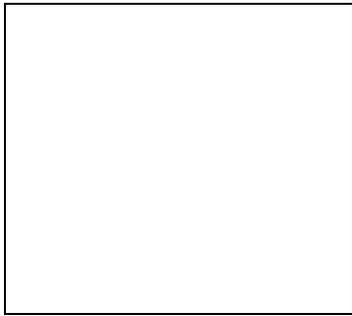




User's Guide

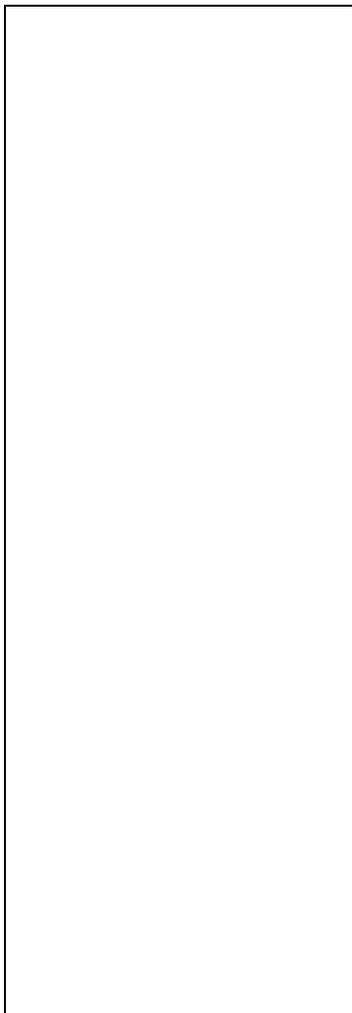
WAQPAN



User's Guide

WAQPAN

This document describes the usage of WAQPAN, an interface between WAQUA and PRESENT, ANIMATE, MATLAB, HISPLO and BOX (SIMVIEW).



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1 **About this manual**

This manual is part of the user's guide of WAQUA. For a description of the user's guide of WAQUA, see the section 'General information' of that guide. For a brief description of the program (files, procedure call), the user can refer to the corresponding chapter in the quick reference guide of the user's guide of WAQUA.

The manual of WAQPAN has the following chapters:

- a description of this manual;
- a general description of the program;
- an extensive description of each dialogue in the program;
- a description of each subroutine in the program;
- glossary;
- index.

In the description of the dialogues of the program, all commands that must be typed by the user will be given in italic characters. All program output will be in a non-proportional font and is indicated by a starting asterisk '*':

2 General description of the program

2.1 Function

interface

This program provides an interface between the SDS file (WAQUA / TRIWAQ) and the plot packages PRESENT, ANIMATE, MATLAB and SIMVIEW (BOX) (if the user wants to select mapdata) or PRESENT and HISPLO (if the user wants to select historydata).

In case of mapdata the user can select data, such as waterlevels, velocities and concentrations, at a certain time (momentary data) or data integrated and averaged over a longer time interval (residual data, either Eulerian or Lagrangian quantities). Moreover, the user can also plot the results of the harmonic analysis applied to WAQUA/TRIWAQ runs.

In case of mapdata of a WAQUA-run the user can choose to generate difference maps of two simulations with different times.

WAQPAN can be applied after a run of the simulation program. The ASCII data files produced by WAQPAN can be used as input to the presentation programs.

WAQPAN reads simulation information written on the SDS file by WAQUA and writes the data to output file(s). Since WAQUA can be executed in WAQUA as well as in TRIWAQ mode, WAQPAN is able to handle both these modes. This is done automatically.

When mapdata of TRIWAQ results are to be generated the user can choose between a horizontal cross section or a vertical cross section. If a horizontal cross section is chosen the user has the possibility to select the depth at which the variables have to be computed. This can be a constant depth with respect to some reference level or a variable depth following the local sigma-layer.

In case of history data either a history plot for a quantity in some special station and in case of TRIWAQ for some special depth or a set of plots over the vertical, for various times for currents and/or constituents in a station, can be selected.

It is important to note that in case of Lagrangian quantities depth selection is not available.

output mode

In WAQPAN a parameter has to be specified to indicate which of the possible output modes is desired: PRESENT, ANIMATE, BOX, MATLAB or HISPLO mode. The BOX-mode generates files in the SIMONA-box structure, which can be included in a SIMONA-input file or can be used within SIMVIEW.

Remark 1: In the case of HISPLO an output file is created that should be used by OBSFIL to obtain a correct inputfile for HISPLO. In the following it is assumed that the user is aware of this substep. Both names HISPLO and OBSFIL will be used in the text.

Remark 2: It is important to note that parts of WAQPAN are out of date with respect to WAQUA/TRIWAQ. Therefore the WAQPAN-results for derived quantities may differ from WAQUA/TRIWAQ. Also the vertical cross sections may differ, due to differences in the layer interface in

	2.2	TRIWAQ. Output files
subdirectory		<p>WAQPAN generates a subdirectory (in the current directory) containing the requested output file(s).</p> <p>In the case of PRESENT or OBSFIL mode this directory will contain only one data file with all relevant information of all pictures for the plot program in one sequence. For OBSFIL also a small file with directions for use, as required for this package, is created.</p> <p>In the case of ANIMATE, MATLAB and BOX mode the directory will contain several data files, for each picture one or more files.</p> <p>Finally, if requested, a log will be included in this subdirectory. This file contains relevant information on the data files that have been created.</p>
	2.2.1	PRESENT
output file name		For the PRESENT interface only one file is created: PRESENT.OUT.
data		<p>This file contains all selected data. The identification of the data is given by a block code. This is a four-character code generated by WAQPAN. The first block code is 'B001' and this code is augmented by one for each desired output time or each new data selection or each new station. The log file shows the correspondence of block codes, times, stations and data selections.</p> <p>Some special remarks have to be made with respect to this data file.</p>
mapdata		In case of mapdata (MAP PLOTS) the first and second column give the local x- and y-coordinates. The meaning of the other columns can be found in the header.
positions		Not all output data are positioned at the same grid. In case of horizontal cross sections, depth data are positioned at depth locations and all other output data are positioned at water level locations. In case of vertical cross sections, the x-positions are relative distances in the horizontal direction with respect to the beginning of the cross section and the y-positions are the values from array ZKS (the centre of the layer(s)), i.e. positions in the vertical direction.
tidal constants		Concerning the presentation of tidal constants, i.e. astronomical amplitudes and improved kappa-numbers (= local phase lags), of all tidal components that can be found on SDS, these are given for one given (M,N) point. The first column gives the corresponding component numbers, the second column represents the angular velocities and the third and fourth column give the tidal constants.
historydata		In case of historydata (HISTORY PLOTS) the first column always contains the timeseries. The meaning of the next columns can be found in the header. If VERTICALS with historydata are created the actual time, the number, name and position of station, respectively, are found in the header. The first column gives the depth at the position (station) considered.

The meaning of the keywords for data selection can be found in the WAQUA/TRIWAQ section in the SIMONA user's guide.

2.2.2 ANIMATE

For the ANIMATE interface several files are created : mapdata files, boundary outlines files, coordinates files and, if specified by the user, a log file. In ANIMATE mode no history plots are made.

output file names

ANIMATE requires one data file for each kind of data per output time. These data files are named as follows:

<H/V><block code><selection code><file code><.VEC>.

