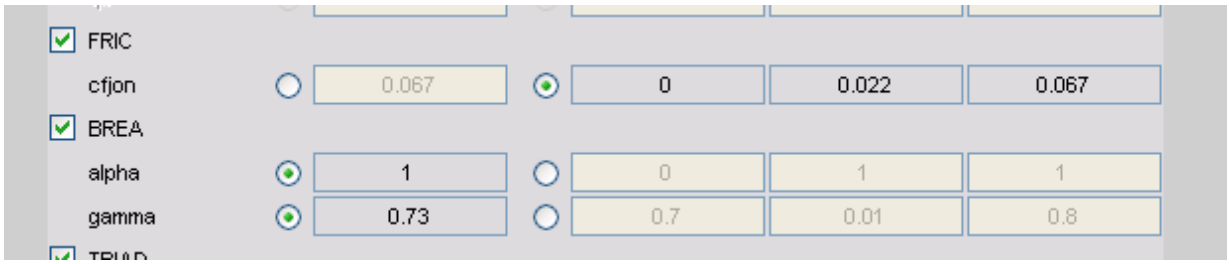


Figure 3.19 Range example

A list of minimum and maximum values is used by SWIVT to warn the user that the chosen value may be unrealistic when this value lies outside the associated range. These values are given in Table 3.6.

Table 3.6 Minimum and maximum values for parameters

PROCESS	PARAMETER	MINIMUM	MAXIMUM
WCAP	cds2	0	4.00E–5
	stpm	0.00	6.00E–3
	powst	0	4
	delta	0	1
	powk	0	2
WCAP1	cds2	0	4.00E–5
	br	0.00	5.25E–3
	p0	0	12
	powst	0	4
	powk	0	2
	nldisp	0	1
	cds3	0	4.5
	powfsh	0	3
QUAD	iquad	1 2 3 4 6 8 51 52 53	
	lambda	0	1
	Cnl4	0	5.00E7

PROCESS	PARAMETER	MINIMUM	MAXIMUM
	ursell	1	20
	qb	0	20
FRIC	cfjon	0.0	0.2
BREA	alpha	0	2
	gamma	0.0	1.5
BREA1	alpha	0	2
	pown	0	0.75
	bref	–4.19	0
	shfac	0	1500
TRIAD	trfac	0.0	0.30
	cutfr	0.5	8.0
NUMREFRL	frlim	0	0.6
	power	0	6
NUM	dabs	0	0.05
	drel	0	0.1
	curvat	0	0.05
	npnts	90	101
	mxitst	0	100
	mxitns	0	100
	deltc	1	24
	deltblk	1	24
	deltspc	1	24
	alfa	0	1

3.5.2.4 Import and save user defined settings

For each case the physical and numerical settings, that can be altered using SWIVT, are stored in the file ***code**.xml* which is part of the case data (see Section 3.5.2.1). However, it is also possible to import user–defined settings from another (additional) xml file by using the open button at the top left of the Single Case Edit Case window (see Figure 3.15). This means that the user can define his/her own 'favourite' physical or numerical parameter settings, ie is free to include or exclude physical processes and adjust relevant parameter values. The imported xml file overrules the ***code**.xml* file.

These user–defined settings are included in the standard case–specific xml (***code**.xml*) file once the `[Ok]` button is used. A new case is generated each time the `[Ok]` button is used and one or more parameters have been changed. This new case is stored with a new subcode which is visible in the Case overview list (see Figure 3.13).

Similarly the save button can be used to store the chosen settings in a separate xml file, only the user–defined block will be stored in this file. This file will always include the `<selected>` tag.

An example of an additional xml file is given below:

```
<?xml version="1.0" encoding="utf-8"?>
<ROOT xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="https://swivt.deltares.nl/swivt.xsd">>
        <swivt>
                <case>
                        <code>f051fries001</code>
                        <settings>
```

```
                        <physics>
                                <GEN3>
                                        <model>KOM</model>
                                </GEN3>
                                <WCAP>
                                        <selected>on</selected>
                                        <cds2>2.36e-005</cds2>
                                        <stpm>0.00302</stpm>
                                        <powst>2</powst>
                                        <delta>0</delta>
                                        <powk>0</powk>
                                </WCAP>
                                <WCAP1>
                                        <selected>off</selected>
                                        <cds2>5e-005</cds2>
                                        <br>0.00175</br>
                                        <p0>4</p0>
                                        <powst>0</powst>
                                        <powk>0</powk>
                                        <nldisp>0</nldisp>
                                        <cds3>1.5</cds3>
                                        <powfsh>1</powfsh>
                                </WCAP1>
                                <QUAD>
                                        <selected>on</selected>
                                        <iquad>2</iquad>
                                        <lambda>0.25</lambda>
                                        <Cnl4>30000000</Cnl4>
                                        <ursell>10</ursell>
                                        <qb>1</qb>
                                </QUAD>
                                <FRIC>
                                        <selected>on</selected>
                                        <cfjon>0.067</cfjon>
                                </FRIC>
                                <BREA>
                                        <selected>off</selected>
                                        <alpha>1</alpha>
                                        <gamma>0.73</gamma>
                                </BREA>
                                <BREA1>
                                        <selected>on</selected>
                                        <alpha>0.98</alpha>
                                        <pown>2.5</pown>
                                        <bref>-1.3963</bref>
                                        <shfac>500</shfac>
                                </BREA1>
                                <TRIAD>
                                        <selected>on</selected>
                                        <trfac>0.05</trfac>
                                        <cutfr>2.5</cutfr>
                                </TRIAD>
                                <NUMREFRL>
                                        <selected>off</selected>
                                        <frlim>0.2</frlim>
                                        <power>2</power>
                                </NUMREFRL>
                                </user>
                        </physics>
                        <numerics>
                                <user>
                                        <NUM>
                                                <selected>on</selected>
                                                <dabs>0</dabs>
                                                <drel>0.01</drel>
                                                <curvat>0.005</curvat>
                                                <npnts>98</npnts>
                                                <mxitst>50</mxitst>
                                        </NUM>
                                </user>
                        </numerics>
                </settings>
        </case>
    </swivt>
</ROOT>
```

The <selected> tag is optional. This results in two options:

- include the <selected> tag, thereby explicitly specifying which physical process to include or exclude.

- omit the `<selected>` tag, thereby using the already present physical processes (as defined in the file ***code**.xml*). This may result in values specified in the xml file not being used if the associated physical process was switched off in the first place.

The difference can be explained as follows. Suppose the user has selected the following two testcases: `l021triad001` (1D Beji–Battjes bar) and `f021grdpw001` (wave growth in deep water). In the default setting of `l021triad001` triad interaction is included, whereas in `f021grdpw001` triad interaction is excluded. The following three options are possible:

- If the `<selected>` tag is included and 'on' for the process triad interaction, then both cases are run including triad interaction and using the parameter values as specified in the xml file.
- If the `<selected>` tag is included and 'off' for the process triad interaction, then both cases are run excluding triad interaction.
- If the `<selected>` tag is excluded, then the testcase `l021triad001` is run including triad interaction and using the parameter values as specified in the xml file, and the testcase `f021grdpw001` is run excluding triad interaction.

Example files are supplied with SWIVT: *UserParamValuesWithProcess.xml,* which includes the `<selected>` tag, and *UserParamValuesWithoutProcess.xml,* which excludes the `<selected>` tag. These files may be edited by the user to achieve the required settings prior to importing them in SWIVT.

3.5.3 Edit all case: single server case

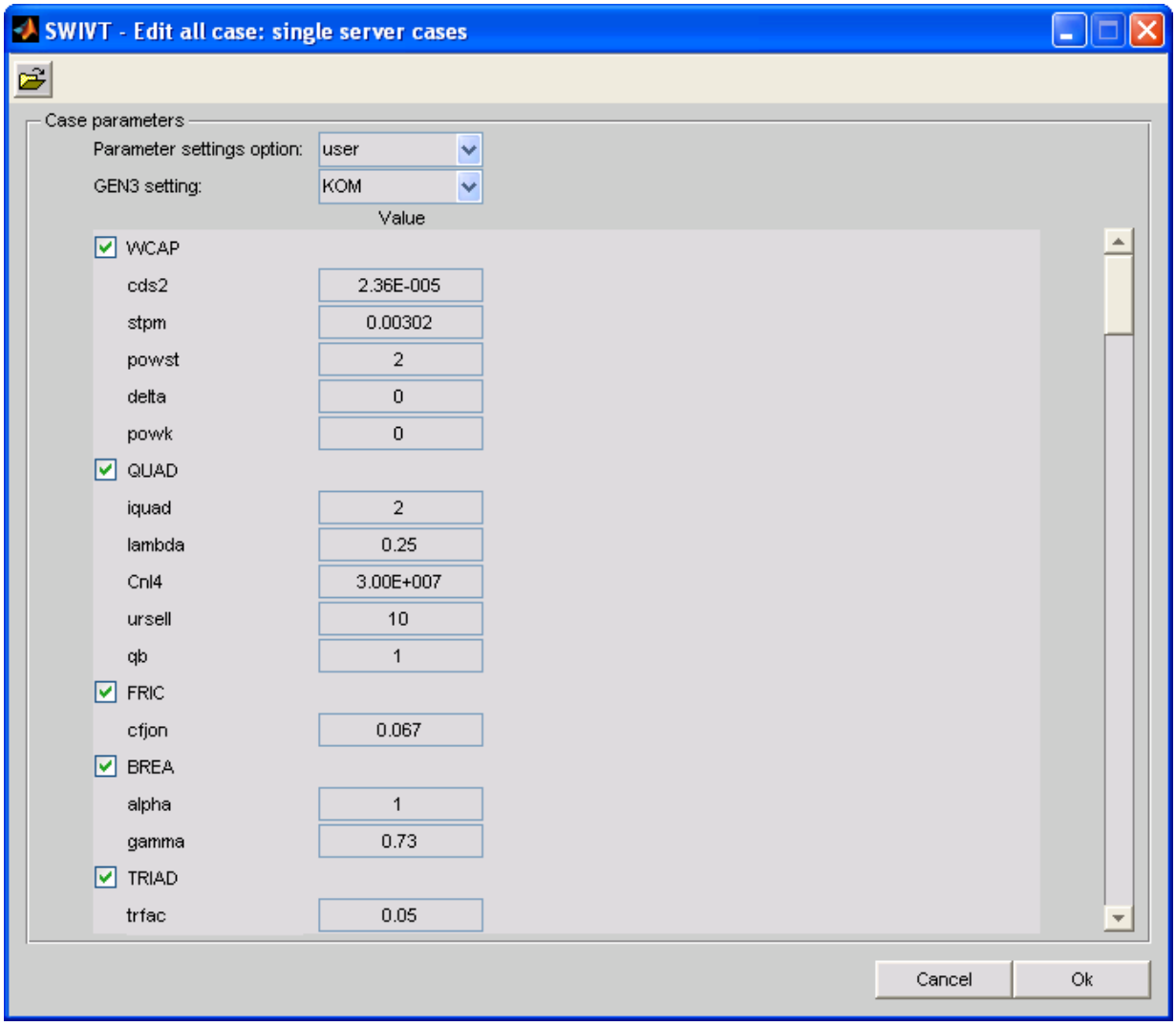


Figure 3.20 Edit all case window: single server cases

This option is used for cases which bear the same casename (eg f051fries). Furthermore, the cases are servercases, thus the subcase code is 000. This **assumes** that the physical processes for these cases are identical. It is possible to switch the physical processes and the use of user–defined numerical parameters on or off as required. Furthermore parameter values can be changed. The GEN3 parameter can be changed provided the SWAN version for all cases is 4051A or above. If one of the cases is run with SWAN4041A the GEN3 parameter is fixed to the value KOM for all cases. More information on the processes and parameters can be found in Section 3.5.2. The new settings will then be imposed on all the selected cases, and for each case a new subcase is generated.

The parameters associated with the newly introduced keywords for SWAN4072ABCDE cannot be used in earlier versions of SWAN. This means that a SWAN4072ABCDE case cannot be run with earlier SWAN versions via SWIVT. On the other hand, cases generated for earlier SWAN versions cannot be run by SWAN4072ABCDE, however, all cases available from the server have also been adapted for SWAN4072ABCDE. In order to compare a run with eg SWAN4041A to SWAN4072ABCDE for a servercase, both cases need to be retrieved from the server en run with the associated SWAN version (output may be available for the default settings).

An overview of possible options as illustrated above is given in Table 3.7.

Table 3.7 Settings versus SWAN versions

	4041A, 4051A	4072A	4072ABCDE, 4081	4091, 4101, 4110, 4131AB	ONR	HR2006
4041A	1	0	0	0	1	1
4051A	1	0	0	0	1	1
4072A	1	1	0	0	1	1
4072ABCDE	0	0	1	0	0	0
4081	0	0	1	0	0	0
4091	0	0	0	1	0	0
4101	0	0	0	1	0	0
4110	0	0	0	1	0	0
4131AB	0	0	0	1	0	0

3.5.4 Edit all case: multiple, distinct server cases

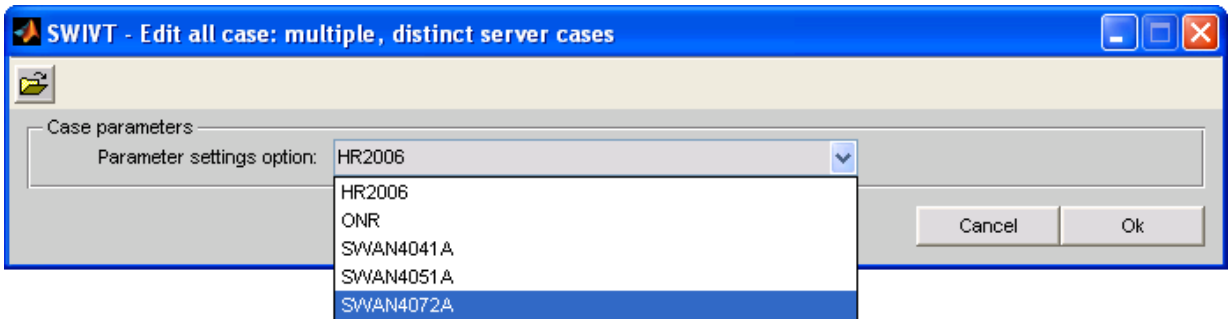


Figure 3.21 Edit case window: multiple, distinct server cases

As for this option the cases are in general non–related cases, it is only possible to select complete new parameter value sets, eg `HR2006`, `SWAN4041A`, `ONR` etc. Obviously this includes the option of loading a user–defined parameter set using the open button on the top left. More information on the processes and parameters can be found in Section 3.5.2. The new settings will be imposed on all the selected cases, and for each case a new subcase is generated.
It should be noted that in this situation it is not possible to switch physical processes or numerical convergence criteria on or off as this setting is part of the case definition, and may differ from case to case. Also the `GEN3` parameter cannot be changed.

3.6 Run case

Pressing the `[Run case]` button will start the execution of SWAN for the selected case(s); selection can be done by means of the mouse, see Section 2.3.4. Before actually running the case(s), it is possible to decide whether or not to generate output after the run, see Figure 3.22. If output is to be generated the following can also be set:

- whether to us a generic presentation template
- whether to use case specific presentation templates
- selecting the required templates
- the page layout.

These options are described in detail in Section 3.7.

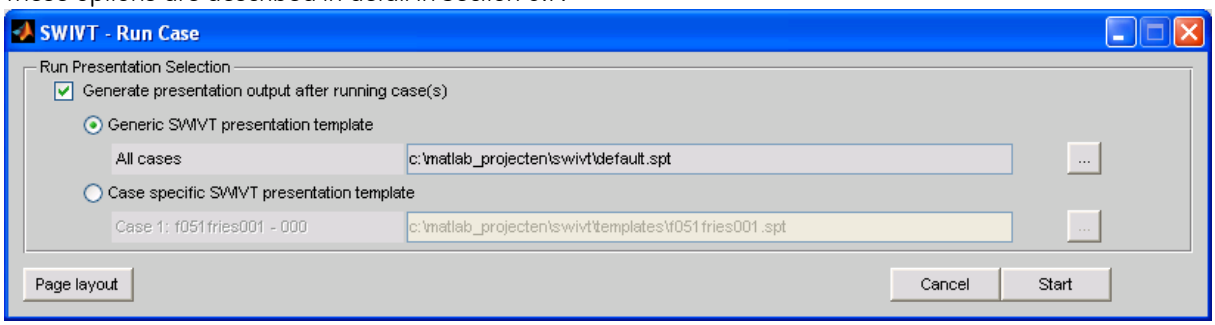


Figure 3.22 Run Presentation Selection window

The actual run(s) will start after pressing the `[Start]` button. To avoid carrying out the run use the `[Cancel]` button. One of the windows given in Figure 3.23 will be displayed whilst the case is running.

