

Chapter 18

Structure and discharge module

This chapter explains the setup of the structure module. The following routines are defined in *Usrdef_Structures.f90*:

- `usrdef_dry_cells`: setup of the dry cells module
- `usrdef_thin_dams`: setup of the thin dams module
- `usrdef_weirs`: setup of the weirs/barriers module
- `usrdef_dischr_spec`: specifiers for the discharge module
- `usrdef_dischr_data`: defines discharge data

18.1 Dry cells

The routine `usrdef_dry_cells` is called if `iopt_drycel=1` and `modfiles(io_drycel,1,1)%status='N'`. Note that the number of dry cells, given by the parameter `numdry` must be defined in `usrdef_mod_params` with a non-zero value.

`idry(numdry)` (Global) X-indices of the dry cells

`jdry(numdry)` (Global) Y-indices of the dry cells

18.2 Thin dams

The routine `usrdef_thin_dams` is called if `iopt_thndam=1` and `modfiles(io_thndam,1,1)%status='N'`. Note that either the number of thins dams at U-nodes (parameter `numthinu`) or the number of thins dams at V-nodes (parameter `numthinu`) must be non-zero. Both parameters are defined in `usrdef_mod_params`.

ithinu(numthinu) (Global) X-indices of thin dams at the U-nodes

jthinu(numthinu) (Global) Y-indices of thin dams at the U-nodes

ithinv(numthinu) (Global) X-indices of thin dams at the V-nodes

jthinu(numthinu) (Global) Y-indices of thin dams at the V-nodes

Remarks

- Thin dams can only be specified along lines parallel to one of the numerical grid axes.
- No thin dams can (obviously) be defined at open boundaries or at the edges of the computational grid.
- Thin dams perpendicular to open boundaries are allowed.

18.3 Weirs and barriers

The routine `usrdef_thin_dams` is called if `iopt_weibar=1` and `modfiles(io_weibar,1,1)%status='N'`. Note that either the number of weirs/barriers at U-nodes (parameter `numwbaru`) or the number of weirs/barriers at V-nodes (parameter `numwbarv`) must be non-zero. Both parameters are defined in `usrdef_mod_params`.

iwbaru(numwbaru) (Global) X-indices of weirs or barriers at the U-nodes

jwbaru(numwbaru) (Global) Y-indices of weirs or barriers at the U-nodes

oricoefu(numwbaru) Discharge coefficient C_e for orifices at the U-nodes
[m^{1/2}/s]

oriheightu(numwbaru) Orifice width O_w at the U-nodes [m]

orisillu(numwbaru) Sill height O_h at the U-nodes [m]

wbarcoefu(numwbaru) Discharge coefficient C_{st} at the U-nodes [m^{1/2}/s]

wbarcrestu(numwbaru) Height of the weir crests h_{cr} at the U-nodes [m]

wbarmodlu(numwbaru) Modular limit m at the U-nodes

iwbarv(numwbarv) (Global) X-indices of weirs or barriers at the V-nodes

jwbarv(numwbarv) (Global) Y-indices of weirs or barriers at the V-nodes

oricoefv(numwbarv) Discharge coefficient C_e for orifices at the V-nodes
[m^{1/2}/s]

oriheightv(numwbarv) Orifice width O_w at the V-nodes [m]

orisillv(numwbarv) Sill height O_h at the V-nodes [m]

wbarcoefv(numwbarv) Discharge coefficient C_{st} at the V-nodes [$\text{m}^{1/2}/\text{s}$]
wbarcrestv(numwbarv) Height of the weir crests h_{cr} at the V-nodes [m]
wbarmodlv(numwbarv) Modular limit m at the V-nodes

Remarks

- The structure is defined as a barrier if the corresponding value of oriheightu or oriheightv has a positive value, otherwise it becomes a weir.
- Energy loss at weirs and barriers can generate a strong flow convergence (retardation) and therefore large currents magnitudes and gradients. This may require small time steps.
- For the same reason, it is recommended to define weirs and barriers sufficiently away from the open boundaries.

18.4 Specifiers for discharges

The routine `usrdef_dischr_spec` is called if `iopt_dischr=1` and `modfiles(io_disspec,1,1)%status='N'`. Note that the number of discharge locations, given by the parameter `numdis` must be defined in `usrdef_mod_params` with a non-zero value.

`kdistype(numdis)` Selects type of vertical location of the discharge

- 0: uniformly distributed over the vertical
- 1: at the bottom
- 2: at the surface
- 3: at a fixed distance from the sea bed
- 4: at a fixed distance from the sea surface

`mdistype(numdis)` Selects method for flagging of discharge points located on dry cells

- 0: Locations on dry (C-node) cells are taken as invalid (default)
- 1: Locations on dry (C-node) cells are moved to the nearest neighbouring wet cell, provided such cell is available
- 2: Locations on dry (C-node) cells are moved to the nearest wet cell. All locations are then considered as valid.

18.5 Discharge data

The routine `usrdef_dischr_data` is called if `iopt_dischr=1` and `modfiles(iddesc,1,1)%status='N'` where `iddesc` is the file descriptor and `ifil` the file index.

The routine is declared as

```
SUBROUTINE usrdef_dischr_data(iddesc,ifil,ciodatetime,disdata,nodat,novars)
CHARACTER (LEN=lentime), INTENT(OUT) :: ciodatetime
INTEGER, INTENT(IN) :: iddesc, ifil, nodat, novars
REAL, INTENT(INOUT), DIMENSION(nodat,novars) :: disdata
```

where

`iddesc` The file descriptor of the corresponding data file:

`io_disloc` discharge locations

`io_disvol` volume discharge data

`io_discur` momentum discharge data

`io_dissal` salinity discharge data

`io_distmp` temperature discharge data

`ifil` The file index

`nodat` Number of discharge locations (must be equal to `numdis`)

`novars` Number of input data variables which depends on the value of `iddesc` (see below)

The data, to be defined, are:

`ciodatetime` date/time in string format¹

`disdata` discharge data

The supplied data must be given in the following order, depending on the value of `iddesc`

`io_disloc` `xdiscoord` X-coordinates of the discharge locations [m or fractional degrees longitude]

`ydiscoord` Y-coordinates of the discharge locations [m or fractional degrees latitude]

¹If the parameter `time_zone` is defined with a non-zero value, the time of the input data must be given in local time.

	zdisoord	Vertical coordinates of the discharge locations (distance from sea bed or sea surface depending on the value of kdistype [m]
io_disvol	disvol	Volume discharge [m ³ /s]
io_discur	disarea	Area over which the discharge takes place [m ²]
	disdir	Discharge direction with respect to the reference axis (Eastward direction on the spherical case) [rad]
io_dissal	dissal	Salinity of the discharged water mass [PSU]
io_distmp	distmp	Temperature of the discharged water mass [deg C]