For example the following list of output files can be generated in one WAQPAN run:

H001BDAT	H002LIN	V004G001
H001FDAT.VEC	H003ADAT	V004G002
H001HDAT.VEC	H003CDAT	V004HDAT
H001IDAT	H003EDAT.VEC	V004IDAT
H001LIN	H003G001.VEC	V004LIN
H002ADAT.VEC	H003G002.VEC	V005CCO
H002CDAT.VEC	H003LIN	V005EDAT.VEC
H002EDAT.VEC	V004CCO	V005FDAT.VEC
H002G001.VEC	V004EDAT	V005G001.VEC
H002G002.VEC	V004FDAT	V005LIN

whereas in case of tidal analysis, for instance the following output files can be generated:

```
H001LIN
H001MDAT
H001N001
H001N010
H001O025
```

All files concerning horizontal cross sections start with an 'H', and all files concerning vertical cross sections with a 'V'.

The block code is a three-character code generated by WAQPAN to identify a certain cross section at a certain time. The first block code is '001' and the code is augmented by one for each desired new output time or each new output window. The log file shows the correspondence of block codes, times and geometries.

The selection code is the code entered by the user to select the kind of data to be outputted. Dependent on the packages WAQUA or TRIWAQ several of the following selections are available :

A[V]	= Waterlevels
B[V]	= Bottom Friction
C[V]	= Depth in meters
E[V]	= Magnitude of local velocity

F[V] = Eddy Viscosity
G<nr>[V] = Concentration of Constituent
H[V] = Eddy Diffusivity
I[V] = Richardson Numbers
J[V] = Eulerian Residual Velocities
K[V] = Eulerian Residual Transports
L[V] = Lagrangian Displacements

Moreover, if the user wants to plot the tidal constants, instead of the abovementioned list the following selections are given :

M = Mean waterlevel or current of tide
N = Astronomical amplitude
O = Improved kappa-number (=local phase lag)

Remark : In the case of residual quantities (J, K and L) and of tidal constants (M, N and O) only the choice of horizontal cross-sections is supported. Moreover, in the case of Lagrangian displacements depth selection is not possible.

The file code can be DAT, LIN, CCO or a three digit long number, when the selection code was 'G' (constituent) or 'N' (amplitude) or 'O' (phase lag). In the last three cases the number indicates the chosen constituent number and tidal component number, respectively.

An extension 'VEC' is added to the file name when the selection code ended at 'v' (meaning that a velocity field plot is incorporated).

data

For each requested horizontal cross section (in combination with one or more times) only one boundary outlines file (file code = LIN) and only one coordinates file (file code = CCO), in case of a curvilinear model, is created.

For a vertical cross section one boundary outlines file and one coordinates file is created for each output time. In this case the boundary outlines file gives the water level and the coordinates file contains the actual layer thickness for that particular time.

positions

The positions in the coordinates file are:

- for horizontal cross sections:
(x, y)-positions are the depth locations surrounding the water level locations of the output data (see the user manual of ANIMATE);
- for vertical cross sections:
the x-positions are relative distances in the horizontal direction with respect to the beginning of the cross section; the y-positions are positions in the vertical direction and are determined with the actual layer thickness.

Note: in case of a vertical cross section the (x, y)-positions in the coordinates file are scaled in order to get a maximum screen filling.

The data in all other files for ANIMATE are positioned at the water level grid.

2.2.3 MATLAB

For the MATLAB interface several files are created : mapdata files, boundary outlines files, coordinates files, files containing the drying/flooding flags and, if specified by the user, a log file. In MATLAB mode no history plots are made.

output file names

MATLAB requires one data file for each kind of data per output time. These data files are named as follows:

<H/V><block code><selection code><file code><.m>.

For example the following list of output files can be generated in one WAQPAN run:

H001AMAT.m	H002LIN.m	V004G001.m	
H001FMAT.m	H003BMAT	.m	V004G002.m
H001HMAT.m	H003G001	.m	V004HMAT.m
H001KH.m	H003G002.m		V004KH.m
H001LIN.m	H003IMAT.m	V004LIN.m	
H002AVEC.m	H003KH.m		V005CCO.m
H002CMAT.m	H003LIN.m	V005EMAT.m	
H002EMAT.m	V004CCO.m	V005FMAT.m	
H002G001VEC.m	V004EMAT	.m	V005KH.m
H002KH.m	V004FMAT	.m	V005LIN.m

whereas in case of tidal analysis, for instance the following output files can be generated:

H001KH.m
H001LIN.m
H001MMAT.m
H001N017.m
H001O017.m

All files concerning horizontal cross sections start with an 'H', and all files concerning vertical cross sections with a 'V'.

The block code is a three-character code generated by WAQPAN to identify a certain cross section at a certain time. The first block code is '001' and the code is augmented by one for each desired new output time or each new output window. The log file shows the correspondence of block codes, times and geometries.

The selection code is the code entered by the user to select the kind of data to be outputted. Dependent on the packages WAQUA or TRIWAQ several of the following selections are available :

A[V]	=	Waterlevels
B[V]	=	Bottom Friction
C[V]	=	Depth in meters
E[V]	=	Magnitude of local velocity
F[V]	=	Eddy Viscosity
G<nr>[V]	=	Concentration of Constituent

H[V]	= Eddy Diffusivity
I[V]	= Richardson Numbers
J[V]	= Eulerian Residual Velocities
K[V]	= Eulerian Residual Transports
L[V]	= Lagrangian Displacements

Moreover, if the user wants to plot the tidal constants, instead of the abovementioned list the following selections are given :

M = Mean waterlevel or current of tide
N = Astronomical amplitude
O = Improved kappa-number (=local phase lag)

Remark : In the case of residual quantities (J, K and L) and of tidal constants (M, N and O) only the choice of horizontal cross-sections is supported. Moreover, in the case of Lagrangian displacements depth selection is not possible.

The file code can be MAT, VEC, LIN, CCO, KH or a three digit long number, when the selection code was 'G' (constituent) or 'N' (amplitude) or 'O' (phase lag). In the last three cases the number indicates the chosen constituent number and tidal component number, respectively. The file code 'VEC' is added to the file name when the selection code ended at 'V' (meaning that a velocity field plot is incorporated).

data

For each requested horizontal cross section (in combination with one or more times) only one boundary outlines file (file code = LIN) and only one coordinates file (file code = CCO), in case of a curvilinear model, is created. Also, a file containing the drying/flooding flags (file code = KH) is created.

For a vertical cross section one boundary outlines file and one coordinates file is created for each output time. In this case the boundary outlines file gives the water level and the coordinates file contains the actual layer thickness for that particular time.

positions

The positions in the coordinates file are:

- for horizontal cross sections:
(x, y)-positions are the depth locations surrounding the water level locations of the output data;
- for vertical cross sections:
the x-positions are relative distances in the horizontal direction with respect to the beginning of the cross section; the y-positions are positions in the vertical direction and are determined with the actual layer thickness.

Note: in case of a vertical cross section the (x, y)-positions in the coordinates file are scaled in order to get a maximum screen filling.

The data in all other files for MATLAB are positioned at the water level grid.

Example

Let us consider the following files which have been generated during a

WAQPAN session:

H001AVEC.m contains the water levels (called “Level”) and the velocity components (called “U” and “V”) of a curvilinear WAQUA simulation.
 H001CCO.m contains the x- and y-coordinates of the curvilinear grid (called “Xdep” and “Ydep”, respectively).
 H001KH.m contains the flags for drying/flooding (called “KHU” and “KHV”).
 K001LIN.m contains the boundary outlines (called “Outline”).

During a MATLAB session the user can compose a plot containing:

- a checkerboard plot of the water level,
- a vector plot of the velocities,
- the dry cells by lines at the cell boundaries, and
- the boundary outlines.