Figure 3.23 Please wait windows (left for one case, right for more than one)

3.6.1 Logging progress

The progress is logged in the *run_log_yyyymmddThhmmss.html*[6] file which is stored in the main **swivt** directory. At the start of the run a browser window is opened in which this file is displayed and regularly updated.

[6] yyyymmddThhmmss denotes a time stamp: yyyy=year, mm=month, dd=day, hh=hours, mm=minutes and ss=seconds.

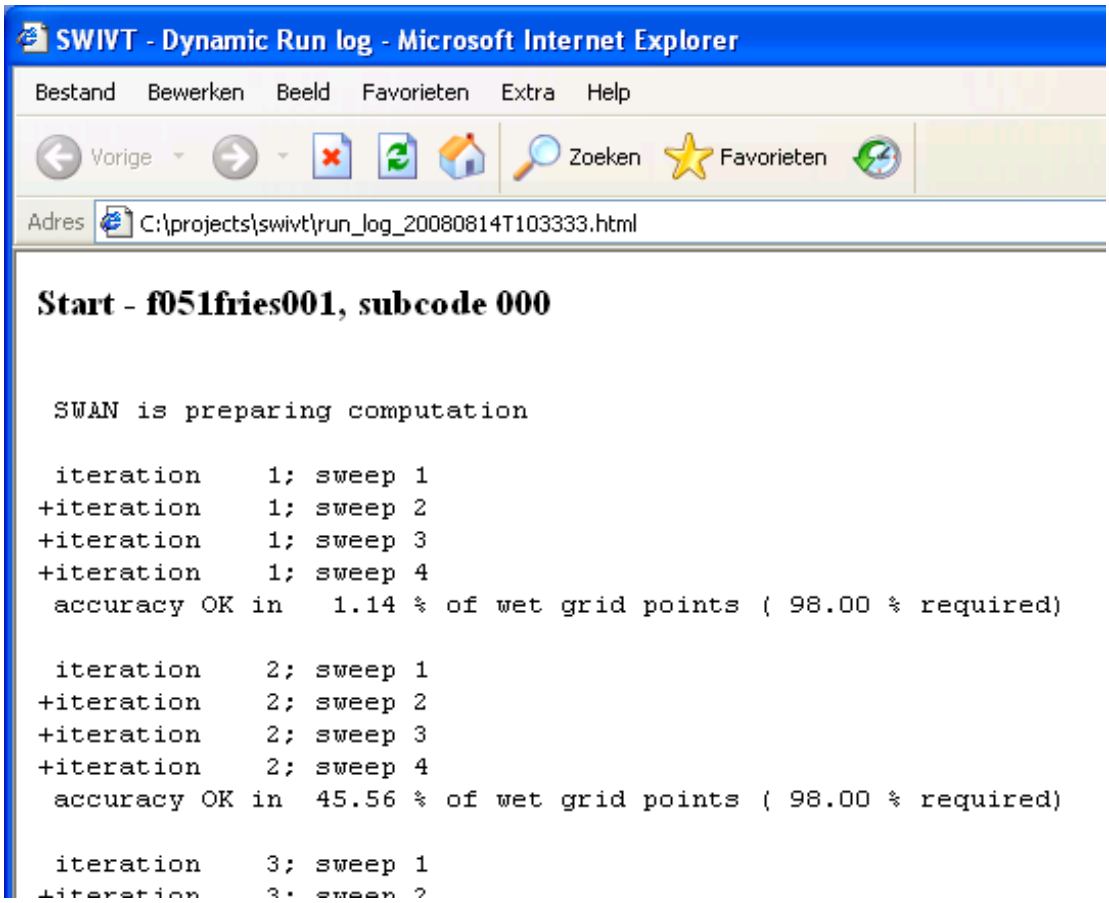


Figure 3.24 *run_log_20080814T103333.html* **in a browser window**

The run information is summarised in a `txt` file. This `txt` file bears the same name as the `html` file (*run_log_yyyymmddThhmmss.txt),* apart from the extension, and is also located in the main SWIVT directory. An example is given below (for a different case as the example above):

```
Begin of SWIVT session

Date       : 14-08-2008
Begin time : 10:33:33

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Casename   : f051fries001, subcode 000, SWAN4051A

Session nr : 001
Number of iterations: 8

accuracy OK in  98.45 % of wet grid points ( 98.00 % required)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Casename   : l021triad001, subcode 000, SWAN4051A

Session nr : 001
Number of iterations: 4

accuracy OK in  98.56 % of wet grid points ( 98.00 % required)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

End of SWIVT session

Date       : 14-08-2008
End time   : 10:35:57
```

This file is also useful in determining the directory in which the results of the run are stored as the identifying session number (here: 001) is listed here (see highlight).

For more detailed information on the SWAN run please refer to the SWAN output file *PRINT*, which is located in the **sessioniii/swan_version/code_subcode/model_io** directory (here: **session001/SWAN4051A/f051fries001_000/model_io** and **session001/SWAN4051A/l021triad001_000/model_io**).

3.7 Present case

3.7.1 Introduction

Pressing the `[Present case]` button will generate a presentation window, unless the ¤ mark is not in place in front of the codename of (one of) the case(s), indicating that there is no SWAN data available to present for that case. Although it seems repetitive in this manual, the buttons are described for each window as this part of the manual is also used as online help which is available through the [`help`] button on the page.

The presentation is based on a template, which is stored as an xml file with the extension *spt*. A template for each case (and each nest if appropriate) on the server is provided with SWIVT in the **templates** directory. This case–specific template is described in Section 3.7.3. The explanation of the use of the presentation window follows in the sections thereafter.

It is possible to generate a great variety of plots for one case, but also for multiple cases. The options provided for the legend are basic and may sometimes not be sufficient. However, it is possible to save the plot in the Matlab fig format which can subsequently be loaded in Matlab using the `hgload` function for further editing. It is also possible to use the Plot edit option on the SWIVT Presentation output window. By clicking on the arrow in the toolbar lots of editing options become available (including adding new items via the Insert menu). Further information can be found in the Help menu under annotating graphs.

It should be noted that as for each case the individual plots are also generated, the number of plots may rise rapidly. To avoid memory overload problems when more than two cases are selected, or when all plots are generated for nested cases, the associated plots are always printed to file (by default in the **presentation** directory) instead of to screen. The plots generated for the link and set option (described further on) are stored with the first case in the list.

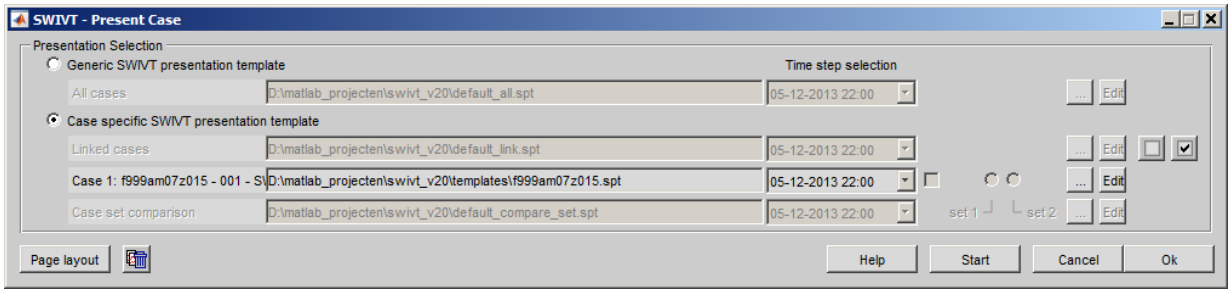


Figure 3.25 Present Case – nonstationary case

As of SWIVT version 2.0 nonstationary cases can be presented too, but just one at a time, and for a single time step only, which can be selected in a list. Simultaneous presentation of stationary and nonstationary cases is not possible. In the coming figures of the Present interface the time step selection part is not shown.

3.7.2 Present Case – define combinations, links, sets and templates

In this section an overview is given with the possible combinations of presenting one or more cases at the time. This overview is based on an example for which the following cases have either been downloaded from the server or generated by editing one of them (the cases with numbers 4,5 and 6):

```
 1 = a011refra001 | 000 | SWAN4041A
 2 = a011refra001 | 000 | SWAN4051A
 3 = a011refra001 | 000 | SWAN4072A
 4 = a011refra001 | 001 | SWAN4072A
 5 = a011refra001 | 002 | SWAN4072A
 6 = a011refra001 | 003 | SWAN4072A
 7 = f061westr001 | 000 | SWAN4072A
 8 = f061westr002 | 000 | SWAN4072A
 9 = f140slote001 | 000 | SWAN4072A
```

The cases are preceded by numbers which are used in the following section to aid identification. It should be noted that this example is chosen for illustrative purposes only. Several combinations can be made, for example (not exhaustive):

- to study the effect of changes in the SWAN version for one particular case (numbers 1, 2 and 3)
- to study the effect of editing a case (eg changing physical or numerical parameter settings) (compare number 3 (default settings) with 4, 5 and 6)
- to study the statistics of a number of SWAN runs (eg numbers 6, 7, 8 and 9)

In the situation that a nested case is chosen in a set of cases to be presented together (in our example numbers 7 and 8 (f061westr00*), the aggregate of the nests will be used (see Section 3.7.4.2).

3.7.2.1 One case

One of the above cases is selected eg: `1 = a011refra001 | 000 | SWAN4041A`.

The Present Case window that appears (after the Case specific SWIVT presentation template is selected) is illustrated in Figure 3.26.

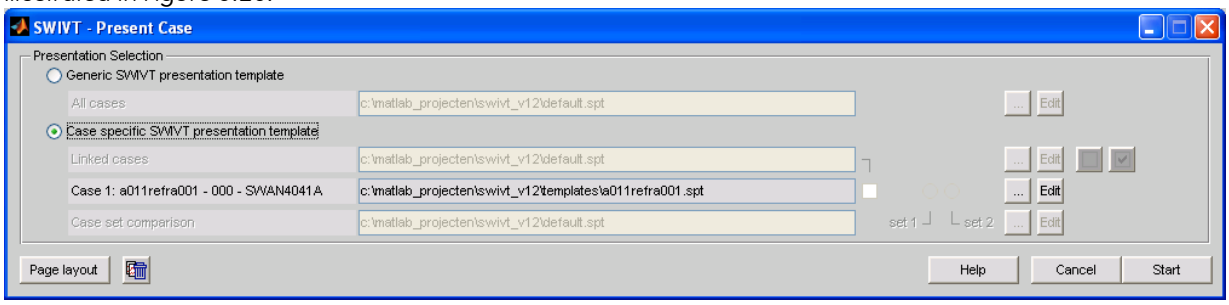


Figure 3.26 Present Case – I One case

A number of buttons are available, these are described in Table 3.8.

Table 3.8 Buttons on the Present Case page

BUTTON	DESCRIPTION
Edit	adapt the template, see Section 3.7.4
...	locate and select another template
Page layout	defines the page layout and whether or not to generate output files, and if so define them, see Section 3.7.4.7
	close all presentation windows

Help	opens the appropriate part of the manual
Cancel	return to the main window
Start	generates the graphs defined in the template for the case, depending on the setting in the page layout on the screen or as a file

It should be noticed that the options link and set are not available and therefore displayed in grey.

Examples of output graphs and tables are given in Section 3.7.5.

3.7.2.2 Two cases

SWIVT graphs and tables may be used to present the results of two cases, or to compare the results of two cases against each other and against measured data. There are a number of options once two cases have been selected for presentation:

A. Same code, same subcode, different SWAN version

eg:
```
2 = a011refra001 | 000 | SWAN4051A
3 = a011refra001 | 000 | SWAN4072A
```

to study, for example, the effect of different SWAN versions for the same case with identical parameters

B. Same code, same SWAN version, different subcode

eg:
```
3 = a011refra001 | 000 | SWAN4072A
4 = a011refra001 | 001 | SWAN4072A
```

to study, for example, the effect of different model parameter settings

C. Different code, (in–)different subcode, (in–)different SWAN version

eg:
```
7 = f061westr001 | 000 | SWAN4072A
8 = f061westr002 | 000 | SWAN4072A
```

or:
```
8 = f061westr002 | 000 | SWAN4072A
9 = f140slote001 | 000 | SWAN4072A
```

As in options A and B the same observational data is available for both cases, it is possible to generate a number of plots with the results of both cases and the observation, see Table 3.10. These additional plots can be generated using the link tick marks described below. In option C the cases usually do not have the observations in common and less plots are available. These plot options are the same as those for three or more cases and described there (Section 3.7.2.3).

The Present Case window that appears for options A and B (after the Case specific SWIVT presentation template is selected and the link tick marks are present in the square boxes) is illustrated in Figure 3.27.

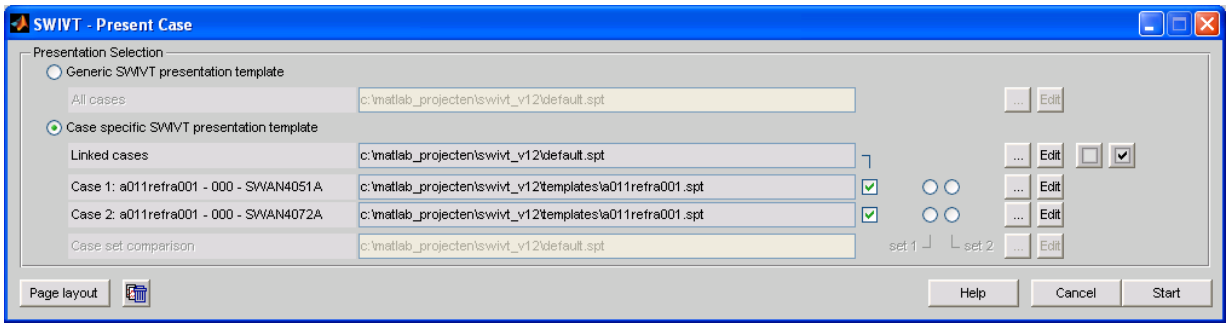


Figure 3.27 Present Case – II Two cases, same code

A number of buttons are available, these are described in Table 3.9.

Table 3.9 Buttons on the Present Case page

BUTTON	DESCRIPTION
Edit	adapt the template, see Section 3.7.4
...	locate and select another template
	select all cases to be linked
	deselect all cases which were linked
Page layout	defines the page layout and whether or not to generate output files, and if so define them, see Section 3.7.4.7
	Close all presentation windows
Help	opens the appropriate part of the manual
Cancel	return to the main window
Start	generates the graphs defined in the three templates, depending on the setting in the page layout on the screen or as a file for all cases listed, including linked and compare set cases if these are chosen.

It should be noticed that the option 'set' could also be used to generate these plots. The set option is described in more detail in Section 3.7.2.3.

The template defined next to the Linked cases field (in this example *default.spt*) can be edited using Edit on the right to it. The available plot types for options A and B are listed in Table 3.10.

Table 3.10 Types of presentation for two cases with the same code (options A and B)

PRESENTATION TYPE
Overview of locations (type 1)
Table of calculated values for case 1 and case 2 and observed values (type 3)
Calculated variance density spectrum for case 1 versus case 2 versus observed values (type 5)
Difference plot of calculated two dimensional parameter (type 6)
Table of statistical comparison of calculated parameters for case 1 versus observed values and case 2 versus observed values or table of statistical comparison of calculated parameters for case1 versus case 2[7] (type 10)
Scatter plot of calculated parameters for case1 versus observed values and case 2 versus observed values, or scatter plot of calculated values for case1 versus case2[7] (type 12)

[7] Note that to compare SWAN results with SWAN results the tick mark should be absent from the box in front of the Include measured data option on the Present Edit window, which can be accessed by clicking the Edit button next to the Linked cases field. By default the tickmark is switched on.

PRESENTATION TYPE
Calculated parameters, computed along a curve, case 1 versus case 2 (no observed values) (type 13)
Calculated parameter case 1 vs case 2 vs Young & Verhagen, Holthuijsen, Bretschneider, Young and Babanin (type 14)
Calculated parameter case 1 vs case 2 vs Kahma & Calkoen, Pierson Moskowitz, Wilson (type 15)
Overview of locations with weights (type 19)

Pressing the Start button in Figure 3.27 will generate the following graphs and tables:

- for case a011refra001.000 with SWAN version 4051A
- for case a011refra001.000 with SWAN version 4072A
- as specified in Table 3.10 and in the linked case template.

