Chapter 13

Introduction

This part of the documentation explains how model setup is defined for a user application. As explained in Section 3.6 a number of *Usrdef_* files with FORTRAN 90 code need to created by the user. These files provide the following information to the program:

- values of an extensive series of model parameters (settings for monitoring files, parallel setup, switches, time parameters, physical parameters, definition of parameters for model forcing)
- model grid and bathymetry
- initial conditions
- open boundary conditions and input of open boundary data
- surface forcing grids and input of forcing data
- location of sub-grids for nesting
- definition of parameters and variables for creating time series and time-averaged output
- definition of parameters and variables for performing harmonic analysis and output of residuals, amplitudes, phases and elliptic parameters
- user-formatted output

All this information has to be defined within specific usrdef_ routines, located in one of the *Usrdef_* files. A complete listing of all usrdef_ routines is given in Table 13.1.

Writing these usrdef_ routines from scratch may be a big task, especially for a beginning user. The next alternative procedures can be followed.

1. Files with generic example code are found in the **setups/examples** directory. Within these files, a specific value, assigned to a model parameter or array, indicates a default value. In many cases, the defaults do not need to be changed or defined by the user. A "?" means that no realistic default is available and the variable has to be defined. Some of the assignment statements in the example code are within an IF block. This means that the definition is conditional and depends on the outcome of the IF test condition (usually the value of a model switch).

2. A second way for making a setup is to copy a *Usrdef_* file from one of the test cases defined in a **setups** directory and make the necessary adaptations.

3. Use can be made of the CIF utility, in which case all parameters needed for model setup (excluding forcing data) and user-defined output are obtained from a central input file. An option is foreseen to create a CIF by the program. For details see Sections 9.4 and 14.1.

4. Once a setup has been created, all forcing data (e.g. bathymetry, meteorological data,...) can be written to a number of files in standard COHERENS format. These files can be used in subsequent simulations for model setup. This requires only to change a few options in the program so that the usrdef_ routines are no longer called by the program.

A complete description of all model variables, which can possibly be used for model setup, is given in the chapters below. Default values are in parentheses. As stated above and in the text below, some definitions are conditional (usually depending on the value of a model switch). Physical units of dimensional quantities are written between square brackets.

The program provides options, selected with the status attribute discussed in Section 14.7, to read external data from a file in standard COHERENS format in which case the usrdef_routine is not called, or to write the setups parameters and data, defined in a usrdef_routine, to an external file in standard COHERENS format. For many usrdef_routines there exists a corresponding read_ and write_routine for reading and writing in standard format. They are listed in Table 13.2

In summary, the following usrdef_routines can be made redundant:

1. Model setup is provided through a CIF

   ```
   usrdef_init_params, usrdef_mod_params, usrdef_sed_params,
   usrdef_tsr_params, usrdef_avr_params, usrdef_anal_freqs,
   usrdef_anal_params
   ```

2. Forcing data are obtained from file(s) in standard COHERENS format

   `usrdef_partition, usrdef_phsics, usrdef_sedics, usrdef_sed_spec, usrdef_1dsur_spec, usrdef_2dobc_spec, usrdef_profobc_spec, usrdef_1dsur_data, usrdef_2dobc_data, usrdef_profobc_data, usrdef_rlxobc_spec, usrdef_surface_absgrd, usrdef_surface_relgrd, usrdef_surface_data, usrdef_nstgrd_spec, usrdef_surface_nstgrd_abs, usrdef_surface_nstgrd_rel, usrdef_dry_cells, usrdef_thin_dams, usrdef_weirs, usrdef_dischr_spec, usrdef_dischr_data`

3. Standard output variables are selected through their key id (see Chapter 20)

   `usrdef_tsr0d_vals, usrdef_tsr2d_vals, usrdef_tsr3d_vals, usrdef_avr0d_vals, usrdef_avr2d_vals, usrdef_avr3d_vals, usrdef_anal0d_vals, usrdef_anal2d_vals, usrdef_anal3d_vals`

Table 13.1: Overview of all *Usrdef_* files and usrdef_ routines in the program.

file	routine	purpose
Usrdef_Model.f90	usrdef_init_params	setup and formats of monitoring files
	usrdef_mod_params	model parameters and formats for all model forcing
	usrdef_grid	model grid and bathymetry
	usrdef_partition	domain decomposition
	usrdef_phsics	physical initial conditions
	usrdef_1dsur_spec	surface forcing conditions (elevations and surface slope) for 1-D (water column) applications
	usrdef_2dobc_spec	open boundary conditions for the 2-D mode
	usrdef_profobc_spec	open boundary conditions for baroclinic currents, temperature, salinity
	usrdef_1dsur_data	input of surface forcing data for 1-D (water column) applications