In order to compose this plot the user has to enter the following commands:

```
>> H001AVEC          % Read the water levels and velocity  >>          %
components
>> H001CCO          % Read the (x,y)-coordinates of the depth- >>
% locations
>> H001KH           % Read the flags arrays for drying/flooding
>> H001LIN          % Read the boundary outlines
>> pcolor(Xdep,Xdep,Level); % Make a pseudocolor plot
>> colormap(jet);colorbar; % Set the colormap property and display  >>          %
color scale
>> shading flat; axis equal % Set the shading of plot to flat and make >>          %
the x- and y-axis equal
>> hold
>> quiver(Xdep,Ydep,U,V) % Make a vector plot
>> pltkhcc;         % Plot the 'schootjes' (curvilinear case)
>> plot(Outline(:,1), Outline(:,2)); % Plot the boundary outlines
```

For the plots of the 'schootjes' there are two MATLAB-macro files present, namely PLOTKHU.m (for rectangular models), PLTKHCC.m (for curvilinear models).

In order to plot the curvilinear grid the following MATLAB commands need to be entered:

```
>> c = Level;
>> c(find(abs(c) > 0)) = 0;
>> surface(Xdep,Ydep,c,'Facecolor','w');
>> axis equal;
```

2.2.4

BOX

For the BOX interface several files are created : data files and (if specified by the user) a log file. All these files concern horizontal mapplots only !

The possibility to use BOX is limited to:

- WAQUA

- the MAP-type must be actual map data.

output file names

BOX requires one data file for each kind of data per output time. These data files are named as follows:

<H><block code><selection code><file code>.

For example the following list of output files can be generated in one WAQPAN run:

```
H001ABOX      H001G001.BOX
H001BBOX      H001G002.BOX
H002ABOX
H001UBOX
H001VBOX
H001EBOX
```

whereas in case of tidal analysis, for instance the following output files can be generated:

```
H001MBOX
H001N023.BOX
H001O047.BOX
```

All files start with an 'H'. The block code is a three-character code generated by WAQPAN to identify a certain cross section at a certain time. The first block code is '001' and the code is augmented by one for each desired new output time or each new output window. The log file shows the correspondence of block codes, times and geometries.

The selection code is the code entered by the user to select the kind of data to be outputted. The following selections are available :

A	=	Waterlevels
B	=	Bottom Friction
C	=	Depth in meters
U	=	U-component of local velocity at u-velocity point
V	=	V-component of local velocity at v-velocity point
G<nr>	=	Concentration of constituent
E	=	Magnitude of local velocity
F	=	Eddy Viscosity
H	=	Eddy Diffusivity
I	=	Richardson Numbers
J	=	Eulerian Residual Velocities
K	=	Eulerian Residual Transports
L	=	Lagrangian Displacements

Moreover, if the user wants to plot the tidal constants, instead of the

abovementioned list the following selections are given :

- M = Mean waterlevel or current of tide
- N = Astronomical amplitude
- O = Improved kappa-number (=local phase lag)

The file code is BOX or a three digit long number, when the selection code was 'G' (constituent) or 'N' (amplitude) or 'O' (phase lag). In the last three cases the number indicates the chosen constituent number and tidal component number, respectively.

2.2.5

HISPLO

For the HISPLO interface two files are created directly by the program : OBSFIL.OUT and OBSFIL.INP. If the user specified so also a logfile is created. The logfile contains a description of the contents of the file OBSFIL.OUT.

data

The file OBSFIL.OUT contains all selected data. The identification of the data is possible by the layout. The file consists of a number of subparts, the order of which is obligatory : first (if any) the waterlevel part for the selected stations. This block starts with, and this is repeated for each station, a "series" card, (which is a header in which the stationname is given), a "control" card in which the timestep and the number of timesteps are given, next a "format" card in which the format used in the last set of cards is given and finally all waterlevel values. After this "waterlevels block", the "currents block" is found : first for all selected stations the magnitude of the current and next for all selected stations the direction of the current. Next in the same way a block for the U-discharges, a block for the V-discharges and a block for the constituents. In WAQPAN the user is forced to follow the (obligatory) OBSFIL ordering which has been given above. So if, for instance, the currents block is started it is not possible to return to the waterlevels block. The user should keep this in mind while making his selection.

The file OBSFIL.INP is a small file in which some general information as title of the run, date and timestep and stations and quantities are given.

3 User interface

The program WAQPAN is an interactive program, prompting for user selections and producing files to be used by PRESENT, ANIMATE, MATLAB, SIMVIEW or HISPLO.

To see how the program is started, see the quick reference guide of the user's guide of WAQUA.

All prompts of WAQPAN are discussed below together with the possible input and error messages. Lines starting with an asterisk '*' indicate that it concerns a program prompt. Due to the fact that several but different files may be created (map files for fielddata and history files for historydata) the user utilizes only a part of WAQPAN for each specific situation. The first two prompts are for the identification of the SDS-file and to answer the question whether the user wants a map plot (either tidal constants or other data) or a history plot. These questions are of interest for all users. If the user is interested in mapplots of the following quantities :

- waterlevels
- depth
- velocity components (for BOX U- and V-components can be selected seperately)
- velocity magnitude
- constituent concentrations
- viscosities
- diffusivities
- Eulerian residual velocities
- Eulerian residual transports
- Lagrangian displacements

or if the user is interested in a set of mapplots of

- mean waterlevels or currents of tide
- astronomical amplitudes
- local phase lags

then the questions related to the prompts 3.4 up to 3.13 are considered. It should be noted that in the case of tidal constants the prompts 3.7, 3.8, 3.11 and 3.13 will be skipped.

If the user is interested in history plots of the following quantities :

- waterlevels
- currents
- discharges
- constituent concentrations

in some given stations, or if the user is interested in a set of plots over the vertical (TRIWAQ only) of either

- currents or
- constituent concentrations

in one or more stations then prompts 3.14 up to 3.23 are to be given.

The order of the questions while running the program is the same as the order given below, except when explicitly mentioned otherwise.

It is important to note that there are limitations with respect to the number of constituents, the number of stations and the number of times for output which can be treated by WAQPAN. If too many constituents (at this moment 10), or in case of histories too many stations (at this moment 550), or too many times for output (at this moment 9000) are to be considered, the program will give an error message and will stop the execution.

Since WAQPAN may be used to treat different SDS files resulting from both 2D and 3D packages not all possibilities mentioned are available in all cases. In WAQPAN only those prompts that make sense are executed. As an example of this situation: in the case of TRIWAQ and a horizontal cross-section the user is asked to select a layer mode, i.e. a horizontal cross-section with variable depth along "sigma layers" or a horizontal cross-section with constant depth. This prompt to determine a layer will never occur if a WAQUA SDS-file is treated simply because in WAQUA no layers exist.

Another important remark concerns the interpolation method that is used whenever the user wants to create a plot of values in a cross-section of constant depth. Due to the definition of the variables in a TRIWAQ computation, some variables like velocities and concentrations are defined in the middle points of the layers. If the value of such a variable is needed in a point situated in either the first half of the first layer or in the second half of the last layer a simple constant extrapolation is used in WAQPAN. Interpolation in the other parts is a simple linear interpolation between the two nearest values.

If points are considered that are permanently dry WAQPAN produces default values to indicate such a situation. In ANIMATE mode a default value 99999. is produced. A value -99999. indicates temporary dry points. In PRESENT mode the value 99999. is used for both situations in case of scalar quantities. In BOX mode the dry points are given the value 0. In MATLAB mode the dry points are indicated by 'NaN' (Not a Number). In case of vector quantities (like currents) a zero value is produced for all components. Finally in OBSFIL no special "large" defaults are used : if a "dry" station is considered (permanent or temporary) a zero value is submitted both for scalar and vector quantities.

The prompts and their meaning (most prompts are self explanatory):

3.1 Identification of the SDS file

The SDS file you want to work with can be specified here. The program prompts:

- * Give identification of SDS-file

If opening of the SDS file failed, the program responds with:

- * SDS file as proposed does not exist, try again

and asks again for an identification.

3.3 Map plots or History plots

The program contains two routes : one for map plots (including tidal constants) and one for history plots. The user should indicate which route is wanted.