If there are less than two tick marks in place, the linked case graphs and tables are not generated, leaving only those mentioned following the first two bullets. Furthermore, presentation types 14 and 15 are only generated for the wave growth cases. Examples of output for two cases are given in Section 3.7.6.

3.7.2.3 Two completely different cases or three or more cases

It may be useful to generate graphs and tables for two completely different cases (option C in Section 3.7.2.2) or for three or more cases, for example:

- it will save time to present results for more cases all at once, rather than to repeat the presentation for each case individually (ie repeat the actions mentioned in Section 3.7.2.1)
- statistical scores over the entire group are required

Again there are a number of options once three or more cases have been selected for presentation:

A. Same code, same subcode, different SWAN version

eg:
```
1 = a011refra001 | 000 | SWAN4041A
2 = a011refra001 | 000 | SWAN4051A
3 = a011refra001 | 000 | SWAN4072A
```

B. Same code, same SWAN version, different subcode

eg:
```
3 = a011refra001 | 000 | SWAN4072A
4 = a011refra001 | 001 | SWAN4072A
5 = a011refra001 | 002 | SWAN4072A
6 = a011refra001 | 003 | SWAN4072A
```

C. Different code, (in–)different subcode, (in–)different SWAN version

eg:
```
6 = a011refra001 | 003 | SWAN4072A
7 = f061westr001 | 000 | SWAN4072A
8 = f061westr002 | 000 | SWAN4072A
9 = f140slote001 | 000 | SWAN4072A
```

There is no easy rule to distinguish between the possible plot types for the above examples. The set comparison option has been introduced to facilitate the user in generating plots that provide insight in the quality of the SWAN results. First two groups of SWAN results, set 1 and set 2, need to be selected. These are then compared against measurement data. For example:

- set 1 may contain a number of cases run with SWAN 4051A, and set 2 may contain the same cases, but then run with SWAN 4072A
- set 1 and set 2 may use different (physical or numerical) parameter settings

Effectively these comparison against measured data also compares them against each other, giving insight in the quality of each set.

The Present Case window that appears (after the Case specific SWIVT presentation template is selected, and a (arbitrary) selection has been made) is illustrated in Figure 3.28.

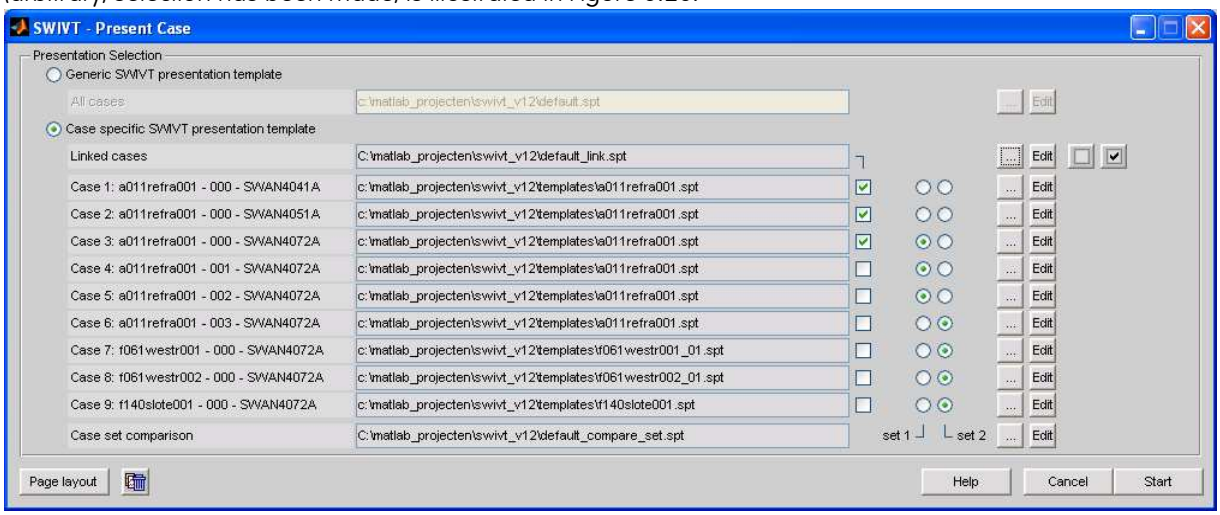


Figure 3.28 Present Case – III Multiple cases

A number of buttons are available, these are described in Table 3.11.

Table 3.11 Buttons on the Present Case page

BUTTON	DESCRIPTION
Edit	adapt the template, see Section 3.7.4
...	locate and select another template
☑	select all cases to be linked
☐	deselect all cases which were linked
`Page layout`	defines the page layout and whether or not to generate output files, and if so define them, see Section 3.7.4.7
	Close all presentation windows
`Help`	opens the appropriate part of the manual
`Cancel`	return to the main window
`Start`	generates the graphs defined in each template, depending on the setting in the page layout on the screen or as a file for all cases listed, including linked and compare set cases if these are chosen.

The template defined next to the Linked cases field (in this example *default.spt*) can be edited using Edit on the right to it. The template defined next to the Case set comparison field can be edited using its associated Edit button on the right. The available plot types are listed in Table 3.12 and Table 3.13.

Table 3.12 Types of presentation for multiple cases using the Linked Cases option

PRESENTATION TYPE
Table of statistical comparison of calculated parameters versus observed values (type 10)
Scatter plot of calculated parameters versus observed values (type 12)

Table 3.13 Types of presentation for multiple cases using the Case set comparison option

PRESENTATION TYPE
Table of statistical comparison of calculated parameters for set 1 versus observed values and set 2 versus observed values (type 10)
Scatter plot of calculated parameters for set1 versus observed values and set 2 versus observed values (type 12)

Pressing the `[Start]` button in will result in the following graphs and tables:

- for each of the nine cases
- for the linked cases 1, 2 and 3 as specified in Table 3.12 and in the Linked Case template
- for set 1 (consisting of cases 3, 4 and 5) and set 2 (consisting of cases 6, 7, 8 and 9) as specified in Table 3.13 and in the Set Comparison template

If there are less than two tick marks in place, the linked case graphs and tables are not generated (2nd bullet), if there are less than two sets defined, the set comparison graphs and tables are not generated (3rd bullet) . Furthermore, presentation types 14 and 15 are only generated for the wave growth cases. Examples of output for two cases are given in Section 3.7.7.

3.7.3 Templates

The number, types and layout of plots is defined in a template. After pressing the start button or one of the Edit buttons in the Present Case Window (Figure 3.26, Figure 3.27 or Figure 3.28) a template is loaded[8] which initialises presentation settings. For each case on the server a case–specific template is available in the **templates** directory. This template can be identified by the code in the filename (eg *f051fries001.spt*, *f061westr002_01.spt* or *f061westr002_all*, see Chapter 4). The *"_all"* template is used to generate the plots for the aggregated nests and is only required for nested cases.

A number of (generic) default plot templates are available in the main SWIVT directory. These are explained in Table 3.14.

Table 3.14 Default plot templates

TEMPLATE	DESCRIPTION
default.spt	used for presentation of one case at the time if there is no code specific template available in the **templates** directory. Also used if one of the other default templates is missing.
default_all.spt	default for the Generic SWIVT presentation template option
default_all_nests.spt	default for the aggregated plots over all nest steps
default_link.spt	default for the linked case option (see Section 3.7.2.2)
default_compare_set.spt	default for the compare set option (see Section 3.7.2.3)

[8] Depending on the size of the template (related to the number of locations) this may take a little while

The user is free to choose another template. The open button ( ) can be used to retrieve a template, whereas the default template can be reloaded with the new button ( ). A request for a plot which is not supported by SWIVT for the selected case(s) will be ignored. An example of such a request is the Table of calculated values (type 2) for a presentation of more than one case; it is only possible to generate a table in which the values for both cases are listed, for a table with case–specific values the Single case presentation needs to be used.

A user defined page layout can be stored in a template, which can then be used again at a later stage. These templates can be generated by hand, but it is safer to create the pages with the Presentation section of SWIVT and to save them as a template. These user–defined templates can be saved anywhere by using the save button ( ). Changes to the default or case–specific templates are not automatically stored for future use, but the user is asked whether the settings need to be saved upon leaving the presentation GUI.

Figure 3.29 SWIVT presentation – save settings request

An example of *default.spt* is given below, whereby lines have been skipped to save space. For more details on the template contents please refer to **Dekker et al 2022a**.

```
<?XML VERSION="1.0"?>
<ROOT>
   <SWIVT>
      <PRESENTATION>
         <NAME>SWIVT - DEFAULT PLOT TEMPLATE</NAME>
         <PAGE>
            <PAGE_STYLE>111</PAGE_STYLE>
            <PAGE_NAME>OVERVIEW OF LOCATIONS AND PARAMETERS</PAGE_NAME>
            <PRESENTATION_ELEMENT>
               <TYPE>1</TYPE>
               <LOCATION>
                  <ID>1</ID>
                  <NAME>STATION 1</NAME>
                  <SELECTED>ON</SELECTED>
                  <STYLE>
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                     <LINEWIDTH>1</LINEWIDTH>
                     <COLOR>0.000,0.000,1.0000</COLOR>
                     <MARKER>NONE</MARKER>
                     <MARKERSIZE>10</MARKERSIZE>
                     <MARKEREDGECOLOR>0.000,0.000,1.000</MARKEREDGECOLOR>
                     <MARKERFACECOLOR>0.000,0.000,1.000</MARKERFACECOLOR>
                  </STYLE>
               </LOCATION>
               <LOCATION>
                  ...
               </LOCATION>
               <PARAMETER>
               </PARAMETER>
               <LAYOUT>
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                  <X_AXIS>
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                     <LABEL>X-COORDINATE [M] RD</LABEL>
                     <LIMITS></LIMITS>
```

```
                    <SCALE></SCALE>
                 </X_AXIS>
                 <Y_AXIS>
                    <SELECTED>OFF</SELECTED>
                    <LABEL>Y-COORDINATE [M] RD</LABEL>
                    <LIMITS></LIMITS>
                    <SCALE></SCALE>
                 </Y_AXIS>
                 <Z_AXIS>
                    <SELECTED>OFF</SELECTED>
                    <LABEL></LABEL>
                    <LIMITS></LIMITS>
                    <SCALE></SCALE>
                 </Z_AXIS>
                 <COLORMAP>JET</COLORMAP>
                 <COLORBAR>OFF</COLORBAR>
              </LAYOUT>
           </PRESENTATION_ELEMENT>
           <PRESENTATION_ELEMENT>
              ...
           </PRESENTATION_ELEMENT>
        </PAGE>
        <PAGE>
           ...
        </PAGE>
     </PRESENTATION>
  </SWIVT>
</ROOT>
```

3.7.4 Present edit – Template editor

The presentation window is made up from three main sections:

- Page selection
- Page style selection
- Presentation selection

and a number of buttons.

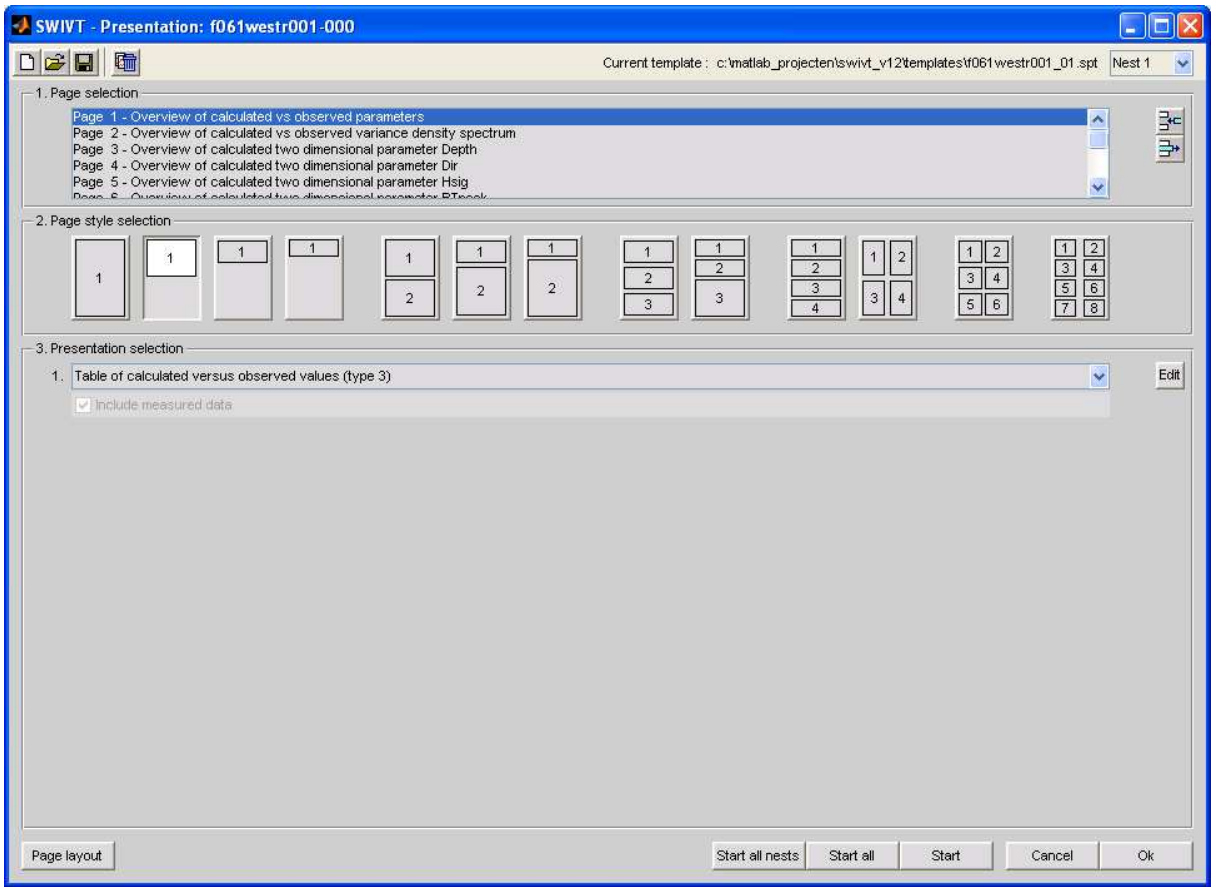


Figure 3.30 Presentation window

When the option of including or excluding the observed data is available[9], the checkbox and the text "include measured data" will be displayed in black and a tickmark can be placed in or removed from the checkbox as required. An `[Edit]` button is available for each plot type on the right hand side in the Presentation selection section. Using this button will display the Presentation generation window in which the plot layout can be defined, more details can be found in Section 3.7.4.6. Furthermore information is given on the selected template and, if appropriate, which nestcode is to be used, at the top right, a button `[Page layout]` at the bottom left and the `[Start all nests]`, `[Start all]`, `[Start]`, `[Cancel]` and `[Ok]`, buttons at the bottom right. These are described in the following sections. In this section first a general background is given on the presentation section.

3.7.4.1 Statistic scores, setting the weighting factor

It is possible to assign a different weighting factor for each individual location for use in the statistical scores calculations. This factor should be between 0 and 1 (both inclusive) and can be specified on the Presentation Configuration screen associated with the statistical table (see Section 3.7.4.6.1).The implementation of this factor is described in **Dekker et al 2022a**.

3.7.4.2 Nesting

Certain SWIVT cases involve nested SWAN runs. These cases are identified by means of a nesting code (see Chapter 4). It is possible to plot the intermediate results by selecting the appropriate nest on the top right of the

[9] When a single case is to be plotted this option is not available as the resulting plots are defined as another type.

page. A default template is available for each nest. By using the button [`Start all nests`] instead of [`Start`], the plots defined in the templates for each nest are generated, as well as three aggregated plots.

Figure 3.31 Nest select option

Table 3.15 Types of presentation for aggregated nest data

PRESENTATION TYPE
Table of aggregated calculated values versus observed values (all nests) (type 3)
Table of statistical comparison for aggregated calculated values versus observed values (all nests) (type 10)
Scatter plot of aggregated calculated values versus observed values (all nests) (type 12)

3.7.4.3 Page selection

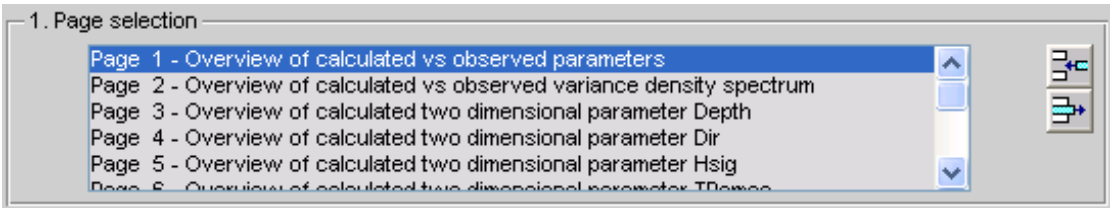


Figure 3.32 Page selection

In this section the page to be set up can be selected. By using the  or  buttons on the right a page can be added or removed respectively. When a page is selected the associated settings are displayed in the Pages style Selection (Section 3.7.4.4) and the Presentation (Section 3.7.4.5). A new page is always inserted after the selected (highlighted) page, with the same properties as the selected page.

