Release Notes 2022

MIKE 21

Contents:

Introduction

Welcome to MIKE 21 2022 Update 1

In this Release Note you will find information about new features of MIKE 21, and what you need to know in order to install and get started with Release 2022.

MIKE 21 is the world's leading modelling package for 2D free surface flow, waves, sediment transport and environmental processes. It is the true work horse of estuarine and coastal modelling with a wider range of facilities and modules than any similar package

System requirements

Operating systems

Fully supported Windows operating systems *	Windows 11 Pro, version 21H2 (64 bit) Windows 10 Pro, version 21H2 (64 bit) Windows Server 2022, version 21H2 Windows Server 2019 Standard, version 1809
Non-supported but partially tested operating systems **	Windows Server 2016 Standard, version 1607

* Fully supported operating systems are systems that have been tested in accordance with MIKE's Quality Assurance procedures and where warranty and software maintenance agreement conditions apply.

** Non-supported but partially tested operating systems are systems, which are not officially supported by the MIKE software products. These operating systems have only undergone very limited testing for the purpose of MIKE software, but the software and key features are likely to work. Installation of MIKE software on a non-supported operating system is done so at the user's own risk. The MIKE software warranty and software maintenance agreement conditions do not apply for unsupported operating systems and DHI is under no obligation to provide assistance or troubleshooting for cases where the software is being used on a non-supported operating system.

Please note that when running a fully supported operating system as a 'guest operating system' on a virtualization platform, it is automatically downgraded to a non-supported operating system under the conditions provided above.

Minimum hardware/software requirements

Processor	compatible with x64 instruction set, 2.2 GHz or higher
Memory (RAM)	4 GB or higher *
Storage	64 GB or higher *
Display	resolution 1024 x 720 (High-Definition) or higher, 24-bit color (true color)
Graphics adapter	64 MB RAM (256 MB RAM or higher recommended), 32-bit true color **
Software requirements	Microsoft .NET Framework 4.7.2 or higher

* The actual required amount of memory and disk space depend on the usage (application, model setup, size of data files etc.)

** MIKE 21 Flow Model FM utilizing GPU requires a Nvidia graphics card with compute capability 5.2 or higher. Please note that some of these graphics' cards have varying performance in single compared to double precision calculations. The GPU functionality is based on version 11.1.1 of the Nvidia® CUDA® Toolkit.

Installation

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DHI License Management - If you are installing on a computer or server where you will also install the license file, please also install the DHI License Manager. It must be downloaded separately.

To install MIKE 21, please go to the MIKE Zero product folder and execute the setup.exe file either on the MIKE 2022 USB or from the downloaded, un-zipped installation files. Press the 'Install' button to begin installation.

The setup program will automatically install all necessary files and folders on your computer. Additionally, an entry is created in the Start Menu for MIKE Zero.

Important information: Please be aware that all MIKE software on the same computer must be installed with the same service pack. This is due to the dependencies between MIKE software products and the ability for the software to use the latest feature and systems updates.

License file and dongle

Please Note that when using the local or network license option, which require a license file and a dongle, then

- the DHI License Manager must installed separately.
- all licensed applications included in MIKE 2022 require a 2022 version of the DHI License Manager.
- a new license file format (file extension dhilic2) has been introduced with MIKE 2022 and these license files can only be used together with a DHI License Manager 2022 or newer.

To use MIKE software in licensed mode, please refer to the DHI License Manager Release Notes. (License Manager Release Notes)

Product invocation

Launch ‘MIKE Zero’ from the Windows Start menu. Then you can select MIKE 21 from within the MIKE Zero Shell.

Starting any MIKE Zero application without a DHI configured hardware key and valid license files will cause the program to run in demo mode. If this happens, a message box will inform you during program initialization. When running in demo mode, the MIKE Zero installation supplies full access to all editors, computational engines and editing facilities. However, restrictions apply to the setups that can be executed as a model simulation.

Support

For general support, please refer to our FAQ.

If you experience any difficulties, or if you have questions, please contact our Customer Care team at mike@dhigroup.com.

You can also contact your local Customer Care team for support in your local language. You can find the list here.

New features and fixed issues

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Every new release of MIKE 21 consists of new modules, new features and/or corrections to problems or significant inconsistencies discovered in previous releases. Please find below short descriptions of the most significant news.