The program prompts:

- * Do you want to create MAP
- * files or HISTORY files ?
- *
- * Type M for MAP files and
- * Type H for HISTORY files (→ 3.14)

As already pointed out, the two routes separate here :

If the plotmode is M(ap) then :

First the program prompts for the type of quantities (fielddata) to be plotted

3.4 Type of Mapplots

- * Which type of map plot ?
- * Make a choice :
- *
- * type E for Eulerian Residual Velocities
- * type L for Lagrangian Res. Velocities
- * (L only allowed for 3D!)
- * type T for tidal constants
- * type V for other map data.

if an error has been encountered in the input the program will give the message :

- * Only E,L, T or V allowed,try again (--> 3.4)

3.5 Output Mode Selection

Next the program asks for the output mode:

- * To build PRESENT, ANIMATE, BOX or MATLAB files ?
- *
- * type 1 or P for PRESENT,
- * type 2 or A for ANIMATE,
- * type 3 or B for BOX and
- * type 4 or M for MATLAB

if an error has been encountered in the input the program will give the message:
* wrong character found,try again (--> 3.5)

3.6 Map Logfile

Next the program will ask whether the user wants to create a logfile:

- * Give full name of extra log file
- * In this file it will be written in
- * shorthand what has been sent to the
- * outputfile.
- * (blank = no extra log file)

Next the program checks whether the submitted SDS file is a **WAQUA** or **TRIWAQ** file.

In case of residual maps, i.e. Eulerian or Lagrangian quantities, the program checks whether these quantities are available. If not, an error message will appear and the program STOPS.

In case of tidal constants, the program checks whether these constants are available. If not, an error message will appear and the program STOPS.

3.7 Salt filter

If salt filtering is enabled (enable by supplying '-saltfilter yes' argument to waqpan.pl), the program will ask for the minimum salt value to be used by the salt filter:

- * Give salt filter (minimum)

The salt filter will replace any salt concentration values with the given minimum if the value is lower than the minimum. Moreover, if a minimum salt filter is supplied, salt concentration values above 35 will be replaced by a maximum value of 35.

3.8 Difference maps

If the requested type of map plot (see Section 3.4) is "other" map data and the simulation mode is **WAQUA** then the program prompts:

- * WAQUA. Do you want to make plots
- * of actual map data or
- * of differences of map data

- * type A for actual map data
- * type D for difference map data

Whenever an error is detected in the user input, a message is printed:

- * Only A or D allowed try again

In case of actual map data the program continues with times selection (→ 3.8).

In case of difference map the program prompts for the name of the second SDS-file.

When considering two velocity or salinity fields from first and second SDS files, respectively: $u1$ and $u2$, then the program computes the difference both in magnitude and direction, respectively:

$$|u1 - u2|$$

$$u1 - u2$$

It should be noted that the symbols $u1$ and $u2$ are treated as velocity vectors or as scalars in case of salinity.

3.9 Map Times Selection

First the time frame, related to the type of plot the user has been asking for, is to be determined. In case of map plot there are two time frames : either an "actual" time frame or a "residual" time frame. As a result of the answer to question given in prompt 3.4 the program knows which frame has to be selected. Note that in case of tidal constants this prompt will be skipped. Next the program prompts for the selection of times (this selection is to be done by the user) :

The program prompts :

```
* Title of the SDS-file involved:
* .....
*
*
* Time frame SDS file : File Time First = .....
*                   File Time Interval= .....
*                   File Time Last  = .....
*
* The following possibilities are available :
*
* a single time      : time
*
* several times (1 to N) : time1,...,timeN
* (separate two values with a comma)
*
* if you want all times available then give: *
*
* if you want a new time interval then give either I (time) or i (time)
* with (time) the new interval. New multiple from ..... will be
* determined by the program.
*
* Separate times with comma's, close your input with a "/"
```

It is allowed to enter more than one line of input. The input will be closed when a slash is given on the end of a line. Per input line you can give :

- one time : this time will be added to the list of selected times
- several times : these times will be added to the list of selected times
- an asterisk : all available times will be added to the list of selected times
- interval i<dt> or I<dt> : this has the same effect as giving an asterisk, only the new given time interval dt will be used

Every time that an input line is given, the program shows the selected time(s) i.e. one or more times the following line if you chose one of the first two possibilities :

Added <time>

and the lines :

times added with interval <time interval>
starting with <time first>

ending with <time last>

if you chose the third possibility.

In the program the next checks are done and (if needed) adaptations are made during the analysis of your input :

- A single time must fit within the file time range. When it does, the nearest file time available is added.
- A new time interval is rounded to a whole number of file time steps.

Whenever an error is detected, a message is printed and the rest of the input line is analyzed further.

If difference map of two different SDS-files is required, the program prompts after the Map Times selection of the first SDS-file:

* Times for difference maps

*

* You have chosen to make difference maps from different SDS-files.

* Do you want to use the same times as for the first SDS-file (Y/N)

If the user chooses to use different times, the program prompts for the 'Map Times Selection' (→ 3.8) of the second SDS-file.

3.10

Geometry window

The program prompts for the geometry window of the map to be plotted :

* Give the coordinates of the cross-sectional window:

* MLEFT, MRIGHT, NDOWN, NUPPER

only if the simulation mode is **TRIWAQ** this line is followed by the message:

* (for a vertical cross-section either M or N should be constant)

The input given by the user is checked :

- Whenever a M or N input value is out of range it is replaced by the minimum value available (for MLEFT and NDOWN) or the maximum value available (for MRIGHT and NUPPER).
- Moreover the following inequalities should hold :
MLEFT <= MRIGHT and NDOWN <= NUPPER.

Any error results in a message after which the geometry line may be entered again.

In case of a vertical cross-section only one active line is allowed. This means that if the cross-section line starts in an inactive point, crosses the water to an island and goes on over the water to another island, only the first part of water, i.e. the first set of active points, is treated in **PRESENT**, **ANIMATE** and **MATLAB** mode.

In case of residuals no vertical cross-sections are allowed. If the user, in

spite of this restriction, asked for a vertical cross-section, he will be invited to try again !

In case of the presentation of tidal constants in **PRESENT** mode, the user should give one point only, i.e. MLEFT = MRIGHT and NDOWN = NUPPER. In that case, the program prompts:

* In case of presentation of tidal constants in
* PRESENT mode, give the coordinates of one point :

* M, N

3.11

Code Selection

In case of a residual computation due to the answers already given the output is (almost) completely determined :

if Eulerian quantities have been selected in question given in prompt 3.4 then an output file with coordinates and either at the users wish Eulerian residual velocities (i.e. the integrated velocities divided by the total time-interval considered) or Eulerian residual transports (i.e. the, over the time interval considered, integrated transports divided by the, integrated, layer thicknesses) will be printed. The screen message reads :

- * Give indication for the MAP(s) wanted:
- * 1 : u,v as vector with their magnitude
- * 2 : Eulerian transports with their magnitude

If an error is found (user did not submit 1 or 2) the message repeated and the user should try again !

else if Lagrangian quantities have been selected in question given in prompt 3.4

an output file with coordinates and Lagrangian "velocities" (i.e. Lagrangian displacements divided by the length of the time interval considered) will be created. In this case no input is needed since only one possibility is available.