The title of the page, as displayed after the dash, can be edited by double clicking on it. An edit window will appear in which the title can be adapted. This title will be displayed on top of the output page.

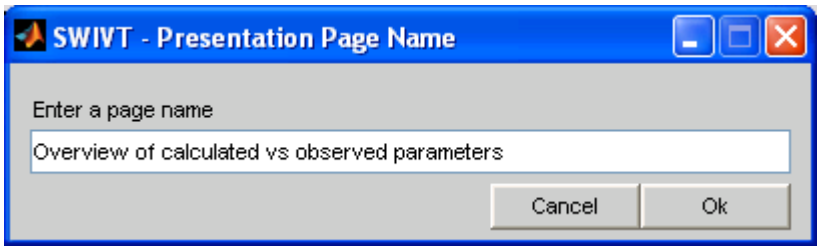


Figure 3.33 Page name edit box

Note that template pages, which generate plots that are not available due to a certain setting (eg limitations as result of the link option) will not be available for editing.

3.7.4.4 Page style selection

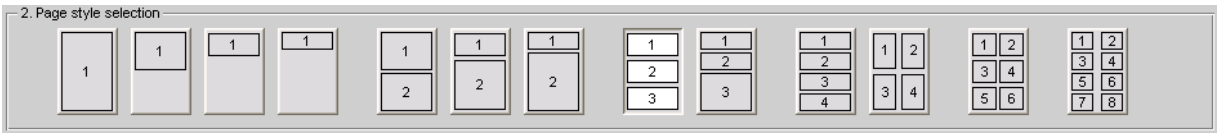


Figure 3.34 Page style selection

In the section the size and number of plots per page is defined by clicking on the required picture. In Figure 3.34 a layout of three equally sized plots is selected. The styles are grouped by the number of plots on a page. Up to eight plots per page are available. It is possible to place an empty graph (type 11) if eg 5 or 7 plots are required, or to position the plots in a different way.

3.7.4.5 Presentation selection

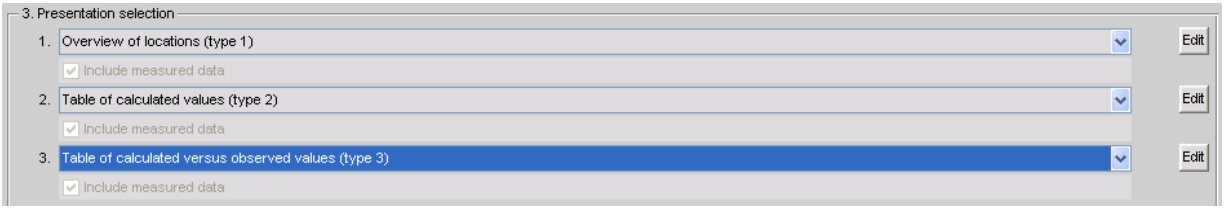


Figure 3.35 Presentation selection

The content of each plot in a page can be defined in the presentation selection. The number of plots on a page depends on the selection of the page style (see Section 3.7.4.4). Several types of plots are available, they are listed in Table 3.16. This table is a cross–reference table which is used by SWIVT to generate the contents of the Presentation configuration window shown in Figure 3.36. Detailed information on the plot types is available in [**Dekker et al 2022a**]. In this example it is not possible to change the fact whether or not to include measured data; this option is available for plots with more than one case at the time.

Note that if there is no data available, surface plots will only display the grid, which may look like a black area when the grid is fine. Unfortunately it is not possible to display the units with the colour bar as these are not provided by the current SWAN version.

Table 3.16 Types of presentation and associated parameters for Single case presentation

PRESENTATION TYPE	LOCATIONS	PARAMETERS	TITLE	AXIS			COLORMAP	COLORBAR
				X	Y	Z		
Overview of locations (type 1)	N	0	1	1	1	0	0	0
Table of calculated values (type 2)	N	N	1	0	0	0	0	0
Table of calculated versus observed values (type 3)	N	N	1	0	0	0	0	0
Calculated variance density spectrum (type 4)	N	0	1	1	1	0	0	0
Calculated versus observed variance density spectrum (type 5)	1	0	1	1	1	0	0	0
Calculated two dimensional parameter (type 6)	N	1	1	1	1	1	1	1
Calculated two dimensional parameter (wind or current) (type 7)	0	1	1	0	0	1	0	0
Calculated two dimensional current (magnitude and direction) (type 8)	0	1	1	0	0	1	1	1

PRESENTATION TYPE	LOCATIONS	PARAMETERS	TITLE	AXIS			COLORMAP	COLORBAR
				X	Y	Z		
Calculated directional variance density plot (type 9)	1	0	1	0	0	1	0	1
Table of statistical comparison of calculated versus observed parameters (type 10)	N	N	1	0	0	0	0	0
Empty graph [10] (type 11)	0	0	0	0	0	0	0	0
Scatter plot of calculated versus observed parameters (type 12)	N	1	1	1	1	0	0	0
Calculated parameters, computed along a curve (no observed values) (type 13)	0	1	1	1	1	0	0	0
Calculated parameter vs Young & Verhagen, Young & Babanin, Holthuijsen, Bretschneider (type 14)	0	1	1	1	1	0	0	0
Calculated parameter vs Kahma & Calkoen, Pierson Moskowitz, Wilson (type 15)	0	1	1	1	1	0	0	0
Calculated versus observed directional variance density plot (type 16)	1	1	1	1	1	0	0	0
Calculated versus observed values (type 17)	N	1	1	1	1	0	0	0
Location and depth (type 18)	N	0	1	1	1	0	0	0
Overview of locations with weight (type 19)	N	0	1	1	1	0	0	0

Table 3.17 Key to Table 3.16

ITEM	DESCRIPTION
Locations	0 = non–selectable; 1 = exactly one location can be plotted (radio buttons are used); N = one or more locations can be selected (checkboxes are used)
Parameters	0 = non–selectable; 1 = exactly one parameter can be selected for plotting; N = one or more parameters can be selected for plotting
Title	0 = title is disabled; 1 = title is enabled and will be put on the plot
X–, Y–, and Z–axis	0 = X–, Y–, or Z–axis is disabled; 1 = X–, Y–, or Z– axis is enabled and will be put on the plot
Colormap	0 = Colormap is disabled, colours cannot be selected; 1 = Colormap is enabled, and the chosen Colormap is used to generate the plot
Colorbar	0 = Colorbar is omitted; 1 = Colorbar is displayed

3.7.4.6 Presentation configuration window

By pressing the Edit button the Presentation configuration window will be displayed, see Figure 3.36. The layout of the associated plot or table can be defined here.

[10] An empty graph may be used to eg plot 5 or 7 graphs on one page, options which are not preset

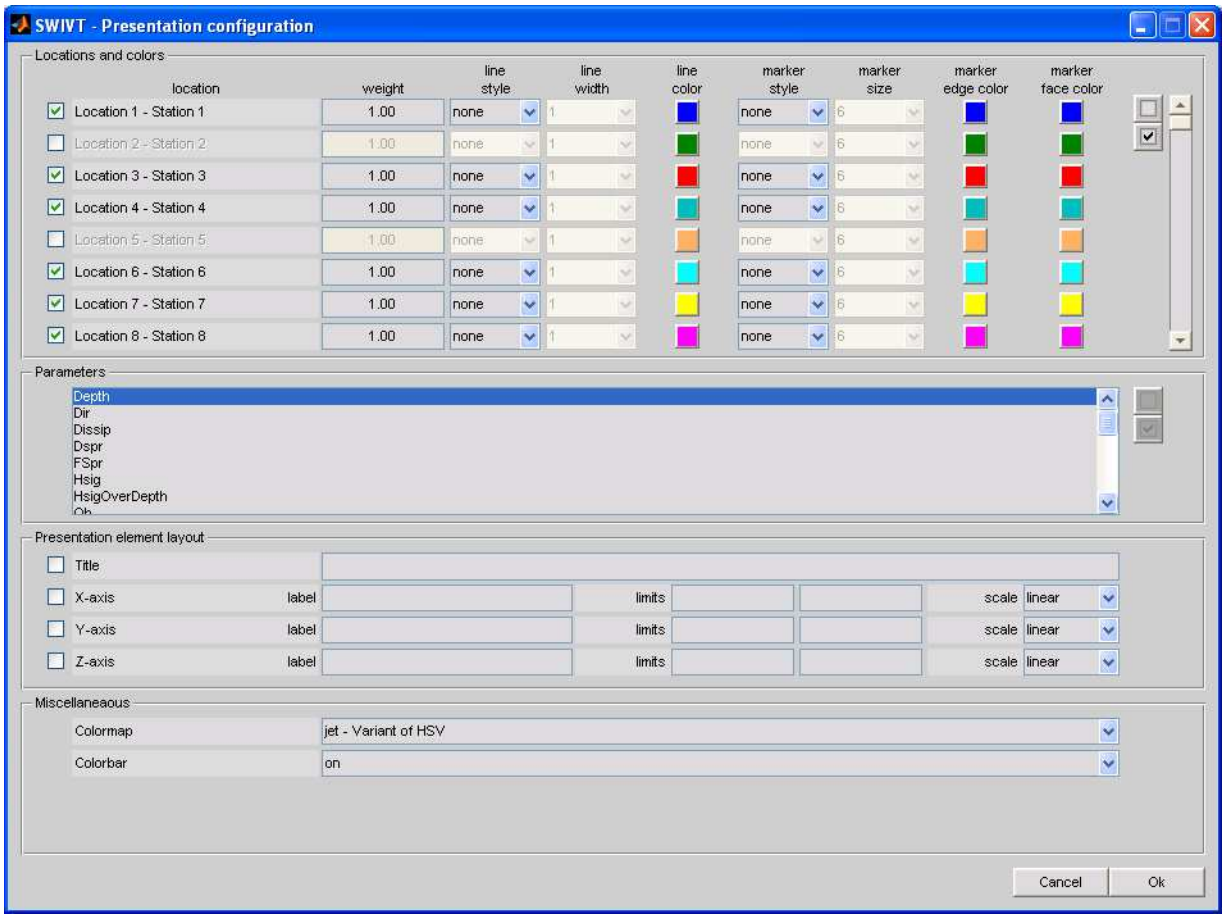


Figure 3.36 Presentation configuration window

The presentation configuration window can be split into four sections which are described in turn in the sections below.

3.7.4.6.1 Locations and colours section

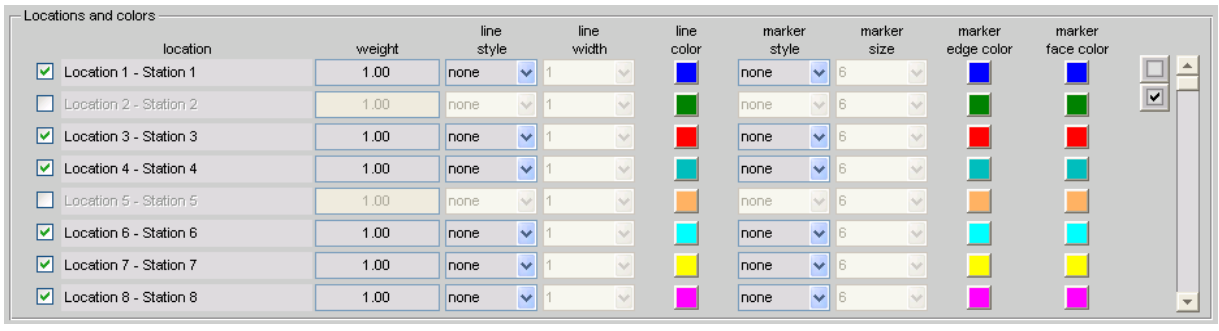


Figure 3.37 Locations and colours section

This part of the window is the place where the required locations can be selected by placing a tick mark in front of it. To select all, use the  button on the right hand side, to deselect all use the  button. In addition the weight, line style, line width, line colour, marker style, marker size, marker edge colour and marker face colour

can be set for each individual location. They can be edited, selected from dropdown boxes or selected by clicking on a coloured box (make sure a line or marker style has been selected). In the latter case a Color window appears in which the colour can be selected: The selected colour is marked by a black box around it.

Figure 3.38 Color window

The scroll bar can be used to display more locations if available. If an item cannot be changed for a plot or is not relevant for the chosen plot, the title appears in grey. The linestyle colour is used in the to indicate locations (eg type 3, type 19), even if the line style is switched off[11]. The weight column was added to the locations and colours section for use in the statistical plots. The weighting factor for each location can be entered here.

3.7.4.6.2 Parameters

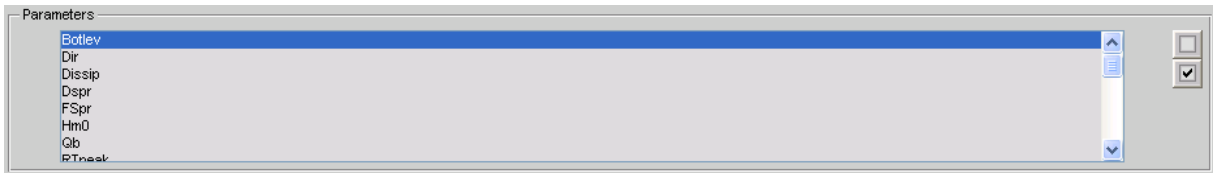


Figure 3.39 Parameters

Use the mouse to select the required parameter(s). To select all, use the  button on the right hand side, to deselect all use the  button. If these are grey (as in Figure 3.36) it means that only one parameter can be plotted for this plot type.

3.7.4.6.3 Presentation element layout

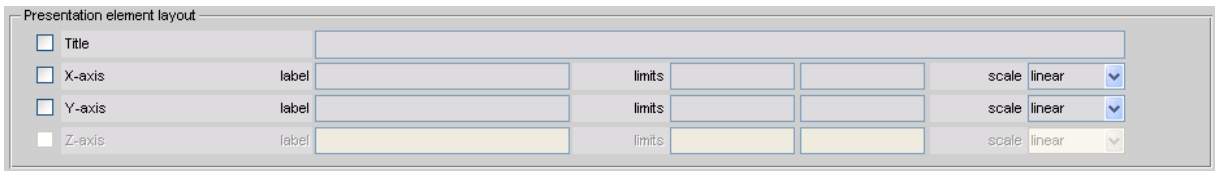


Figure 3.40 Presentation element layout

Text for the title of the plot and the axes labels can be set in the presentation element layout section,. Additionally other parameters which define the axes can be set here: the lowest and highest values (limits) and

[11] Please note that the line style color can only be changed when a line style is selected.

the scale (linear or log). If the item is enabled but no values are entered, the default values will be generated by SWIVT. Once a tick mark is in place in the checkbox, the user can enter the information required. In case of the axes, all information will need to be supplied, including the label, limits and scales.

3.7.4.6.4 Miscellaneous

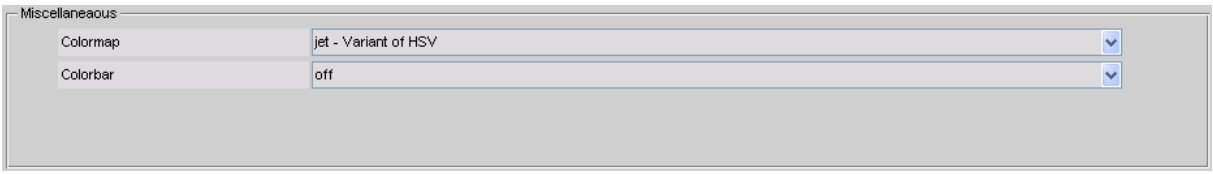


Figure 3.41 Miscellaneous

The colormap that should be used is defined in the Miscellaneous section, as well as whether to display the colorbar or not.

