

## How to Set Up Initial Conditions for BreZo

*Brett F. Sanders*

May 23, 2007

Revised July 17, 2007

Revised August 26, 2008 (for BreZo 4.0)

Initial conditions are required when solving the shallow-water equations and consist of the spatial distribution of water level ( $\eta$ ) or depth ( $h$ ) as well as velocity ( $u$  and  $v$ ). There are several options for setting up initial conditions in BreZo. The first is to assign a uniform distribution of either  $\eta$ ,  $u$  and  $v$  or  $h$ ,  $u$  and  $v$ . This can be accomplished by using the input parameters on lines 15 and 16 of the .input file. The second is to perform a restart (explained later). This is selected using the input parameter of line 15 (`ic_options=2`). The third option is to use one or more regional sets of initial condition data. This is useful for dam-break studies, for example, to define the location of a reservoir. To use the last option, set `ic_area=1` (line 17 of .input file; otherwise this should be set to zero) and prepare a new file with an .ic extension formatted as follows,

```
nic !number of initial condition domains
1
root of filename !repeat starting here
left.1
ic_options !(0=constant eta; 1=constant h)
0
u_ic  v_ic  h_ic  eta_ic
0.0d0  0.0d0  1.0d0  1.0d0
c_ic !leave one float here if scalar_options == 0
0.0d0
```

When `ic_area=1` in the .input file, BreZo will first set a uniform initial condition over the entire domain based on the initial condition data specified in the .input file (line 16), and then override these parameters regionally with regional initial condition data specified in a .ic file. In this example, only one sub-area is specified (`nic=1`) and its extent is controlled by the triangle mesh “left.1” which should include two files: `left.1.node` and `left.1.ele`. For each sub-area, there are two options (constant eta or constant h) and the values of `u_ic`, `v_ic`, and either `h_ic` and `eta_ic` will be used accordingly.

To input several sub-areas with different initial conditions, change the value of `nic` and repeat the eight lines starting with “root of file name”..

The sub-area files (`left.1.node` and `left.1.ele`) should be placed in the same directory as the other grid and input files being read by BreZo.

There are examples of .input and .ic files to help clarify how this works.

### Restart Options

When line 15 of the `.input` file is set as follows, `ic_options=2`, BreZo will open a `.restart` file. Restart files include a start time and a listing of `h`, `u` and `v` for each cell. Restart files are written when BreZo finishes a simulation. For example, suppose the root of the project file is `bay.1` and the model is executed 1000 time steps. When last step has completed, BreZo will create a restart file named `bay.1.1.restart`. To continue the previous simulation, the user needs to open `bay.1.input` and set `ic_options=2` (line 16) and `restart_number=1` (line 18). When BreZo is executed, it will read the initial condition from `bay.1.1.restart` and write the final solution to a file named `bay.1.2.restart`. To restart a second time, set `restart_number=2` and the final solution will be saved to `bay.1.3.restart`.