In the case of other quantities, except the tidal constants, the user has to enter a (or several) code(s) to select the type of data to be outputted. All input must be given on one line , with the choices seperated by comma's only. An input error results in a message after which the complete line must be entered again. The following possibilities are available :

If the output mode is PRESENT and
the simulation mode is WAQUA next prompt : 10A

If the output mode is ANIMATE or MATLAB and
the simulation mode is WAQUA next prompt : 10B

If the output mode is PRESENT and
the simulation mode is TRIWAQ and
the cross-section mode is HORIZONTAL next prompt : 10C

If the output mode is PRESENT and
the simulation mode is TRIWAQ and
the cross-section mode is VERTICAL next prompt : 10D

If the output mode is ANIMATE or MATLAB and

the simulation mode is TRIWAQ and
the cross-section mode is HORIZONTAL next prompt : 10E

If the output mode is ANIMATE or MATLAB and
the simulation mode is TRIWAQ and
the cross-section mode is VERTICAL next prompt : 10F

If the output mode is BOX and
the simulation mode is WAQUA next prompt : 10G

If the output mode is BOX and
the simulation mode is TRIWAQ and
the cross-section mode is HORIZONTAL next prompt : 10H

10A. PRESENT / WAQUA

- * Give codes for horizontal cross sections:
- * SE = Waterlevel
- * H = Depth in meters
- * VC = Vel.Components + Constituents

10B. ANIMATE-MATLAB / WAQUA

- * Enter codes, a "V" added to a code means
- * that a vector plot will be incorporated :
- * A[V] = Waterlevels
- * C[V] = Depth in meters
- * E[V] = Magnitude of local Velocity
- * G<nr>[V] = Concentration of Constituent number <nr>

10C. PRESENT / TRIWAQ / HORIZONTAL CROSS-SECTION

- * Give codes for horizontal cross sections:
- * SE = Waterl. + Bottom stress vel. + Chezy
- * H = Depth in meters
- * VC = Vel.Comp. + Visc + Diff + Rich + Const

10D. PRESENT / TRIWAQ / VERTICAL CROSS-SECTION

- * Give codes for vertical cross sections:
- * SD = Waterl. + Disch + Bottom stress + Chezy
- * VC = Vel.Vectors + Visc + Diff + Rich + Const

10E. ANIMATE-MATLAB / TRIWAQ / HORIZONTAL CROSS-SECTION

- * Enter codes for horizontal cross sections
- * A "V" added to a code means that a vector
- * plot will be incorporated :
- * A[V] = Waterlevels
- * B[V] = Bottom Friction
- * C[V] = Depth in meters
- * E[V] = Magnitude of local Velocity
- * F[V] = Eddy Viscosity
- * G<nr>[V] = Concentration of Constituent number <nr>
- * H[V] = Eddy Diffusivity
- * I[V] = Richardson numbers

10F. ANIMATE-MATLAB / TRIWAQ / VERTICAL CROSS-SECTION

- * Enter codes for vertical cross sections
- * A "V" added to a code means that a velocity field plot will be added to the plot:
- * E[V] = Magnitude of local Velocity
- * F[V] = Eddy Viscosity
- * G<nr>[V] = Concentration of Constituents number <nr>
- * H[V] = Eddy Diffusivity
- * I[V] = Richardson numbers

10G. BOX / WAQUA

- * Enter codes :
- * A = Waterlevels
- * C = Depth in meters
- * U = Local Velocity in U-direction
- * V = Local Velocity in V-direction
- * G<nr> = Concentration of Constituents number <nr>

10H. BOX / TRIWAQ / HORIZONTAL CROSS-SECTION

- * Enter codes for horizontal cross sections :
- * A = Waterlevels
- * B = Bottom Friction
- * C = Depth in meters
- * U = Local U-velocity in U-velocity point
- * V = Local V-velocity in V-velocity point
- * E = Magnitude of local Velocity
- * F = Eddy Viscosity
- * G<nr> = Concentration of Constituent number <nr>
- * H = Eddy Diffusivity
- * I = Richardson numbers

If harmonic analysis of tides has been selected (see prompt 3.4) the user has to enter one or more codes to select the type of tidal constants to be plotted in **ANIMATE**, **BOX** or **MATLAB** mode. If the output mode is **PRESENT**, this prompt will be skipped. All input must be given on one line , with the choices seperated by comma's only. An input error results in a message after which the complete line must be entered again. The following possibilities are available :

- * Enter codes :
- * M = Mean waterlevel or current of tide
- * N = Astronomical amplitude
- * O = Improved kappa-number (=local phase lag)

The user should make a selection of tidal components for which the astronomical amplitude and local phase lag should be plotted. To this end the program gives the next prompt:

- * Number of tidal components is ...
- * Make selection for astronomical amplitude/local phase lag
- * Do you want all tidal components on screen ?
- * Give y(es) or n(o)

If the screenmode is y(es) this will result in a list of names of tidal components of the form:

- * Available components are

- *
- *

etc.

Next, the names of the tidal components have to be entered:

- * Give sequence names of components
- * that you want to select and
- * separate names with comma's

If an error has been encountered in the input an error message will appear and the user should try again.

3.12 Depth Determination

In the case that the simulation mode is **TRIWAQ** and the cross-section mode is **HORIZONTAL** (i.e. N nor M given in the geometry card are constant) the user may enter a code to select a layer mode , i.e a horizontal cross-section with variable depth or a horizontal cross-section with "constant depth". This prompt will be skipped when the tidal constants have been chosen. When the choice "constant depth" has been made the user has to indicate a depth mode , i.e. constant depth with respect to the waterlevel or constant depth with respect to the reference level of the simulation.

The next prompt appears :

- * Do you want horizontal cross-sections along
- * lines of variable depth (i.e. sigma layers)
- * (give s) or horizontal cross-sections
- * with constant depth (give d)

if an error is detected in the layer mode, the program will continue :

- * Only s/S/d/D allowed, try again ! (--> 3.11)

Next, if layer mode is s/S (sigma) :

- * Give layer number to be considered
- * Only positive integers allowed
- * between 1 and <kmax>

and if an error is found in the layer number the program will respond :

- * Only positive integers allowed
- * between 1 and <kmax>

If layer number is ok then next prompt is --> 3.12

else if layer mode is d/D :

- * Horizontal cross-sections of constant depth
- * with respect to waterlevel (then give w) or
- * with respect to reference level (give r)

If an error is encountered in the depth mode :

- * Only w/W/r/R allowed, try again !

If depth mode is accepted then :

- * Give depth to be considered
- * Downwards is positive !

If depth mode is ok next prompt will be --> 3.12

3.13 Choice to Continue

After the creation of these map files the program can go on to create more map plots. The user has the possibility to force the program to do so answering the following question :

- * Do you want to continue this WAQPAN session ?
- * Give y or n

if answer is n(o) ----> END OF SESSION. Program stops.

if answer is y(es)----> 3.13 :

3.14 Same times Frame ?

If the answer for continuation was yes then the program starts again but first it is checked whether a time selection has to be done again or not (except for tidal constants) :

- * Should the time(s) remain the same ?
- * Give again y or n

If answer is n(o) : next prompt to be expected is --> 3.8.

If answer is y(es) : next prompt to be expected is --> 3.9.

Else if the plotmode is H(istory) :
(see prompt 3.3)

3.15 Type of History Plots

Next the program asks for the output file and hence which plot package has to be used :

- * To build PRESENT or OBSFIL files ?
- * type 1 or P for PRESENT and
- * type 2 or O for OBSFIL

if an error has been encountered (only p/P/o/O are allowed) in the input the program will give the message :

- * wrong character found , try again (--> 3.14)

3.16 History Logfile

Next the program will ask whether the user wants to create a logfile :

- * Give full name of extra log file
- * In this file it will be written in shorthand what
- * has been sent to the outputfile
- * (blank = no extra log file)

Next the program checks whether the submitted SDS file is a **WAQUA** or **TRIWAQ** file and whether histories are available.

3.17 History Times Selection

First the time frame, related to the type of plot the user has been asking for, is to be determined. In case of history plots there is only one time frame possible.