3.7.4.7 Page layout

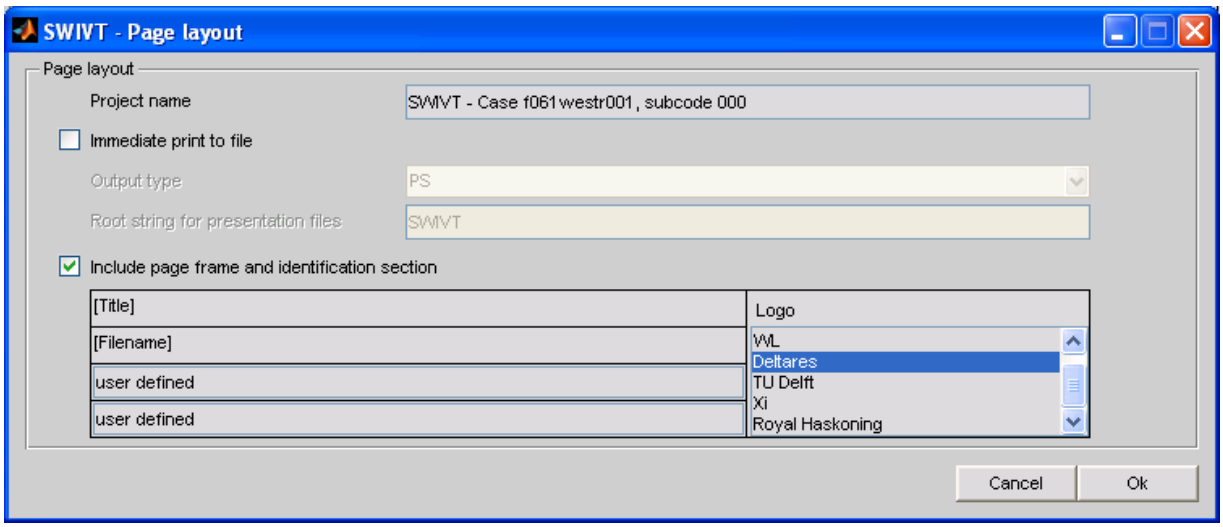


Figure 3.42 Page layout

Finally the Page layout can be set in the associated window (Figure 3.42). The title and the filename are taken from the case information, in addition the user can add two lines of extra information if required. A logo will be displayed on the page and can be selected on the bottom right. To produce a plot without the frame and identification section remove the tick mark.

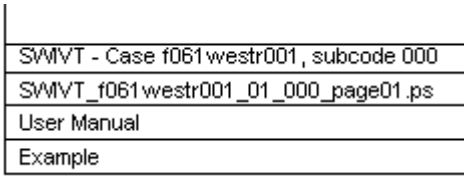


Figure 3.43 Titles on the output page

By default the plots will be printed directly to a file. This means that, by default, the tick mark is in place in the white box to the left of the text "Immediate print to file". The options to select output type and to add a root string for presentation files are also available. The files will be stored in the **presentation** subdirectory of the case.

(for example: **C:/projects/swivt/sessions/session001/f061westr001_000/presentation**). In addition to the specified format, a table will also be stored as csv file in this subdirectory. By default the specified output format is png format. Remove the associated tick mark if the plot is to be displayed on the screen[12], after which they can be saved where required.

3.7.5 Examples of SWIVT output plots and table; one–case presentation

3.7.5.1 Overview of locations, type 1

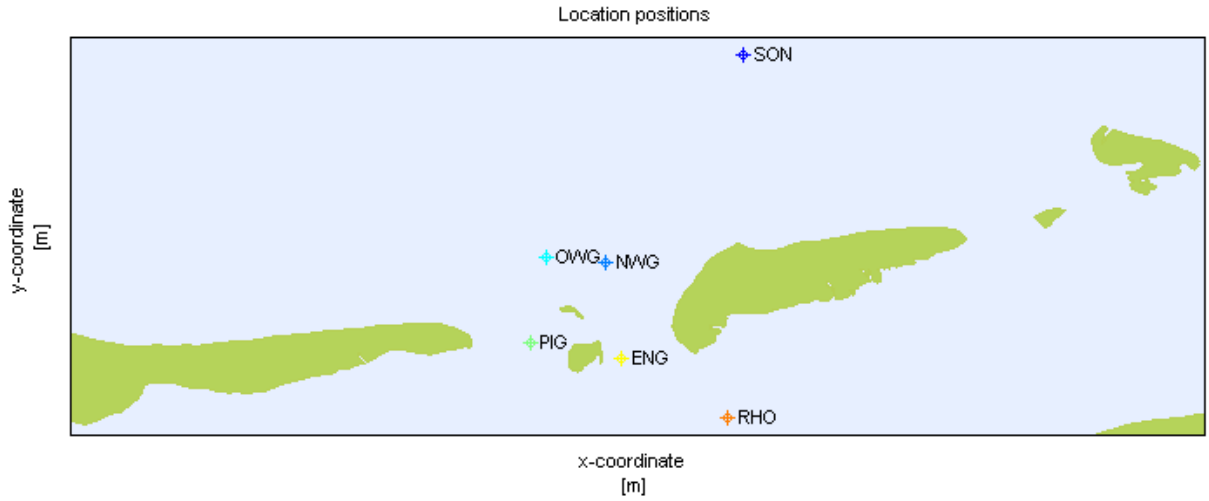


Figure 3.44 Overview of locations, type 1

3.7.5.2 Table of calculated values, type 2

Table 3.18 Table of calculated values, type 2

Table calculated values

Xp [m]	Yp [m]	Dir [degr]	Hsig [m]	RTpeak [sec]	Tm02 [sec]	Tm_10 [sec]
206767	622696	301.8750	2.2628	7.1696	4.4902	5.8911
199959	612484	299.2930	1.8160	8.1090	3.7582	5.3532
196992	612714	297.6290	1.8051	8.1090	3.8615	5.4732
196215	608476	294.3430	0.6468	3.8740	2.0716	3.1385
200738	607693	287.1420	0.6719	3.8740	1.9700	3.2991
205996	604802	319.1390	0.4680	2.6776	1.6527	2.0449

The colours on the left of the table correspond to the colours on the location overview plot (unless the user has changed the colours in such a way that they don't match anymore).

[12] Whenmore than two cases are presented at the same time, plot to screen is not available, the plots will automatically be printed to a file.

3.7.5.3 Table of calculated versus observed values, type 3

Table 3.19 Table of calculated versus observed values, type 3

Table calculated versus observed values

Xp [m]	Yp [m]	Hsig [m]		RTpeak [sec]		Tm02 [sec]		Tm_10 [sec]	
206767	622696	2.2628	2.2486	7.1696	6.6667	4.4902	5.2247	5.8911	6.1564
199959	612484	1.8160	1.7536	8.1090	8.0000	3.7582	4.9285	5.3532	6.0220
196992	612714	1.8051	1.8977	8.1090	7.4074	3.8615	5.2723	5.4732	6.2451
196215	608476	0.6468	0.5618	3.8740	3.4483	2.0716	2.8595	3.1335	3.6005
200738	607693	0.6719	0.5308	3.8740	3.8462	1.9700	2.7345	3.2991	3.6160
205996	604802	0.4680	0.3117	2.6776	2.1739	1.6527	2.2005	2.0449	2.7781

The colours on the left of the table correspond to the colours on the location overview plot (unless the user has changed the colours in such a way that they don't match anymore).

