FEFLOW plug-ins

The open programming interface (IFM) provides the possibility to easily extend the standard capabilities of FEFLOW by user-defined functionality, to replace internal functionality, to couple other simulation or database software and to automate workflows.

A number of call-backs in the FEFLOW code can be used to execute user code at specific stages of the modelling process, such as whenever the model file is opened or after each time step of a transient simulation. The second component of the interface - a large number of FEFLOW-specific functions - can be used to access nearly all model data in FEFLOW for reading and writing.

Plug-ins for the programming interface are typically programmed in C or C++. External code in other languages can be used via mixed-language programming. The generation of all necessary frame code is conveniently done by a plug-in for Microsoft Visual Studio, thus limiting the required programming skills of the user to the complexity of the specific functionality to be implemented.

Available plug-ins:

The following list provides information about existing plug-ins for the programming interface, developed by both DHI-WASY and FEFLOW users. Their status and the conditions to obtain the plug-ins might be quite different, so please contact the respective developer for additional information.
If you would like your plug-in(s) to be listed here, please send an email to mikebydhi.de@dhigroup.com.

IFM Plug-in	Basic description	Contact
BetaGamma	Thermodynamic model for the density of water, incorporating pressure and temperature effects (Temp = 0 ... 350° C and p = 0 ... 100 MPa). See also White Papers Vol. III chapter 2.	Dr Fabien Magri, Freie Universität Berlin, Germany fabienma@zedat.fu-berlin.de
BrineDensity	The plug-in regards the fluid density related to temperature, pressure and concentration and sets the fluid density after each time step for all matrix and discrete feature elements. The following reference values for concentration C_0 = 0 g/l, C_S = 350000 mg/l, pressure p_0 = 100 kPa, p = 10MPa and temperature T_0 = 0C, T = 350C were set. The density equation of state was adjusted by means of sodium chloride concentration.	Dr Fabien Magri, Freie Universität Berlin, Germany fabienma@zedat.fu-berlin.de
DensityFracture	This plug-in calculates density effects due to pressure and temperature changes in Discrete Feature Elements (DFE) and finite elements. Density is calculated using the same equations as the BetaGamma IFM plug-in, incorporating pressure and temperature effects (T = 0 ... 350° C and p = 0 … 10Mpa).	Dr Guido Blöcher, GFZ Potsdam, Germany bloech@gfz-potsdam.de Dr Fabien Magri, Freie Universität Berlin, Germany fabienma@zedat.fu-berlin.de
Feddes	Root water uptake from the complete Feddes model. The parameters required for Feddes model implementation such as the number of sink elements considered, the value of pressure head of each sink element and the stress	Dr Z. Thomas; Agrocampus ouest & Geosciences Rennes, France, zthomas@univ-rennes1.fr

	function as well as the width and the area of the root zone, were computed during the simulation period and summarized in ASCII file (*.out1).	
HeatConductivity	Values of the heat conductivity were determined by laboratory experiments at 20° C and were corrected by its temperature dependence. Based on a correlation equation by [Somerton1992], the module uses experimental data for the prediction of the effects of temperature on heat conductivity on fully saturated sandstones. Therefore, the heat conductivity of the solid at any point of the reservoir with a defined temperature can be calculated.	Dr Guido Blöcher, GFZ Potsdam, Germany bloech@gfz-potsdam.de
IfmHydroAS	Couples FEFLOW to the 2D hydrodynamic simulation system Hydro_AS-2D.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
IfmMIKE11	Couples FEFLOW to the 1D hydrodynamic simulation system MIKE11.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
ImportMatProp	Imports conductivities and specific storage for all mesh elements from a text file. Used for transferring data from FracMan (by Golder Assoc.) to FEFLOW.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
ImportParameters	Imports material properties from a simple data file to be assigned to specified locations at simulation start. Used for a simplified setup of PEST optimizations and similar applications.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
Interface to TECPLOT	Exports hydraulic heads and optionally concentrations to TECPLOT *.plt format (TECPLOT release 10), so that TECPLOT can be used to postprocess and visualize the results. 2-D and 3-D models with triangular and quadrangular discretization are supported.	Dr. C. Braun, BCE Koblenz, c.braun@bjoernsen.de
IfmLake	Calculates the development of water levels from internal fluxes (received or discharged by the lake from the groundwater model) and/or external fluxes (defined by the user). The plug-in further changes the horizontal extent of the lakes depending on water level and surface elevation.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
LambdaT	Calculates temperature-dependent thermal conductivity of the solid, following Zoth and Hänel (1988).	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
leakGRM	Sets leakage boundary conditions (flow exchange between a river and groundwater) for large scale groundwater models. The plug-in enables single node 3rd order boundary conditions in 2D and 3D models. Leakage parameters (leakage coefficient for inflow and outflow).	Bernhard Becker, RWTH Aachen, Institut für Wasserbau und Wasserwirtschaft, b.becker@iww.rwth-aachen.de