The program prompts :

```
* Time frame SDS file : File Time First = .....
*                               File Time Interval = .....
*                               File Time Last  = .....
*
* Times should fitt within this frame
* Give return if you want to go on
*
* The following possibilities are available :
* Select by giving the indicator, and next the
* times required (all items should be separated
* from each other by a comma)
*
```

if the user specified PRESENT (see prompt 3.14) then two extra possibilities are available (not interesting for Histories but interesting for Verticals)

```
* A single time, give S followed by the time wanted
* Example : S, 1230.
* More times, give M followed by the times wanted
* Example : M, 1230. , 2460. , 2900.
```

Next possibilities are for both PRESENT and OBSFIL

```
* All times available, give A
* Example : A
* Whole time region but with a greater time interval
* give I followed by the interval wanted
* Example : I,550.
* Part of time region with special interval, give a
* P followed by the starting time, the interval and
* the endtime
* Example : P,1230., 1230., 3690.
```

Whenever an error is detected, a message is printed :

```
* Start your input with one of the symbols
* S , M , I , A or P
*
* Try again ( --> 3.16 )
```

3.18 Output Mode Selection

For Histories there are several possibilities. The user has to decide which type of print/plot is wanted.

Remark :

If the output mode selection is entered and the user has already selected modes before, first a question whether the same modes have to be kept will be given.

- * Do you want to keep the same data
- * history plots/prints of the checkpoints
- * Old choice was
- *
- * Make your choice give Y(es) or N(o)

So the following question is skipped if the output mode should be kept, i.e. if the users answer is Y.

- * Which type of HISTORY print/plot ?
- * Make a choice from data for :

Next the program shows which data are available on the selected SDS-file , i.e.

- * Waterlevels , give a W
- * Currents , give a C
- * U-discharges , give a U
- * V-discharges , give a V
- * Constituent concentrations, give a P

If one of these types is not available one of the following messages will occur instead of one of the messages above :

- * No Waterlevel data for Histories on SDS
- * No Velocity data for Histories on SDS
- * No U-discharge data for Histories on SDS
- * No V-discharge data for Histories on SDS
- * No Constituent Concentrations on SDS

Whenever an error is detected in the user input, a message is printed :

- * Submitted character not recognized as option,
- * Try again (--> 3.17)

Remark : In case of **OBSFIL** a special ordering is needed. First all waterlevel plots, next all velocity plots, next all U-discharge plots, next all V-discharge plots and finally all Constituent Concentration plots. The **WAQPAN** program submits a warning when the plot asked for by the user is not allowed anymore and asks to make a new selection. So once the user has, for instance, selected currents it is not possible to return to waterlevels !

3.19

Station Selection

The user should make a selection of stations for which the selected quantities should be plotted. To this end the program gives the message :

- * Number of stations on SDS is ...
- * Make selection
- * Do you want a print of all stationsnames ?
- * Give Y(es) or N(o)

if the printmode is Y(es) this will result in a list of the form :

- * Available stations are
- * 1 = 2 =
etc.

3.20 Number selection

Next the numbers of the stations have to be entered :

- * Number of stations on SDS is ...
- * Give sequence numbers of stations
- * that you want to select, use a comma to make
- * distinction between two numbers.
- * A zero station number means that all stations have been submitted
- * The Stationsnumbers run from 1 to ..
- * A maximum of 8 stations in one row is allowed

- * Give a zero or just enter if you are ready with
- * the selection of the stations

If a stationnumber is out of range or if no stationnumber has been specified an error message will appear and the user should try again. (--> 3.19)

3.21 Verticals / Histories Selection

Normally history plots will be produced. If it however concerns results of a **TRIWAQ** computation and if currents or constituents were specified in question given in prompt 3.17 and if a **PRESENT** file has been asked for, the user will have to answer the extra question :

- * Which plot : Verticals or Histories ?
- * Give indication what type of print/plot is wanted
- * If prints/plots of verticals for each time for
- * the currents, then write v or V on your screen.
- * If you, however want histories then write h or H.

Of course "currents" has to be replaced by "constituents" if appropriate.

In case that a wrong symbol to this question is submitted, i.e. not v/V/h/H, the program gives the message :

- * Error, character not recognized !
- * Try again, only V or H are allowed

Remark :

If the user selected verticals the program checks whether in the given station both currents and constituents are available. In that case all information available will be printed (included vertical viscosities, vertical diffusivities and Richardson numbers) even if the user specified only currents or only constituents. As a consequence the number of columns in the blocks may differ since in some stations all variables are available and in other stations only part of the variables.

3.22 Depth Selection

If the user asked to make histories of either currents or constituent concentrations and the SDS-file is a **TRIWAQ** file then also the depth, at which the values have to be considered, has to be specified. Therefore the user has to enter a code to select a layer mode , i.e a history with variable depth following the sigma-layer as specified or a history with "constant depth". When the choice "constant depth" has been made the user has to indicate a depth mode , i.e. constant depth with respect to the waterlevel or constant depth with respect to the reference level of the simulation. This information is obtained using the messages :

- * Do you want histories along lines of variable depth
- * (i.e. sigma layers) then give s or histories along
- * lines of constant depth then give d

if an error is detected in the layer mode, the program will continue :

- * Only s/S/d/D allowed, try again ! (--> 0)

Next if layer mode is s/S (sigma) :

- * Give layer number to be considered
- * Only positive integers allowed
- * between 1 and <kmax>

and if an error is found in the layer number the program will respond :

- * Only positive integers allowed
- * between 1 and <kmax>
- * Try again

else if layer mode is d/D :

- * Horizontal cross-sections of constant depth
- * with respect to waterlevel (then give w) or
- * with respect to reference level (give r)

If an error is encountered in the depth mode :

- * Only w/W/r/R allowed, try again !

If depth mode is accepted then :

- * Give depth to be considered
- * Downwards is positive !

3.23 Choice for Continuation

After the creation of these History / Verticals files the program can go on to create more History plots. The user has the possibility to force the program to do so answering the following question :

- * Do you want to continue this WAQPAN session ?
- * Give y or n

If the answer is n(o) -----> end of session

If the answer is y(es) ---> 3.23.

3.24 Same times Frame

The program prompts:

Should the time(s) remain the same ?
Give again y or n

If the answer is n(o): the next prompt to be expected is the one for the output time(s) (--> 3.16).

If the answer is y(es): the program replies with:

Same time values are used as in last loop !

and the next prompt to be expected is the output mode selection (--> 3.17).

4 Technical Description Routines WAQPAN

The program **WAQPAN** offers a **SIMONA** user the opportunity to read information from the **SDS**-file, make combinations of the various quantities and create a (new) file in such a way that it can be used as an input file for one of the plotpackages **PRESENT**, **ANIMATE**, **SIMVIEW**, **MATLAB** or **HISPLO** (the latter via the interface **OBSFIL**).

In this chapter a short explanation is given, especially for the maintenance of **WAQPAN**, which quantities are treated in which subroutines of **WAQPAN**. Also a short description of the task of each subroutine is given. This description is the same as given in the header of each routine following the key **DESCRIPTION**.

In routine **WANP02** the user is asked which type of datafile has to be created : (lanima is the variable to indicate the various possibilities)

```
lanima =    1 : PRESENT  - MAP
           2 : ANIMATE - MAP
           3 : PRESENT - HISTORIES
           4 : OBSFIL  - HISTORIES
           8 : BOX     - MAP
           9 : MATLAB - MAP
```

In the **MAP** part, i.e. plots of fielddata for a given time, there are several possibilities. First the user should indicate whether he is interested in :

- actual, i.e. momentary quantities like for instance waterlevels

or

- integrated, i.e. residual quantities like Eulerian or Lagrangian transports, or
- tidal constants, such as astronomical amplitudes and local phase lags

Although, the tidal constants are time-independent, they are treated as fielddata.

