Guide to the versions of iFlow and list of modules

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1 Version numbers

Version	Description	Publication or chapter
2.4	Starting version	• Dijkstra et al. (2017)
2.5	Restructuring of the sediment functionality. Adds erodibility and long time-scale integration	• Brouwer et al. (2018) • Dijkstra (2019) - chapter 2
2.6	Adds sediment-induced turbulence damping and hindered settling	• Dijkstra et al. (Submitted to Journal of Geophysical Research Oceans), • Dijkstra et al. (Submitted to Geophysical Research Letters) • Dijkstra (2019) - chapter 4, 5
2.7	Adds fluvial sediment source, water and sediment sources and sinks	• Dijkstra et al. (Submitted to Ocean Dynamics) • Dijkstra (2019) - chapter 6

2 Modules in iFlow

Package general

Module	Version	Description
Output	2.4	Save output variables for use within iFlow
ReadSingle	2.4	Load a single iFlow output file
ReadMultiple	2.4	Load multiple iFlow output files
Sensitivity	2.4	Intelligently loop the simulation over any number of values of any number of variables
~~CalibrationPlot~~	~~2.4~~	~~Evaluate the result of a sensitivity analysis using a cost function that compares model results to data and plot the result~~ removed in v2.5
Calibration	2.5	Automatic calibration of M_2 water level to observations using a specified cost function. Only for one-parameter calibration.
OutputMat	2.5	Save output variables to a .mat file for use in Matlab
ReadIterative	2.5	Like ReadMultiple it reads multiple output iFlow output files, but only loads one file at a time, then allows iteration over other modules before reading the next file. Useful when memory is too small to read all files at once.
Iterator	2.6	Auxiliary module that takes two or more iterative modules and combines their loops into one loop. Prevents loops-in-loops.

Table 1: List of modules included in iFlow version 2.4.

Package numerical

Module	Version	Description
RegularGrid	2.4	Create a 2DV standard grid and output grid.
HydroLead	2.4	Leading-order hydrodynamics using fully numerical methods
HydroFirst	2.4	First-order hydrodynamics using fully numerical methods
HydroHigher	2.4	Higher-order hydrodynamics up to any order using fully numerical methods
HigherOrderIterator	2.4	Auxiliary module for higher-order computations (i.e. above first order)
ReferenceLevel	2.4	Computation of a sub-tidal reference level based on the river-induced set-up
~~SedDynamicLead~~	~~2.4~~	~~Leading-order sediment dynamics using fully numerical methods~~ From v2.5 this functionality is in module SedimentCapacity.
~~SedDynamicFirst~~	~~2.4~~	~~First-order sediment dynamics using fully numerical methods~~ From v2.5 this functionality is in module SedimentCapacity.
~~SedDynamicSecond~~	~~2.4~~	~~Second-order sediment dynamics restricted to river-induced resuspension of sediment, using fully numerical methods~~ From v2.5 this functionality is in module SedimentCapacity.
~~StaticAvailability~~	~~2.4~~	~~Sediment transport and trapping. Closure module for SedDynamicLead, SedDynamicFirst and SedDynamicSecond.~~Obsolete, from v2.5 replaced by EquilibriumAvailability in package semi_analytical.
SalinityLead	2.4	Dynamic leading-order salinity computation using fully numerical methods
SalinityFirst	2.4	Dynamic first-order salinity computation using fully numerical methods
KEFittedLead KEFittedFirst KEFittedHigher KEFittedTruncated	2.4	Set of modules for a vertically uniform eddy viscosity depending on the local velocity and depth, and for the roughness depending on the local velocity. The dependency between the eddy viscosity and roughness is drawn from relations obtained from a $k-\epsilon$ model.
DiffusivityUndamped	2.5	Sets eddy diffusivity related to the eddy viscosity and a Prandtl-Schmidt number
SedimentCapacity	2.5	Leading-, first- and part of the second-order sediment dynamics, computing the sediment capacity using fully numerical methods
KEFittedMAW	2.6	Based on the KEFittedTruncated module. Adds damping functions suppressing the eddy viscosity, eddy diffusivity and bed shear stress as a result of vertical sediment stratification.

Table 2: List of modules included in iFlow version 2.4.

Package semi_analytical

Module	Version	Description
HydroLead	2.4	Leading-order hydrodynamics. Fully analytical in the vertical direction and numerical in the horizontal direction
HydroFirst	2.4	First-order hydrodynamics. Fully analytical in the vertical direction and numerical in the horizontal direction
~~SedDynamic~~	~~2.4~~	~~Leading-, first- and second-order sediment dynamics and transport/trapping using analytical solutions, but with numerical integration. The second-order sediment dynamics is restricted to river-induced resuspension.~~From v2.5 this functionality is in module SedimentCapacity.
SedimentCapacity	2.5	Leading-, first- and second-order sediment dynamics, computing the sediment capacity using analytical solutions, but with numerical integration.
EquilibriumAvailability	2.5	Sediment transport/trapping, solving the bed-evolution equation for an equilibrium of the availability and erodibility of sediment (morphostatic). Solution is analytical in supply limited conditions and numerical otherwise.
DynamicAvailability	2.5	Sediment transport/trapping, integrating the bed-evolution equation for the availability and erodibility of sediment over a long time scale with varying river discharge (morphostatic). Solution is numerical.
HinderedSettling_bed	2.6	Hindered settling based on the subtidal near-bed concentration.
SedimentSource	2.7	Prepares sediment source/sink terms on the upstream boundary and interior from the input.

Table 3: List of modules included in iFlow version 2.4.

Package analytical

Module	Version	Description
Geometry2DV	2.4	Create a two-dimensional geometry with arbitrary depth and width
SaltHyperbolicTangent	2.4	Diagnostic (i.e. prescribed) well-mixed salinity field according to a tanh function
SaltExponential	2.4	Diagnostic (i.e. prescribed) well-mixed salinity field according to an exponential function
TurbulenceUniform	2.4	Prescribed vertically uniform eddy viscosity and roughness
TurbulenceParabolic	2.4	Prescribed eddy viscosity with a parabolic vertical profile and constant roughness
~~KEFittedLead~~ ~~KEFittedFirst~~ ~~KEFittedHigher~~ ~~KEFittedTruncated~~	~~2.4~~	~~Set of modules for a vertically uniform eddy viscosity depending on the local velocity and depth, and for the roughness depending on the local velocity. The dependency between the eddy viscosity and roughness is drawn from relations obtained from a $k-\epsilon$ model.~~Moved to package numerical

Table 4: List of modules included in iFlow version 2.4.

References

Brouwer, R. L., Schramkowski, G. P., Dijkstra, Y. M., and Schuttelaars, H. M. (2018). Time evolution of estuarine turbidity maxima in well-mixed, tidally dominated estuaries: the role of availability- and erosion-limited conditions. *Journal of Physical Oceanography*, 48:1629–1650.

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