3.7.5.4 Calculated variance density spectrum, type 4

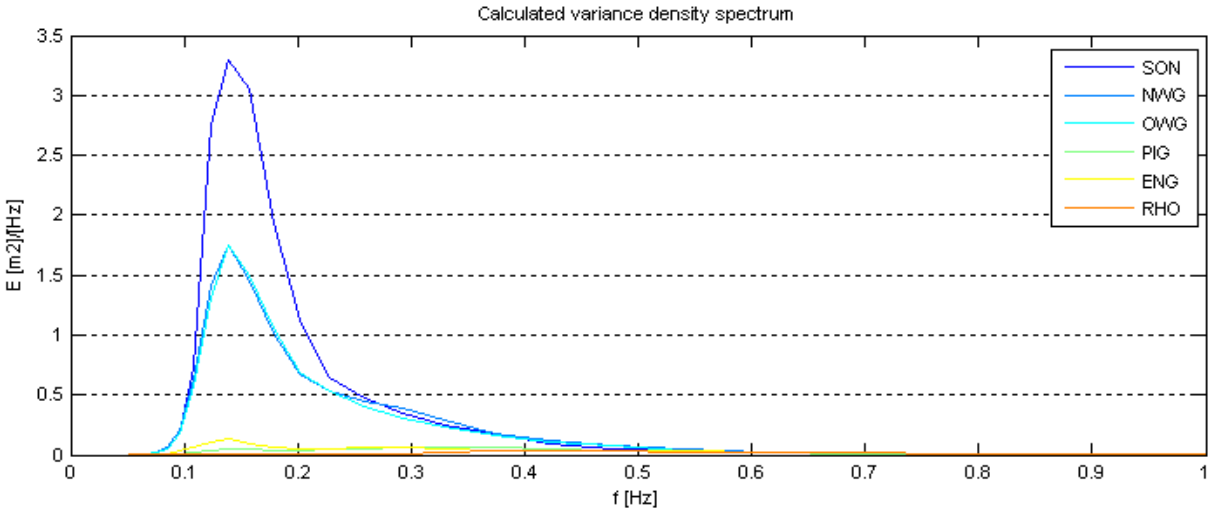


Figure 3.45 Calculated variance density spectrum, type 4

3.7.5.5 Calculated versus observed variance density spectrum, type 5

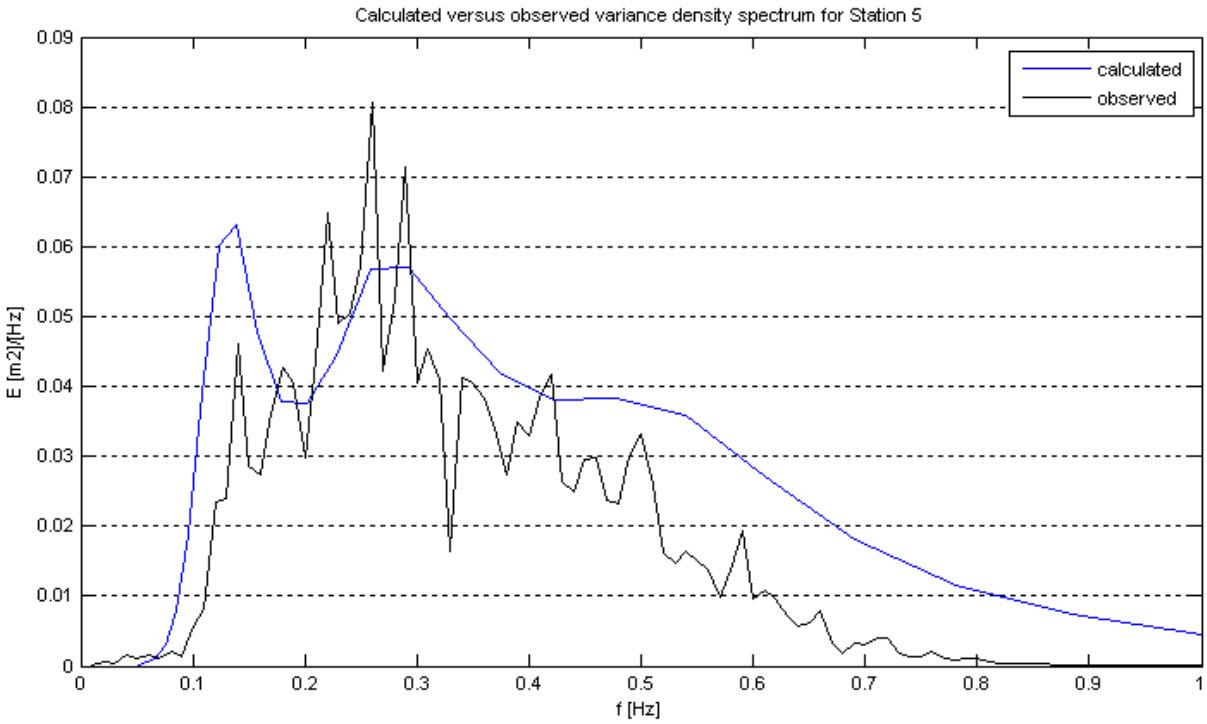


Figure 3.46 Calculated versus observed variance density spectrum, type 5

3.7.5.6 Calculated two dimensional parameter, type 6

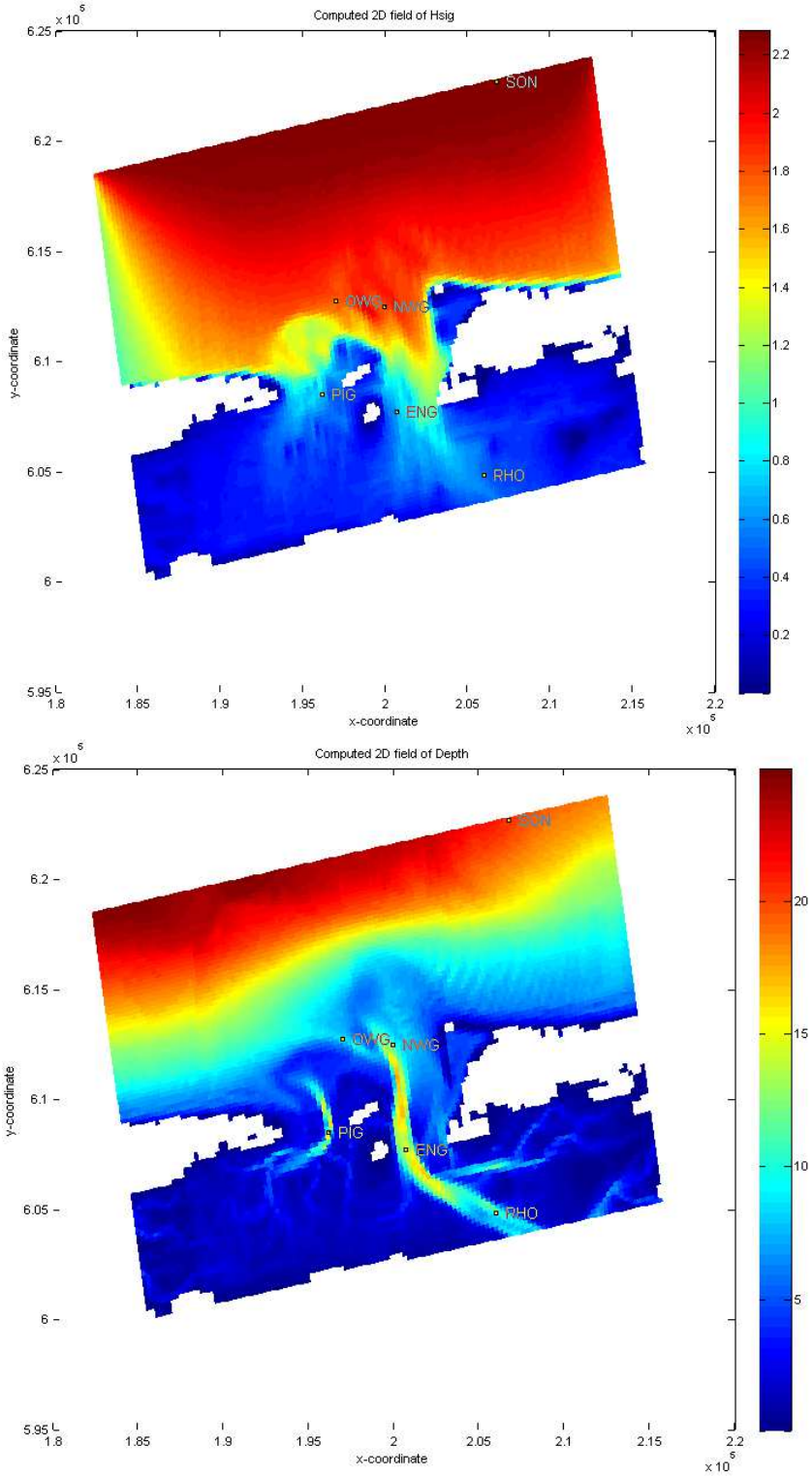


Figure 3.47 Calculated two dimensional parameter, type 6, two examples

3.7.5.7 Calculated two dimensional parameter (wind or current), type 7

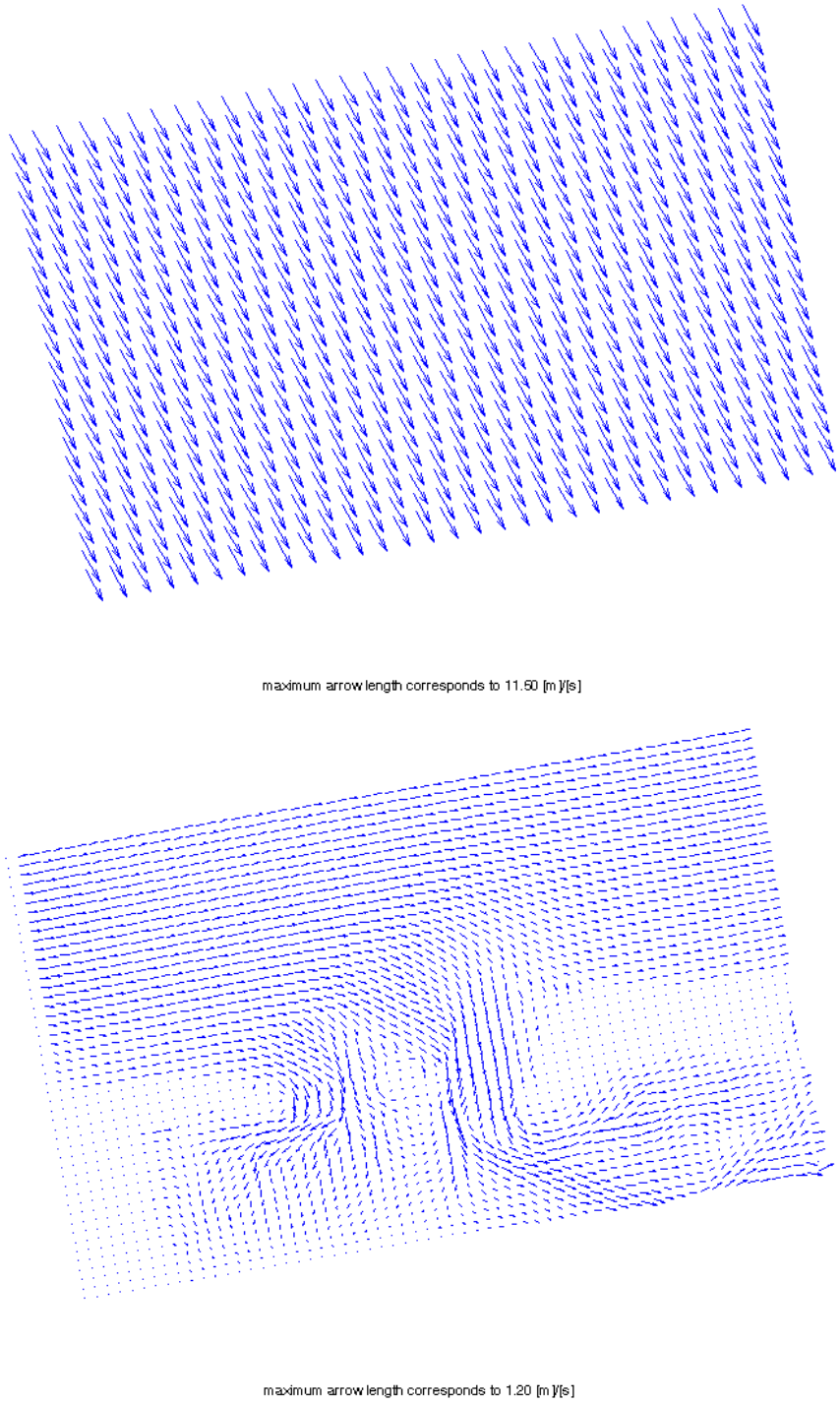


Figure 3.48 Calculated two dimensional parameter (wind or current), type 7

3.7.5.8 Calculated two dimensional parameter (direction), type 8

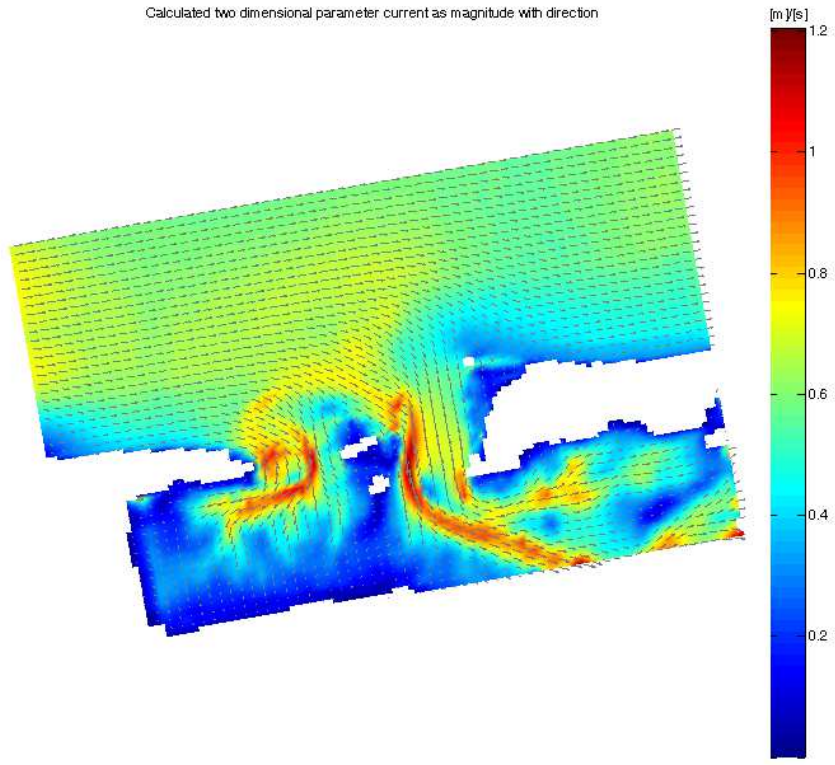


Figure 3.49 Calculated two dimensional parameter (direction), type 8

3.7.5.9 Calculated directional variance density plot, type 9

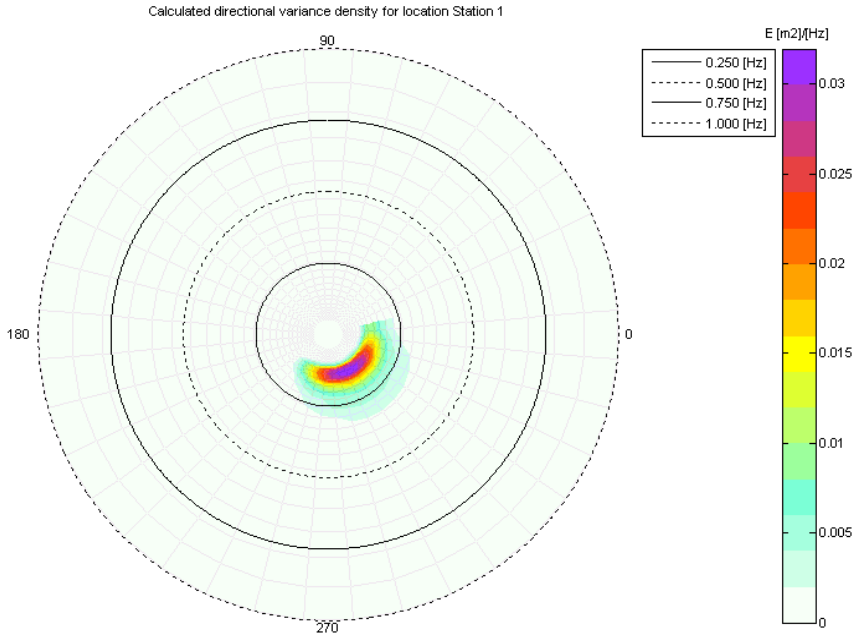


Figure 3.50 Calculated directional variance density plot, type 9

3.7.5.10 Table of statistical comparison of calculated versus observed parameters, type 10

Table 3.20 Table of statistical comparison of calculated versus observed parameters, type 10

Statistical comparison of calculated and observed parameters, based on 6 locations

	Hsig [m]	RTpeak [sec]	Tm02 [sec]	Tm_10 [sec]
BIAS	0.0919	0.3785	0.9026	0.5372
MAE	0.0919	0.3785	0.9026	0.5372
STDEV	0.0520	0.2582	0.3213	0.2183
RMS	0.1035	0.4469	0.9491	0.5729
SCI	0.0850	0.0848	0.2452	0.1210

3.7.5.11 Empty graph, type 11

Certain page layouts require an empty graph, eg if a page with five or seven graph is to be created.

3.7.5.12 Scatter plot of calculated versus observed values, type 12

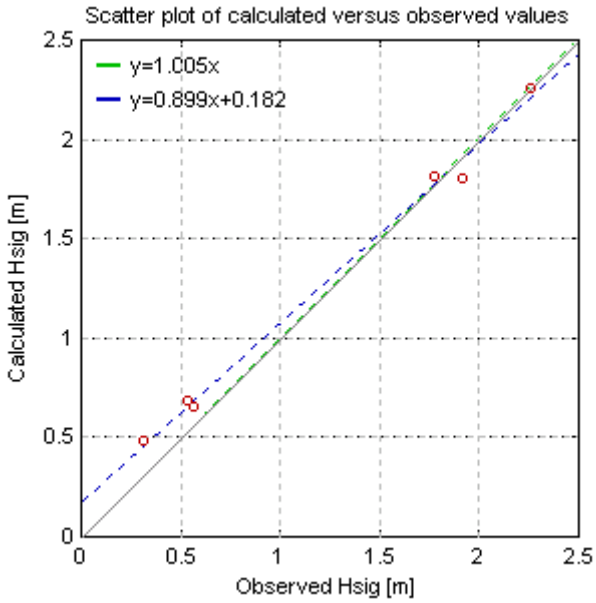


Figure 3.51 Scatter plot of calculated versus observed values, type 12

3.7.5.13 Calculated parameter, computed along a curve, type 13

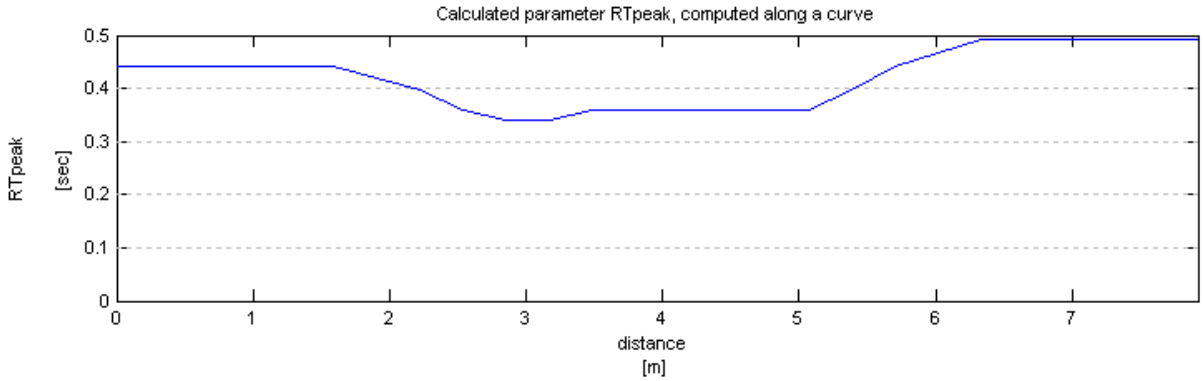


Figure 3.52 Calculated parameter, computed along a curve, type 13

3.7.5.14 Calculated parameter vs Young & Verhagen, Holthuijsen, Bretschneider, Young & Babanin type 14

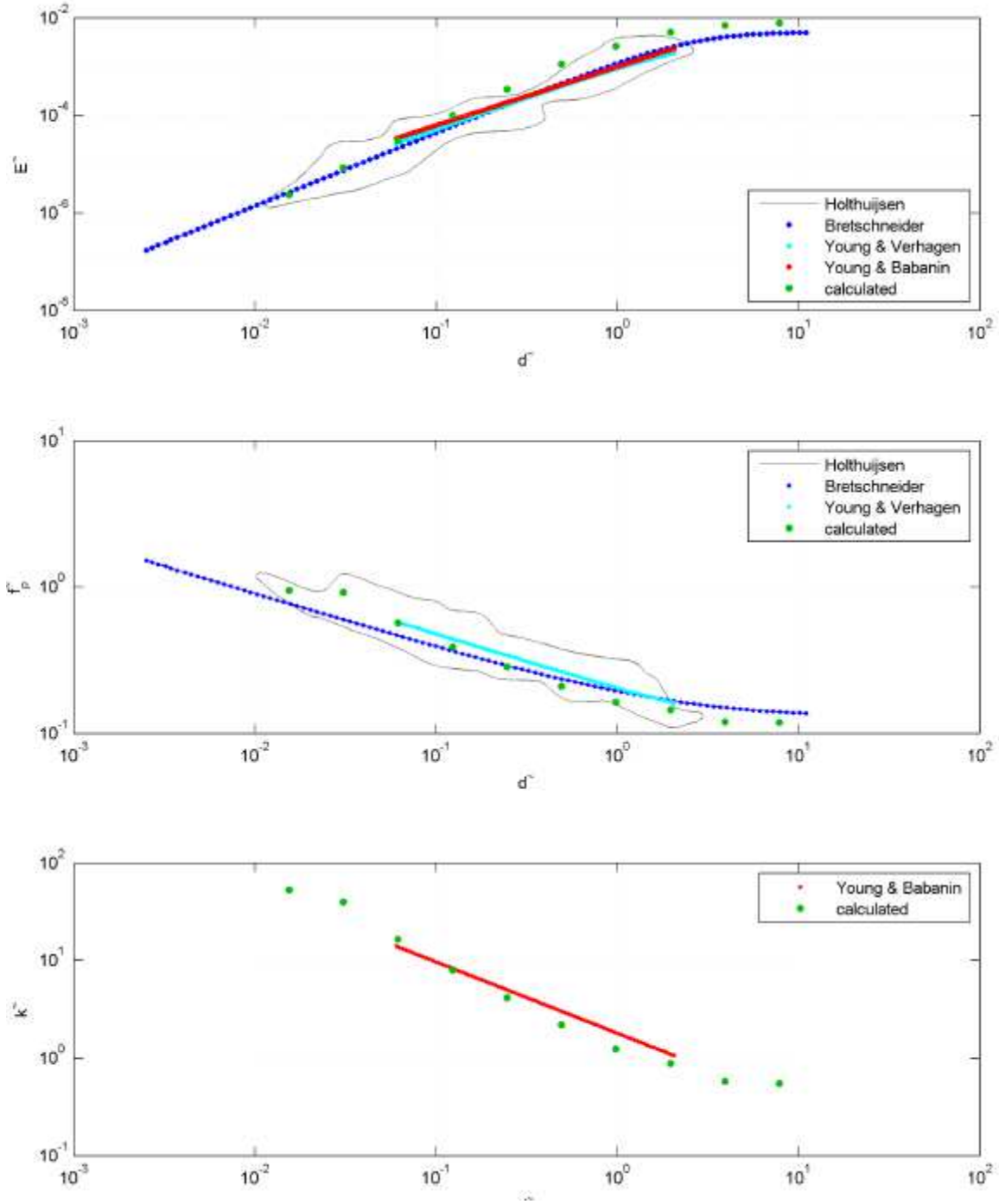


Figure 3.53 Calculated parameter vs Young & Verhagen, Holthuijsen, Bretschneider, Young & Babanin type 14