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Table 13.1: Continued

	usrdef_2dobc_data	input of 2-D open boundary data
	usrdef_profobc_data	input of open boundary data for 3-D baroclinic currents, temperature and salinity
	usrdef_rlxobc_spec	setup of near-boundary areas for application of the relaxation scheme
Usrdef_Surface_Data.f90	usrdef_surface_absgrd	definition of surface data grids in absolute coordinates
	usrdef_surface_relgrd	definition of surface data grids in relative coordinates
	usrdef_surface_data	input of (2-D) surface forcing data
Usrdef_Nested_Grids.f90	usrdef_nstgrd_spec	general specifications for nesting (number of open boundary points, type of coordinates)
	usrdef_nstgrd_abs	locations of sub-grid open boundaries in absolute coordinates
	usrdef_nstgrd_rel	locations of sub-grid open boundaries in relative coordinates
Usrdef_Sediment.f90	usrdef_sed_params	parameters for the sediment model
	usrdef_sedics	initial conditions for the sediment model
	usrdef_sed_spec	sediment particle properties
Usrdef_Structures.f90	usrdef_dry_cells	locations of dry cells
	usrdef_thin_dams	locations of thin dams
	usrdef_weirs	locations and parameters for weirs and barriers
	usrdef_dischr_spec	specifiers for discharge module
	usrdef_dischr_data	discharge data
Usrdef_Time_Series.f90	usrdef_tsr_params	definition of metadata and output grid for time series output
	usrdef_tsr0d_vals	definition of 0-D time series output data

(Continued)

Table 13.1: Continued

	usrdef_tsr2d_vals	definition of 2-D time series output data
	usrdef_tsr3d_vals	definition of 3-D time series output data
Usrdef_Time_Averages.f90	usrdef_avr_params	definition of metadata and output grid for time averaged output
	usrdef_avr0d_vals	definition of 0-D time averaged output data
	usrdef_avr2d_vals	definition of 2-D time averaged output data
	usrdef_avr3d_vals	definition of 3-D time averaged output data
Usrdef_Harmonic_Analysis.f90	usrdef_anal_freqs	definition of frequencies and formats for harmonic analysis
	usrdef_anal_params	definition of metadata and output grid for harmonic output
	usrdef_anal0d_vals	definition of 0-D data for harmonic analysis
	usrdef_anal2d_vals	definition of 2-D data for harmonic analysis
	usrdef_anal3d_vals	definition of 3-D data for harmonic analysis
Usrdef_Output.f90	usrdef_output	user-defined routine

Table 13.2: List of usrdef_routines which have a related read_ and write_ routine for reading from or writing to a file in standard COHERENS format.

user-defined	standard read	standard write
usrdef_grid	read_grid	write_grid
usrdef_partition	read_partition	write_partition
usrdef_phsics	read_phsics	write_phsics
usrdef_sedics	read_sedics	write_sedics
usrdef_sed_spec	read_sed_spec	write_sed_spec
usrdef_1dsur_spec	read_1dsur_spec	write_1dsur_spec
usrdef_2dobc_spec	read_2dobc_spec	write_2dobc_spec
usrdef_profobc_spec	read_profobc_spec	write_profobc_spec
usrdef_1dsur_data	read_1dsur_data	write_1dsur_data
usrdef_2dobc_data	read_2dobc_data	write_2dobc_data
usrdef_profobc_data	read_profobc_data	write_profobc_data
usrdef_rlxobc_spec	read_rlxobc_spec	write_rlxobc_spec
usrdef_surface_absgrd	read_surface_absgrd	write_surface_absgrd
usrdef_surface_relgrd	read_surface_relgrd	write_surface_relgrd
usrdef_surface_data	read_surface_data	write_surface_data
usrdef_nstgrd_spec	read_nstgrd_spec	write_nstgrd_spec
usrdef_nstgrd_abs	read_nstgrd_abs	write_nstgrd_abs
usrdef_nstgrd_rel	read_nstgrd_rel	write_nstgrd_rel
usrdef_dry_cells	read_dry_cells	write_dry_cells
usrdef_thin_dams	read_thin_dams	write_thin_dams
usrdef_weirs	read_weirs	write_weirs
usrdef_dischr_spec	read_dischr_spec	write_dischr_spec
usrdef_dischr_data	read_dischr_data	write_dischr_data