Maximum head	Exports the maximum hydraulic head at each node during a simulation to an ASCII file.	Dr. C. Braun, BCE Koblenz, c.braun@bjoernsen.de
Min/Max Head Logger	Min/Max Head Logger calculates the minimum, maximum and mean head values at each node during a transient simulation run. The results are stored in a nodal user distribution.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
MoG	Calculates the heat flow along a ground heat exchanger based on the assumption of a constant temperature along the heat exchanger.	Holger Kaiser, kaiser@gf-tec.com
obs_points	Writes a text file with head, concentration and temperature values for all observation points during the simulation.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
obs_points_groups	Writes a file containing the boundary flow values for all budget groups. The file is written during the simulation, therefore the plug-in is for example useful for batch simulations.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
OpenLoop	Sets the extraction temperature plus a temperature differential at the injection node of an open loop geothermal system. Unlimited number of separate systems in the model, support for cooling towers (with hard-coded characteristics).	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
OpenLoopQt	The OpenLoopQt plug-in is designed for applying a time-varying heating or cooling power demand between groups of abstraction and injection boreholes for open-loop geothermal systems. The plug-in calculates the minimum required fluid flow through the system considering heat pump and heat exchanger properties and applies the resulting fluid flow and temperature conditions to the model. Current fluid flow and temperature differentials can be monitored in diagrams, and warning messages indicate situations when the power demand cannot be fulfilled.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
RiverPrototypes	RiverPrototypes facilitates the transition from steady-state modelling to transient models in case that the temporal behaviour of many river nodes (transfer boundary conditions) is based on the same prototype function, differing only in the reference (steady-state) water level or the reference elevation.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
RiverWaterDepth	Takes river bottom elevations defined in a reference distribution and adds them to all values in a time series of a transfer boundary condition at the same node. The time series represents the time-varying water depth, and the bottom elevation is added.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com

setGG	Sets - sets an initial 3D temperature distribution according to a gradient defined by a nodal distribution and the initial temperature.	DHI-WASY GmbH
SetHeatBC2	SetHeatBC2 sets a Dirichlet heat transport boundary condition for infiltration wells in case of infiltration and removes the boundary condition in case of no infiltration or pumping.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
SetMassBC2	SetMassBC2 sets a Dirichlet mass boundary condition for infiltration wells in case of infiltration and removes the boundary condition in case of no infiltration or pumping. It works for single or multiple species models.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
setT	Calculates and sets transmissivity values in a 2D horizontal confined model from user distributions for aquifer bottom and top and conductivity.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
SinkEqmodif	Calculates root-water uptake in a 2D cross-sectional model by regarding the depth of the root zone.	Dr Z. Thomas; Agrocampus ouest & Geosciences Rennes, France, zthomas@univ-rennes1.fr
Varying Saltwater Head	Sets equivalent freshwater head BCs based on time series for varying saltwater head, and switches the BCs to seepage face above the water table.	mikebydhi.de@dhigroup.com
VaryingBC	Sets and removes boundary conditions and/or constraints for specific time intervals and node groups.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
VeloEx+Budget	Exports flow velocity vectors and budget values for selected nodes to a text file.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
VeloXYZ	Read xyz coordinates from import+export\data.txt and writes velocities at these xyz-coordinates to a file named velocities.dat after activation.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
WellPrototype	Applies time series to a number of wells based on a base (prototype) pumping-function scaled by an individual factor for each well.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com
Zedat	Export of velocity components vx,vy, vz on given pathline locations.	DHI-WASY GmbH, mikebydhi.de@dhigroup.com