3.7.5.15 Calculated parameter vs Kahma & Calkoen, Pierson Moskowitz, Wilson, type 15

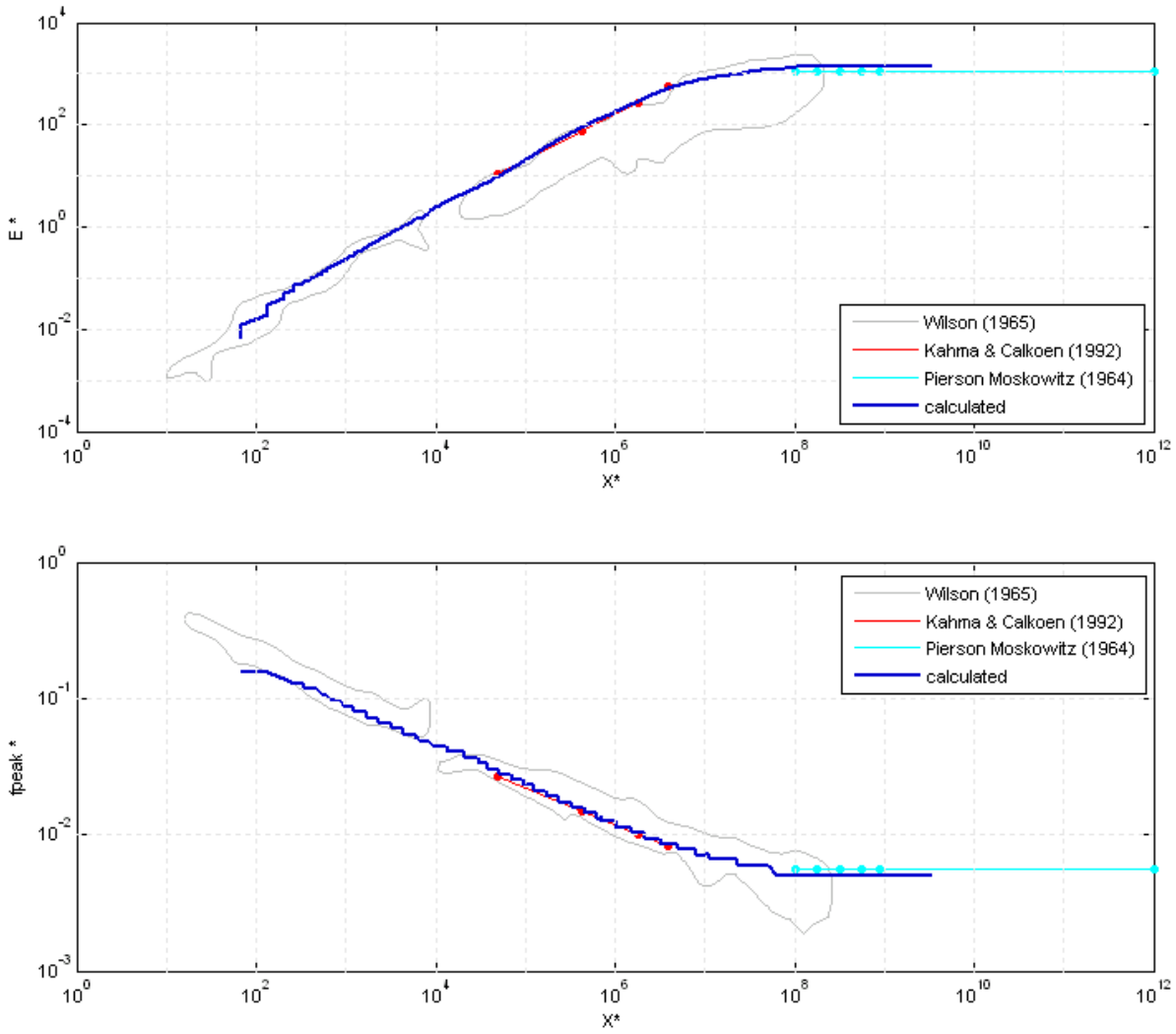


Figure 3.54 Calculated parameter vs Kahma & Calkoen, Pierson Moskowitz, Wilson, type 15

3.7.5.16 Calculated versus observed directional variance density plot, type 16

Calculated versus observed directional variance density plot is not yet available.

3.7.5.17 Calculated versus observed values, type 17

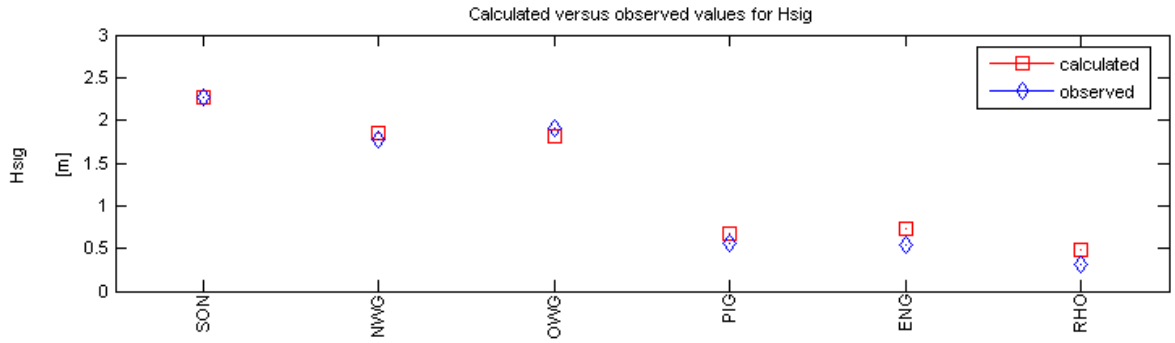


Figure 3.55 Calculated versus observed values, type 17

3.7.5.18 Location and depth, type 18

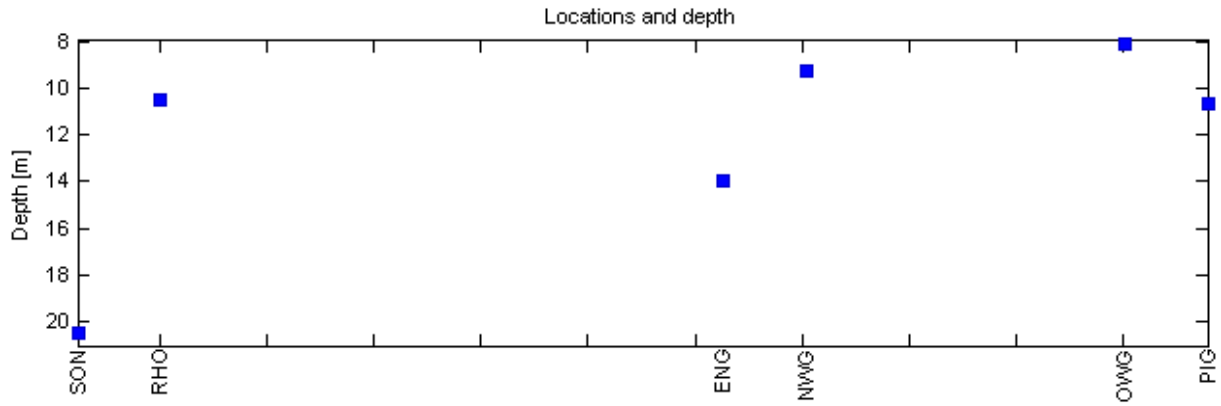


Figure 3.56 Location and depth, type 18

3.7.5.19 Overview of locations with weight, type 19

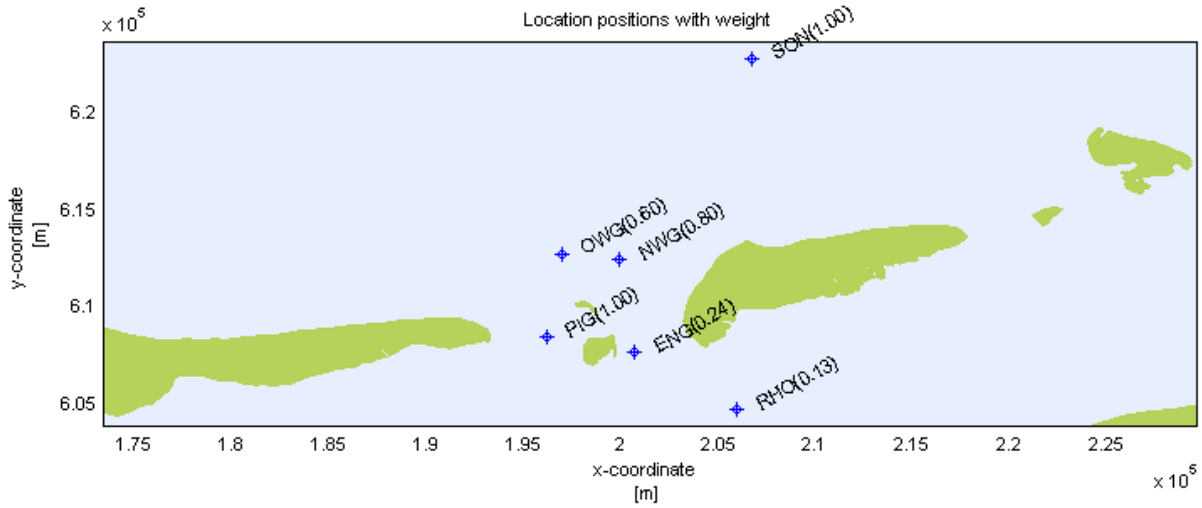


Figure 3.57 Overview of locations with weight, type 19

Please note that the weighting factors presented in Figure 3.57 are fictitious and only supplied for illustration purposes.

3.7.5.20 All nests, deviation from the plots above

The only plot for all–nests that deviates from the plots described above is the scatter plot (type 12), where an extra legend is placed at the bottom right, explaining which symbols is used for each nest.

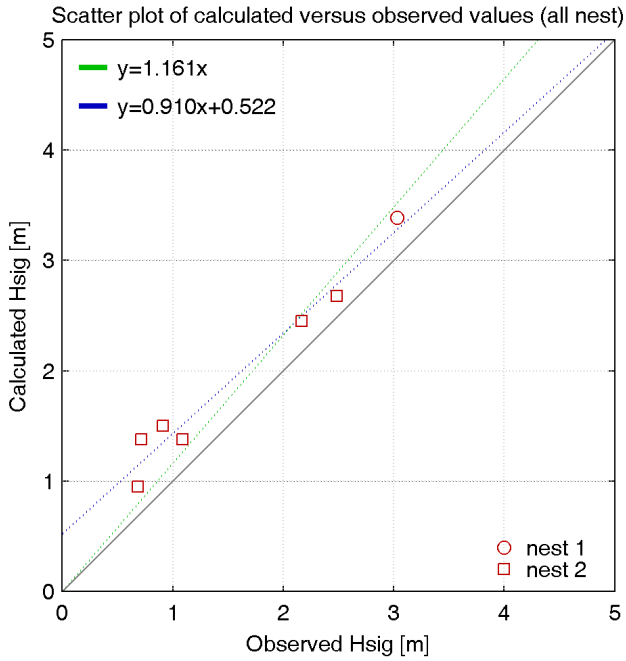


Figure 3.58 Scatter plot of calculated versus observed values (all nests), type 12

3.7.6 Examples of SWIVT output plots and table; Linked cases with same codename

3.7.6.1 Overview of locations, type 1

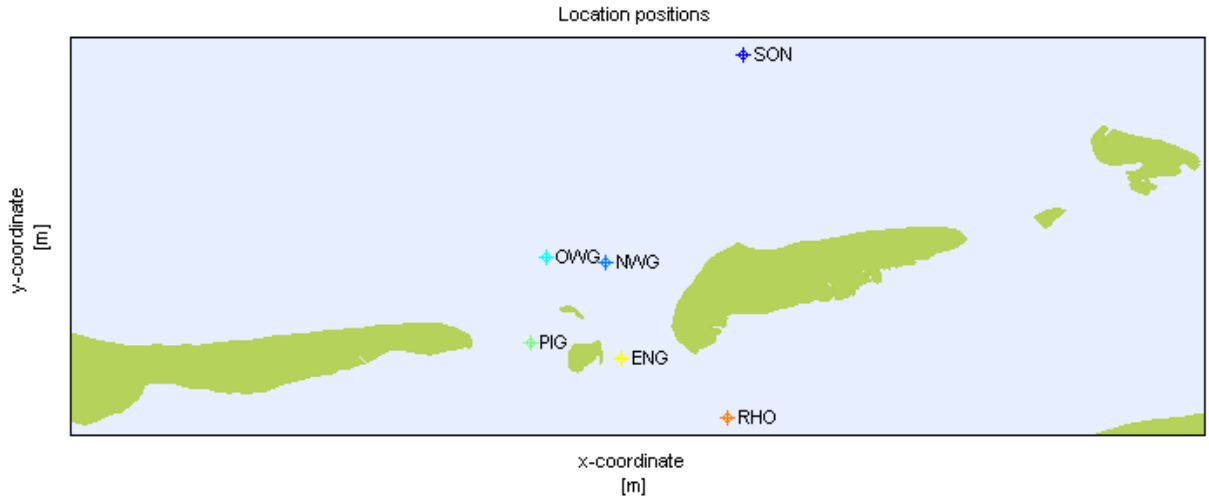


Figure 3.59 Overview of locations, type 1

3.7.6.2 Table of calculated values for case1 and case 2, type 3

Table 3.21 Table of calculated values for case1 and case 2 vs observed, type 3

Table calculated values for case 1 and case 2 vs observed

Xp [m]	Yp [m]	Depth [m]			Hsig [m]			Tm_10 [sec]		
2.00	10.00	0.4000	0.4000	0.4000	0.0985	0.0983	0.1110	1.1268	1.1301	1.1400
2.00	0.00	0.4000	0.4000	0.4000	0.1059	0.1056	0.1050	1.1189	1.1229	1.1570
2.00	-5.00	0.4000	0.4000	0.4000	0.1065	0.1064	0.1000	1.1201	1.1227	1.1490
7.50	10.00	0.4000	0.4000	0.4000	0.1057	0.1054	0.1010	1.1111	1.1173	1.1470
7.50	2.50	0.4000	0.4000	0.4000	0.1095	0.1076	0.1070	1.1006	1.1011	1.1570
7.50	0.00	0.4000	0.4000	0.4000	0.1043	0.1011	0.1050	1.1161	1.1146	1.1550
7.50	-5.00	0.4000	0.4000	0.4000	0.0972	0.0971	0.1040	1.1214	1.1227	1.1480
12.00	2.50	0.2453	0.2453	0.2453	0.1001	0.0955	0.0980	1.1240	1.1199	1.1820
12.00	0.00	0.2000	0.2000	0.2000	0.0939	0.0906	0.0980	1.1253	1.1265	1.1980
12.00	-5.00	0.2000	0.2000	0.2000	0.0868	0.0862	0.0890	1.1241	1.1277	1.1580
15.00	10.00	0.4000	0.4000	0.4000	0.1234	0.1230	0.1120	1.0859	1.0894	1.1860

3.7.6.3 Calculated variance density spectrum for case 1 versus case 2, type 5

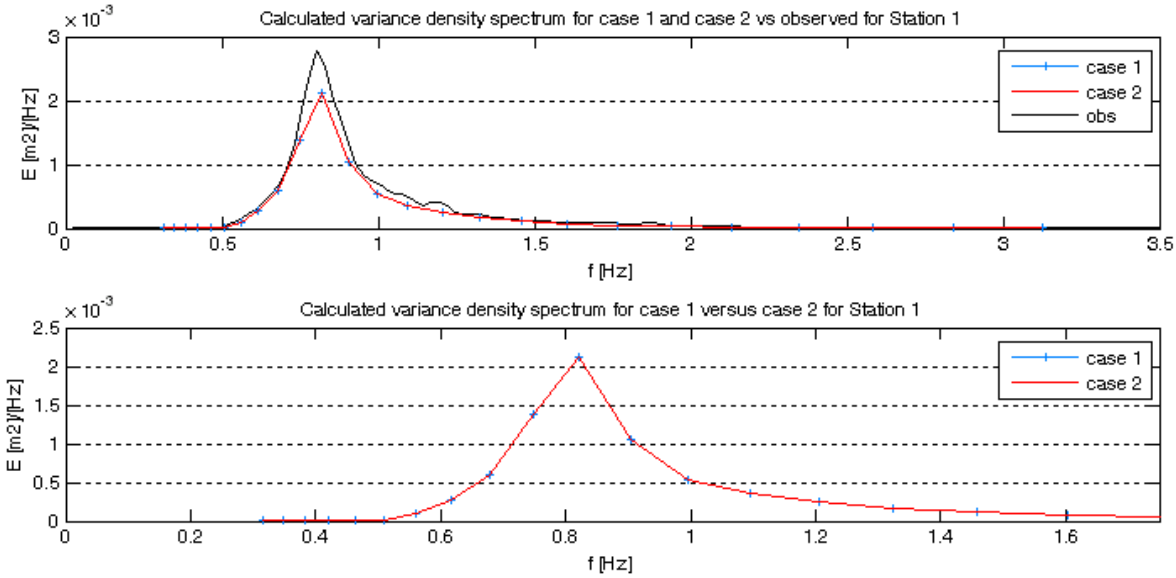


Figure 3.60 Calculated variance density spectrum for case 1 versus case 2 (one with and one without observed values), type 5