For actual map-quantities (fielddata), except the tidal constants, and the **TRIWAQ** mode the user may choose between horizontal or vertical cross-sections.

In the case of **HISTORIES** and lanima = 3 there is the possibility to make plots "over the vertical" of either velocities or constituent concentrations for a selected location (station).

The **MAPDATA** times are read, both for actual and for residual quantities in routine **WANP14**. Times for **HISTORYDATA** are read in routine **WANP33**. The geometry window that will be used in the case of **MAPDATA** is determined in routine **WANP28** and the determination of stationnames in the case of **HISTORYDATA** takes place in routine **WANP31**.

Code selection is performed in routine **WANP13**.

The outputfiles are being filled in routine **WANP06** for the **MAP**-plots and in routine **WANP32** for the **HISTORY**-plots.

After the execution of all these tasks the user may change (if wanted) times, windows, stations and codes, and either add new blocks to the outputfiles (in the case of **PRESENT** and **HISPLO**) or create new sub-files (in the case of **ANIMATE**, **BOX** or **MATLAB**).

In the case of Eulerian residual quantities the following options are available :

- i) Residual velocity and/or transport in a 3D sigma-layer (**WANP51**).
- ii) The (interpolated) residual velocity- or transport in case of a 3D situation but with a constant depth or in case of a 2D situation (**WANP57**, **WANP58**).

In the case $lanima = 2$ and Eulerian quantities the user has the options :

- i) Residual velocity and/or transport in a 3D sigma-layer (**WANP52**).
- ii) The (interpolated) residual velocity or transport in a 3D situation with constant depth or in a 2D computation (**WANP56**, **WANP57**).

In the case $lanima = 1$ and the option Lagrangian there is only one possibility :

Lagrangian (residual)-displacements in a 3D sigma-layer. (**WANP53**)

If $lanima = 2$ and the option is Lagrangian there is also only one, the same possibility : (residual)-displacements in a 3D sigma-layer. (**WANP54**)

In the case of actual (not integrated over time and/or averaged) quantities including the tidal constants the following possibilities are available :

- i) In case of a horizontal cross-section of a 3D domain (**WANP19**) with code :

SE - Coordinates waterlevelpoints, Waterlevels, bottomfriction and Chezy values.

H - Coordinates depth-points and the depth in those points

VC - Coordinates waterlevelpoints, U,V,Omega and W velocities and vertical viscosity, vertical diffusivity, Richardsonnumbers and eventually concentrations of l_{max} constituents

TC - Mean waterlevels or currents of tide, astronomical amplitudes and local phase lags

- ii) If it concerns results of a 2D computation or a horizontal cross-section of a 3D model for a constant depth (routine **WANP21**) :

SE - Coordinates waterlevelpoints and the waterlevel

- H - Coordinates depth points and the local depth values
- VC - Coordinates waterlevelpoints and the computed velocities U and V and the concentrations of lmax constituents
- TC - Mean waterlevels or currents of tide, astronomical amplitudes and local phase lags

iii) If it concerns a vertical cross-section (3D see **WANP20**) with code :

- SD - The local coordinate (in this case a line), the local depth, the water-level, the local discharge, the local bottomfriction-velocity and the local Chezy value. All quantities computed in waterlevelpoints.
- VC - The local horizontal and vertical coordinate (in this case it concerns a plane), the layer depth for each point, the local, i.e. for that layer, U-, V-, Omega- and W velocity and for each point from the cross-section the vertical viscosity, diffusivity and Richardson numbers. Finally if available, the concentrations of lmax constituents.

If lanima = 2 or 9, i.e. **ANIMATE** or **MATLAB** the following possibilities are offered to the user : (coordinates file CCO and boundary outlines file LIN are created separately in case of **ANIMATE** see routines **WANP29** and **WANP30**)

i) If it concerns a horizontal cross-section in a 3D model then (see routine **WANP08**) the codes are : (a [V] means that the velocity-arrows may be added to the plots)

- A[V] The waterlevel
- B[V] The bottomfriction velocity in waterlevel points
- C[V] The depth values in waterlevel-points
- E[V]The absolute velocity in waterlevel-points
- F[V]The vertical velocity in the submitted layer in the waterlevel-points
- G[V] The concentration of the constituent considered in the waterlevel-points
- H[V] The Eddy-diffusivity in the waterlevel-points
- I[V] The Richardson numbers in the waterlevel-points
- M Mean waterlevels or currents of tide in the waterlevel-points
- N Astronomical amplitudes in the waterlevel-points
- O Local phase lags in the waterlevel points

- ii) If it concerns a 2D model, only the options A[V], C[V], E[V], G[V], M, N and O are available. (See routine **WANP10**)
- iii) If it concerns a vertical cross-section (3D see routine **WANP09**) only the options E[V], F[V], G[V], H[V] and I[V]. Local coordinates (CCO) and boundary outlines (LIN) files are constructed.

In routine **WANP65** a list of tidal components with their names can be created and the user should make a selection if these components.

In the case $lanima = 3$ (**PRESENT**) or $lanima = 4$ (**HISPLO**) the following possibilities are available in **WAQPAN**.

History-Plots of :

- W Waterlevels
- C Currents
- U- Discharges
- V- Discharges
- P Concentrations

The user should also indicate the station-numbers (names). This is done in routine **WANP31**. If currents or concentrations are asked for in 3D, these can also be considered over the vertical. Therefore the user should also indicate whether (only if $lanima = 3$) **HISTORIES** or **VERTICALS** are required. (Routine **WANP39**.) In the case of **HISTORIES** and either currents (C), or concentrations (P) the user should indicate whether the values have to be computed per sigma layer or for a constant depth (See routine **WANP04**).

In routine **WANP32** SDS results are elaborated for the **HISTORIES** files. In **WANP34** results are transported into helparray **DATAR** and

- if $lanima = 3$ printed as a **PRESENT** file in routine **WANP35**

or

- if $lanima = 4$ printed as a **HISPLO** file in routine **WANP36**.

In routine **WANP40** the elaboration of results if verticals have been asked for is performed.

The routines named so far play a key-role in the **WAQPAN** package. All other routines are help routines that are called only once. All routines are easy to understand.

Finally a list of all routines with their **DESCRIPTION** is given :

Subroutine : WAQPAN

Program to read 3D **TRIWAQ** or 2D **WAQUA** simulation data from the **SIMONA DATA STORAGE** file and to prepare and generate (an) **INPUT** file(s) for the packages **PRESENT** (Map or Time), **ANIMATE**

(Map) or **HISPLO** (Time histories)

WAQPAN is the driver of the package. Subsequently the following tasks are performed :

- Check whether the user wants to create a file suited for use by **PRESENT , HISPLO, ANIMATE, BOX** or **MATLAB**.
- Ask user to specify the name of the SDS-file; Open file and experiment
- Checks if saltfilter is enabled, and if so, asks the user to specify the minimum salt value.
- Place all important time-independent arrays in core
- Ask user to specify the time steps for which output is wanted
- If Map then

Check whether the user wants to create a file suited for **PRESENT, ANIMATE** or **MATLAB**

Ask user what type of cross-section is wanted

Else if History then

Check whether the user wants to create a file suited for **PRESENT** or **HISPLO**

Ask user which stations have to be considered

Endif

- Ask user which codes (i.e. quantities) are required
- Execute a loop for all times. Determine for each time the values for the codes as specified in the window (MAP) or in the stations (HISTORY) as specified
- Ask whether user wants to specify and run other times, windows and/or codes

Description of all subroutines of WANPAN

Subroutine WANP01

Determine name SDS file and experiment. Check whether file and experiment exist.

Subroutine WANP02

Determine which print/plot is asked for by user. If needed open PRESENT file.

