

XBeach, version 1.24.6057, codename “Halloween release”

Release date: Friday, October 31th, 2023

These release notes specify the changes with respect to the previous XBeach release; the 1.23.5526, codename ‘XBeach-X’.

The new release includes:

New physical formulations and functionality

- Reformulation of dimensional parameters to non-dimensional parameter for application in simulations of scaled physical experiments. The *hmin* parameter has been formulated in a different way with the *deltahmin* as dimensionless parameter and use of *rollergamma* to limit roller energy in very shallow water. The *tsmin* parameter is expressed in terms of the time step with the *dtlimts* parameter.
- Reformulation of the time scale of avalanching model that is independent of grid resolution and is related to the IG swash period and extent. The *avalttime* parameter is expressed in the spectral wave period with a proportional *ntrepAvaltime* parameter. *Hswitch* is not required anymore do to the reformulated avalanching implementation.
- The sediment transport formulation is reformulated to incorporate the effects of the grain diameter in a similar manner to that formulated in DUROSTA (keyword *alfaD50*).
- Beta-functionality to include rainfall in a simulation has been added (keyword *rainfall*).
- Option included to read in ship heading in ship track file.

Removed functionality

- The BeachWizard module has been removed from the XBeach code.
- Sediment transport in the non-hydrostatic mode of XBeach is turned off by default until specific intra-wave transport equations are available.

Output parameters

- Depth-velocity magnitude (flux) is added as output parameter (*qmag*).
- Rainfall parameters are added (*rainfallrate*, *rainfallinput* and *rainfallinput*).
- Water depth used for Stokes drift, turbulence and wave forces is added (*hstokes*).
- Water level only for wet points is added (*zswet*).

Boundary and initial conditions

- A reduction factor on the short-wave group variance at the boundary signal is implemented to correct for the effects of directional spreading in a 1-dimensional model. This functionality can be applied with the keyword *wbcevarreduce*.
- A new approach to include tidal variations in the simulations is implemented. With the keyword *tidetype = hybrid*, the tidal variation is both forced at the boundary and within the model itself. In this way, fewer artificial waves are generated at the boundary.
- The addition of two boundary condition parameters: *wbcScaleEnergy*, which ensures the significant wave height of the randomly-generated wave time series at the boundary exactly complies with the input significant wave height (default = on), and *wbcRemoveStokes*, which removes the net onshore Stokes drift flux of the bound infragravity waves at the offshore boundary to better allow the XBeach model to maintain the imposed tide and surge level (default = on).
- The directions of wave components at the offshore boundary of cyclic models are fixed such that they fit an integer number of times inside a cyclic model domain (keyword *cyclicdiradjust*).
- Beta-functionality to set initial condition from a previous simulation (keyword *hotstart*).

Numerical modifications

- *Truncationtype* is added as keyword for the stationary model to specify how the truncation error is computed.
- *nuhfac* is turned off by default if using the Smagorinski model to remove grid dependent forcing and IG wave response.
- When using the Manning, White-Colebrook or White-Colebrook-grainsize bed friction models, a minimum and maximum cf value can be set to prevent very high or very low bed friction (keywords *mincf* and *maxcf*, respectively).
- Added optional openMP parallelization for computation of offshore boundary conditions in waveparamsnew.F90; many thanks to MARIN for this contribution.
- The uncorrected input wave spectrum is used to generate bound IG waves (keyword *Sfold*).

Skillbed

- Validation tests for the BOI program have been added
- Validation tests for the non-hydrostatic model have been added (Boers and Buckley tests)
- Skillbed is computed using only default settings

Manual and tools

- Layout of the online manual has been updated.
- First version of Python Toolbox has been published: <https://xbeach-toolbox.readthedocs.io/en/latest/>

Main bug fixes

- Code fixes to ensure the implementation of the advection of wave breaking information in the Roelvink-Daly breaker model is consistent in 1D and 2DH XBeach models and that the Roelvink-Daly breaker formulation can be used in MPI-models.
- The urms output has been fixed for stationary wave computations
- Bugfix for boundary condition *wbctype=params* with *nonh* and *nonhq3d=1*.
- Update of the coefficients in the Ruessink, Ramaekers and Van Rijn wave shape model to match those published in 2012
- Rewrite *roelvink_2d* function to optimize speed.
- Fix end-of-file error in spectral boundary conditions; many thanks to IMDC for the fix.
- Fix MPI strucdepth error; many thanks to IMDC for the fix.

Principal list of revised default values

- *sedtrans* = 0 (for non-hydrostatic mode)
- *vardx* = 1
- *single_dir* = 1 (for 2D surf-beat simulations)
- *CFL* = 0.95 (1D) or *CFL* = 0.7 (2D)
- *wbctype* = *jonstable*
- *wbcEvarreduce* = 0.3 (1D models) or 1.0 (2DH models). Manually set *wbcEvarreduce* to 1.0 to simulate 1D flume experiments
- *tideloc* = 2 (when *zs0* is not specified), otherwise *tideloc*=0
- *break* = *Roelvink_daly* (for *surfbeat*)
- *gamma*
 - *Roelvink_daly*: *gamma* = 0.46; *gamma2* = 0.34
 - otherwise: *gamma* = 0.55 (unchanged)
- *alpha* = 1.38
- *beta* = 0.08

- bedfriction = manning
- nufac = 0.0
- facSk = 0.15
- facAs = 0.20
- alfaD50 = 0.4
- wetslp = 0.15
- tint = 900.0
- tintp = 1.0
- Sfold = 1
- dtlimTs = 5.0
- nTrepavalttime = 1.0
- rollergammax = 1
- deltahmin = 0.1
- wavint = 600.0