3.7.6.4 Difference plot of calculated two dimensional parameter, type 6

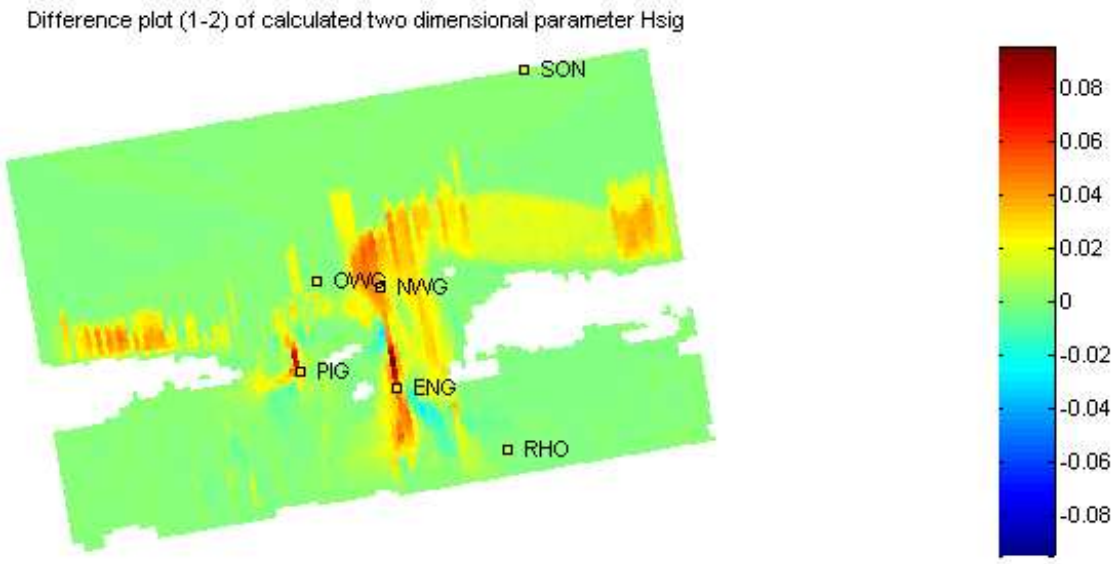


Figure 3.61 Difference plot of calculated two dimensional parameter, type 6

3.7.6.5 Table of statistical comparison of calculated parameters for case 1 versus case 2, type 10

Table 3.22 Table of statistical comparison of calculated parameters for case 1 versus case 2, type 10

Statistical comparison of calculated and observed parameters, based on 26(set 1) / 26(set 2) locations

	Hsig (set 1)	Hsig (set 2)	Tm01 (set 1)	Tm01 (set 2)	Tm02 (set 1)	Tm02 (set 2)	Tm_10 (set 1)	Tm_10 (set 2)
BIAS	0.0055	0.0057	0.0749	0.0623	0.1020	0.0658	0.0673	0.0469
MAE	0.0055	0.0057	0.0749	0.0623	0.1020	0.0658	0.0673	0.0469
STDEV	0.0033	0.0031	0.0678	0.0539	0.0935	0.0527	0.0688	0.0499
RMS	0.0064	0.0064	0.1001	0.0817	0.1371	0.0837	0.0953	0.0678
SCI	0.0733	0.0739	0.1058	0.0849	0.1616	0.0931	0.0834	0.0629

3.7.6.6 Scatter plot of calculated parameters for case 1 versus case 2, type 12

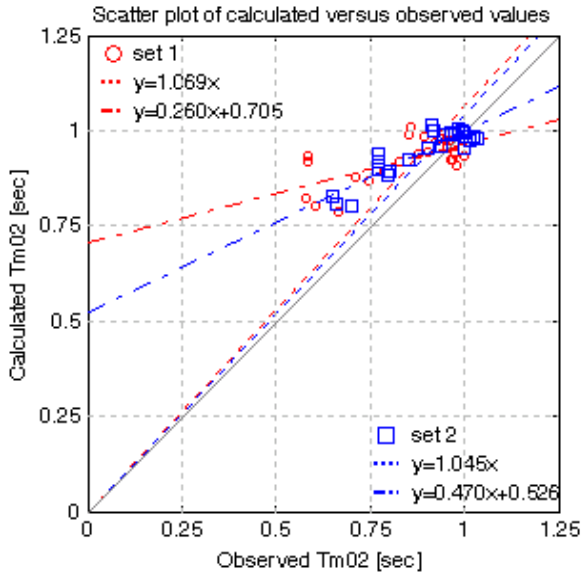


Figure 3.62 Scatter plot of calculated parameters for case 1 versus case 2, type 12

3.7.6.7 Overview of locations with weight, type 19

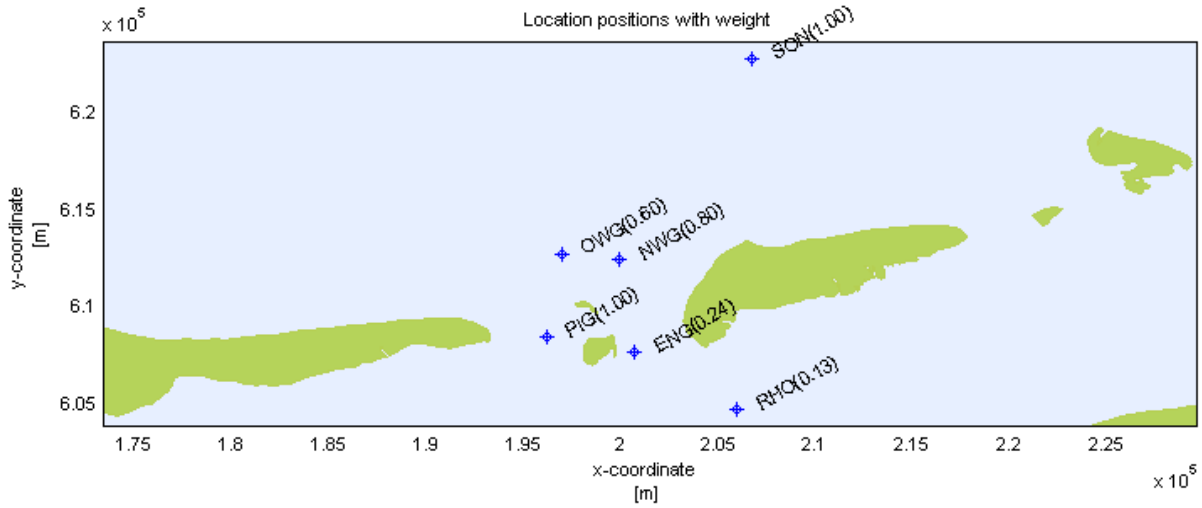


Figure 3.63 Overview of locations with weight, type 19

3.7.7 Examples of SWIVT output plot and table: Linked cases

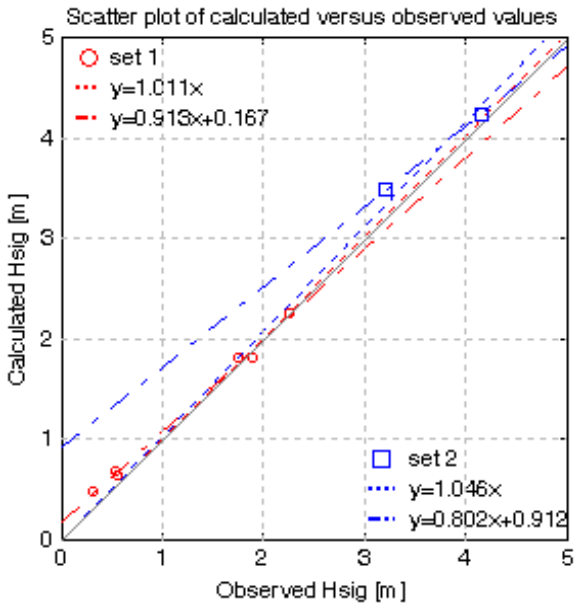
Note that the example figures and tables are not necessarily from the same cases

3.7.7.1 Table of statistical comparison of calculated parameters versus observed values (type 10)

Statistical comparison of calculated and observed parameters, based on 7 locations

	Hsig	RTpeak	Tm01	Tm02	Tm_10
BIAS	0.1049	0.3785	0.6984	0.8788	0.4648
MAE	0.1049	0.3785	0.6984	0.8788	0.4648
STDEV	0.0475	0.2582	0.2433	0.2933	0.1993
RMS	0.1231	0.4469	0.7522	0.9217	0.5306
SCI	0.0785	0.0848	0.1699	0.2210	0.1056

3.7.7.2 Scatter plot of calculated parameters versus observed values (type 12)



3.7.8 Examples of SWIVT output plot and table: Set comparison

3.7.8.1 Table of statistical comparison of calculated parameters for set 1 versus observed values and set 2 versus observed values (type 10)

Table 3.23 Table of statistical comparison of calculated parameters for set 1 versus observed values and set 2 versus observed values, type 10

Statistical comparison of calculated and observed parameters, based on 63(set 1) / 24(set 2) locations

	Depth (set 1)	Depth (set 2)	Dir (set 1)	Dir (set 2)	Hsig (set 1)	Hsig (set 2)
BIAS	4.7152	4.1258	-34.7510	-78.5805	0.6319	0.5796
MAE	4.7152	4.1258	34.7773	-12.2125	0.6319	0.5796
STDEV	21.2566	20.1495	156.7217	155.4729	2.8462	2.6979
RMS	21.6079	20.2124	159.3093	263.7983	2.8934	2.7081
SCI	2.1606	2.3098	1.4407	-0.0000	2.3088	1.9677

The header of the table indicates the number of locations in each set that are used for the statistical calculations.

3.7.8.2 Scatter plot of calculated parameters for set1 versus observed values and set 2 versus observed values (type 12)

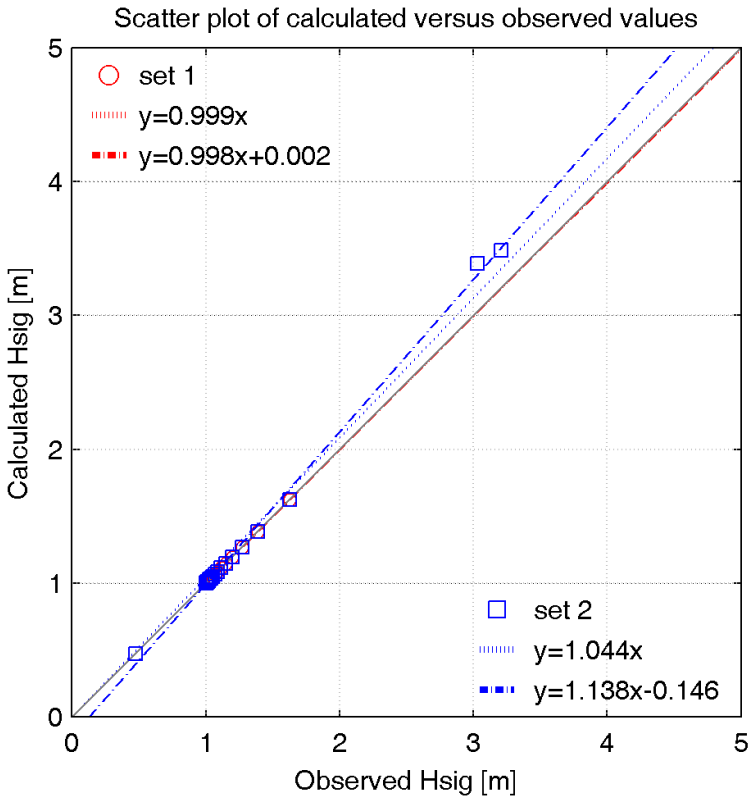


Figure 3.64 Scatter plot of calculated parameters for set1 versus observed values and set 2 versus observed values, type 12

This example shows that two colours are used to differentiate between the sets, as well as the symbol type in case of the markers.

4 Glossary

TERM	DESCRIPTION
case	a SWIVT case consists of a set of SWAN model input files, a SWIVT input file and optional files with observed data
casename	block 1,2 and 3 of the code (see code)
code	The code name of a case is built–up as: $\begin{vmatrix} a \\ l \\ f \end{vmatrix} \lvert iii \rvert \lvert ccccc \rvert \lvert iii \rvert \_ \lvert ii \rvert$ where **Table 4.1 Code description cases** ITEM: DESCRIPTION 1st block: a = analytical case, l = laboratory case, f = field case 2nd block: iii = case identifying code (3 integers) 3rd block: ccccc = case identifying code (5 characters) 4th block: iii = subtype identifying code (3 integers) 5th block: ii = nestcode identifying nest run (2 integers) (optional) The first three blocks constitute the casename.
loccode	code with the text "loc" followed by two integers. These integers refer to the position (line number) of the location in the ***code***.*loc* file. This code is separated from its predecessors by an underscore.
nestcode	see code (5th block)
pagecode	automatically generated code with the text "page" followed by two integers. This is a number denoting the page number in the page layout list of pages. This code is separated from its predecessors by an underscore.
servercase	a case derived from the SWIVT server, identified by subcode 000 (see also subcase)
session	a SWIVT run, ie all activities that take place between starting and closing SWIVT.
subtype	see code (4th block)
subcase	a case derived from a servercase, identified by subcode other than 000.
subcode	automatically generated code of three integers, 000 identifying the base case as defined on the SWIVT server. This code is placed after the nestcode and separated from this by an underscore. The subcode is not part of code. Please note that subcode 000 is reserved for server cases. Local cases always start with subcode 001.
swanversioncode	code starting with SWAN, followed by the version number, eg 4072A. The value is taken from the property swan_version which comes with the case from the server.
tablecode	automatically generated code of one integer, used to identify the table output file associated with an output page. This code is separated from its predecessors by an underscore.

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https://swanmodel.sourceforge.io

A Appendix

A.1 Examples

A.1.1 From start to finish, a step by step example

This example assumes that SWIVT has been installed according to the instructions in Section 2.1. The objective is to run SWIVT for f051fries001 and to produce the results.

1. Start SWIVT by double clicking the icon on the desktop
2. On the matlab screen enter: `swivt('new')`
3. Click on the blue SWIVT splash screen
4. Click on `Add case` to retrieve the case from the server
5. As the name of the case is known, click on `select property` and choose `code`
6. Click on `f051fries001`
7. Click on `OK`
8. Click on the top right button in the toolbar to inspect the settings of this case
9. Close the window
10. Click on `Edit case` if items need to be changed, see Section 3.5 for all the options
11. Click on `Run case`
12. Select the case specific template, a user defined template can be selected here too
13. Click on `Page layout`
14. Select `Immediate print to file` if required.
15. Enter the user defined text to personalise the page
16. Select the required logo
17. Click on `OK`
18. Click on `Start`
19. The run log appears in a new window, inspect the results

A.1.2 Selecting a parameter set

Suppose that a user wants to perform a validation, and includes the 1D Beji–Battjes bar (l021triad001) from the ONR Testbed, in his set of validation testcases. Since this case is 1D, SWAN does not allow for the inclusion of quadruplets. If the user wanted to perform a validation using the one of the SWAN or HR2006 default settings, and if the difference introduced in Table 3.3 didn't exist, there would be no SWAN run, and therefore no result, for this testcase. The reason is that quadruplets are included in the default settings, but – as just mentioned – this case does not allow for quadruplets.

Continuing the argument, the Beji–Battjes bar is a good case for testing the triad interaction. Again, using the one of the SWAN or HR2006 default settings, without the difference in Table 3.3, triad interaction would be excluded. The reason, again, is that this physical process is excluded by default.

The same argument – optimal results can only be obtained if the in/exclusion of physical processes differs from the SWAN default settings – also holds for a number of other testcases. We want to prevent the undesirable situation that a user, after having selected a parameter settings option, needs to manually (de)activate physical processes in a number of cases in order to get optimal results. This can be cumbersome and yield undesirable results in particular if a large number of validation cases is selected. This cumbersome aspect is resolved by taking into account the subtle difference introduced in Table 3.3.

This means that, once the user has selected a parameter settings option, SWIVT will take care of the correct in/exclusion of physical processes. SWIVT derives the meta information on the in/exclusion of physical

processes from the ONR Testbed settings (for the cases originating from the ONR Testbed) or from the settings as applied in an earlier study (no cases can enter SWIVT before it has been studied thoroughly).

For the Beji–Battjes bar, for example, this means that quadruplets are automatically excluded, since this is the case in the ONR Testbed. Furthermore, triads are activated. For example, for parameter cutfr the values 2.2, 5.0, 2.5 and 2.2 are taken after selecting parameter settings options SWAN4041, SWAN4051, SWAN4051A and HR2006 respectively.

Please note that the user still has the possibility to manually overrule the in/exclusion of physical processes. If he would activate quadruplet interaction for the Beji–Battjes case (which wouldn't make sense, but merely for the sake of argument), then the values mentioned in Table 3.5, depending on the selected parameter option, will be taken.

The whole reasoning above also holds for the parameter settings options `User`: the invoked parameter settings are only used for the physical processes that are *included* in the selected case.