Subroutine WANP03

Read all time independent arrays from SDS and place pointers in array starting from indicated positions.

Subroutine WANP04

Determine type of horizontal cross-section: along sigma interface or along plane with constant depth to reference plane.

Subroutine WANP05

Write explanation of ANIMATE file names to log file.

Subroutine WANP06

Run through all times and all wanted codes and make for the geometry wanted the corresponding ANIMATE or PRESENT files.

Subroutine WANP07

Actualize waterlevel flag with the value 99999. on dry points and 0. elsewhere.

Subroutine WANP08

Write contents of arrays in the correct format to a file to be used by program ANIMATE.

Subroutine WANP09

Create and fill files with data to be used by the ANIMATE program in the case of vertical cross-sections.

Subroutine WANP10

Write contents of arrays either of WAQUA or of a cross-section of constant depth of TRIWAQ in the correct format to a file to be used by program ANIMATE.

Subroutine WANP11

Compute all derived quantities from the main arrays from **WAQUA** or **TRIWAQ** as read from SDS. These arrays can be used to print and/or plot results of computations by for instance **PRESENT** or **ANIMATE**.

Subroutine WANP12

Explode one-dimensional arrays into full twodimensional arrays.

Subroutine WANP13

Get code info from standard input for MAP data.

Subroutine WANP14

Read times from standard input that fit within the given range and time increment.

Subroutine WANP15

Determine the global windfield for the time CURTIM.

Subroutine WANP16

Initialize all computational points with 0 and all dry points with 9999.

Subroutine WANP17

Determine julian day number of given date. It is assumed that a realistic date is given.

Subroutine WANP18

Compute date and time corresponding to integration step nst in the form yy/mm/ddhh:mm:ss.

Subroutine WANP19

Print results in case of a horizontal cross-section to a file to be used by **PRESENT**.

Subroutine WANP20

Print data on a file in such a way that this file can be used to make plots/prints by **PRESENT**.

Subroutine WANP21

Print results in case of **WAQUA** or a horizontal layer with constant depth to a file to be used for **PRESENT**.

Subroutine WANP22

Helper routine to compute the values of concentrations, u-velocities and

v-velocities in a 2D plane of constant depth. The depth is measured either below reference plane or below the current waterlevel from the values as given in a general 3D field.

Subroutine WANP23

Determine local min and max values for looking window.

Subroutine WANP24

Copy one value (realin) to another value (reaout).

Subroutine WANP25

Compute helparrays for a curvilinear transformation.

Subroutine WANP26

Update all values with respect to waterlevel and depth.

Subroutine WANP27

Initialize arrays to be used in the generation of vertical cross-sections.

Subroutine WANP28

Determine the window coordinates from standard input.

Subroutine WANP29

Write curvilinear grid coordinates (of the **WAQUA** depth positions) to the output CCO (Curvilinear Coordinates Output) file.

Subroutine WANP30

Write grid position of boundary outlines to output file.

Subroutine WANP31

Read and select data (Waterlevel, Current, Discharges or Transport) together with the Checkpoints, i.e. station numbers from standard input. Make difference between **PRESENT** and **OBSFIL**.

Subroutine WANP32

Run through all times for all stations and make printfiles for either **PRESENT** or **OBSFIL**. Print according to the submitted code.

Subroutine WANP33

Read times from standard input that fitt within the range and time increment given. Place all times in array.

Subroutine WANP34

Run through all times for all stations and fill array for either **PRESENT** or **OBSFIL**.

Subroutine WANP35

Run through all times for all stations and make printfiles for **PRESENT**. Print according to the submitted code.

Subroutine WANP36

Run through all times for all stations and make printfiles for **OBSFIL**. Print according to the submitted code.

Subroutine WANP37

Determine the angle with the north direction in degrees for the vector (ucompo, vcompo).

Subroutine WANP38

Copy temporary **OBSFIL** file to permanent **OBSFIL** file.

Subroutine WANP39

Determine whether user wants plots of verticals for each time and each station or that user wants plots of histories for all times for all stations.

Subroutine WANP40

Run through all times for all stations and make printfiles for the verticals to be used by **PRESENT**. Print according to the submitted code.

Subroutine WANP41

Determine important variables like vicow, difcw, rich and rho for specified location and time.

Subroutine WANP42

Write results as asked by user to **PRESENT** file.

Subroutine WANP43

Compute, dependent on the way the user has defined the bottom roughness the related Chezy3D coefficient.

Subroutine WANP44

Compute densities after salinity- or temperature computation.

Subroutine WANP45

Compute bottom stress velocity and viscosity coefficients using k-eps

modulation.

Subroutine WANP46

Compute diffusivity for all layers.

Subroutine WANP47

Let user select station number.

Subroutine WANP51

Print Eulerian residual results in case of a horizontal sigma cross-section to a file to be used by **PRESENT**.

Subroutine WANP52

Write contents of Eulerian residual velocity and transport arrays in the correct format to a file to be used by program **ANIMATE**.

Subroutine WANP53

Write contents of Lagrangian residual displacement arrays in the correct format to a file to be used by program **ANIMATE**.

Subroutine WANP54

Print Lagrangian residual results in case of a horizontal sigma cross-section to a file to be used by **PRESENT**.

Subroutine WANP55

Ask user which MAP is wanted in case of Eulerian residuals for program **ANIMATE**.

Subroutine WANP56

Write contents of Eulerian residual velocity or Transport arrays in 2D in the correct format to a file to be used by program **ANIMATE**.

Subroutine WANP57

Compute the values of Eulerian residual velocities, and transports in a 2D plane of a constant depth from values given in a general 3D field. The depth is measured either below reference plane or below the waterlevel.

Subroutine WANP58

Print Eulerian residual results in case of **WAQUA** or horizontal layer with constant depth to a file to be used by **PRESENT**.

Subroutine WANP59

Checks if meshes of two different experiments are the same by comparing NMAX, MMAX and LGRID.

Subroutine WANP60

Gets MAP times from CONTROL arrays.

Subroutine WANP61

Computes the difference fields of arrays SEP, UP, VP, CZ and RP.

Subroutine WANP62

Defines the block code to be printed in PRESENT.OUT.

subroutine WANP63

Writes the bulk data arrays to the Animate, Box or Matlab files.

subroutine WANP64

Writes the arrays KHU and KHV to the Matlab files for plotting drying/flooding.

subroutine WANP65

Reads and selects tidal components from standard input.

subroutine WANP66

Fills the array homeg with angular velocities and their component numbers

In case of astronomical splitting fill extra angular velocities corresponding to tidal components P1 (33), NU2 (60), K2 (79) and LABDA2 (70).

subroutine WANSAL

Check input salt constituent array on given minimum and maximum and change out of bound values with replacement values.

5 Glossary

ANIMATE	Presentation program for personal computers with MS-Windows that enables you to visualize calculations from mathematical models using animations.
BOX	Output option the result can be used in SIMONA-input files.
MATLAB	MATLAB is an interactive program to help you with numeric computation and data visualisation. Principally, MATLAB is built upon a foundation of sophisticated matrix software for analysing linear systems of equations.
HISPLO	Presentation program to plot time histories from at most twenty different Dadi files. Subprogram of the WAQUA package. (WAQUA43)
OBSFIL	Program that stores observed data that have a regular time interval in a file, designed for selective retrieval and display by the HISPLO system. Subprogram of the WAQUA package. (WAQUA32)
PRESENT	<p>Presentation program developed by Delft Hydraulics and available under UNIX and on personal computers that enables you to visualize results of calculations from mathematical models. The program needs three files in order to make plots :</p> <ol style="list-style-type: none">1) a data file (for example PRESENT.OUT)2) an INPUT file in which it has been written which tasks have to be performed3) a configuration file

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