Release 2022 Update 1

New features

Module/type	New feature
Future of the Standard and Nested Grid based MIKE 21 Flow Model (usually referred to as MIKE 21 Classic)	**The Flexible Mesh based MIKE 21 Flow Model FM is the future MIKE package for all 2D free surface flow modelling applications.** Over recent MIKE releases, considerable efforts have been made to ensure that all core functionality from MIKE 21 Classic is available in MIKE 21 Flow Model FM. **A second announcement is hereby made that MIKE 21 Classic (and all variant engines, for example, MIKE 21 Flood Screening Tool) is planned to be decommitted as a MIKE product in the near future.** This decision is naturally taken with caution, and the time for decommitting will not be earlier than 6-months from the release data of MIKE 2022 Update 1 (this update release). Announcements on the decommitment schedule, including end of support, will be made via the DHI website in due course.
MIKE Zero	A **redesigned Start Page for MIKE Zero** collects an extended set of MIKE tools within theme-based (rather than product-based) interactive workflows, and introduces new MIKE Cloud applications and Cloud-enhanced functionality.
MIKE Zero	A new **graphical overview**, working together with the updated tabbing functionality in MIKE Zero, collects important model components (for example, sources and structures) in one interactive, customisable and floating mapping window.
MIKE Zero	**Updated tabbing functionality**: New tab grouping (horizontal and vertical), tear-off tabs from the main MIKE Zero shell, and new cascade and restore options.
MIKE Zero	The Grd2Mike tool has been updated to allow the specification of item details and land value.

MIKE 21 Flow Model FM	It is now possible to specify simulation period as a function of time step interval, simulation start date and simulation end date.
MIKE 21 Flow Model FM	**Modelling of Coastal Vegetation**: Vegetation density can be considered as constant or time varying zones of rigid plants (for example, mangroves). Additionally, the application of flexible stems and/or flexible blades, after Luhar (2011) and/or Nepf (2013), is also possible.
MIKE 21 Spectral Waves FM	**Modelling of Coastal Vegetation**: Two dissipation models applicable to rigid plants are included; a multi-layered approach for the fully spectral formulation and directionally decoupled parametric formulation after Suzuki et al. (2012), and a single layered approach for the fully spectral formulation after Jacobsen et al. (2019). It is possible to choose between constant and variable drag coefficients (after Sanchez-Gorzalez et al. and Mendez and Losada).
MIKE 21 Mooring Analysis	**New option for specifying wave conditions**: It is now possible to specify wave parameters where no dynamic wave data is available. Wave conditions can be specified in two different ways; regular wave parameters (using Stokes 1st order, Stokes 5th order or Stream function options), or irregular wave parameters (using Pierson-Moskowitz, JONSWAP or TMA).
MIKE 21 Mooring Analysis	The vessels dialog has been updated to allow for filtering of irregular frequencies when analysing multi-vessel setups. Care should be taken to only filter the regions where irregular frequencies occur (if the filter range is too large, energy will be removed from genuine frequencies).
MIKE 21 Flow Model FM	It is now possible to import information for multiple pier structures via a text file.
MIKE 21 Flow Model FM	It is now possible to use rating curves in combination with simple sources. The discharge from a source is determined from a rating curve table using the water level in the cell where the source is located.
MIKE 21 Flow Model FM	Line structures (for example, gates) have been updated to better handle multiple overlapping structures.
MIKE 21 Spectral Waves FM	Output of spectral results can now be applied on a structured grid (overlay).
MIKE 21 Spectral Waves FM	Fetch calculations have been improved when using MPI parallelisation.
MIKE ECO Lab	**Improved handling of dry elements**: An option to enable MIKE ECO Lab calculations in dry elements for fixed (not transported) state variables has been included. If enabled, fixed variables will be computed in dry elements, concentrations of transported state variables will be set to zero and not be updated, and certain built-in forcings will handled in a special manner. Finally, the flood and dry state of an element is available as a new built-in forcing.
MIKE ECO Lab	**Dynamic removal of unused expressions to improve performance**: You can now 'replace' unused equations with a constant value before the simulation runs, thereby saving on computational time. 'Unused' in this context refers to an expression that is written to a result file but not relevant for a model output and therefore has no side effects (like calling an external plugin, random numbers, etc).
MIKE ECO Lab	**New built-in constants and forcings**: The FM-based engines now support several new built-in constants mainly useful for ABM modelling. These include: • IS_SHORE_ELEMENT • DISTANCE_TO_SHORE • DIRECTION_TO_SHORE The first returns a flag (0/1) if an element has a land vertex or face (if the element is a shore element or not). The last two compute the approximate distance and direction to the shore from an element centre. If the element is a shore element itself, the shortest distance and direction (from the cell centre) to the closest land boundary is computed. For any other (non-shore) element it is the distance and direction to the nearest shore element (plus its shore

	distance). **Please note** that these constants are computed on simulation start-up, and do not change during the simulation.
MIKE ABM Lab	**New algorithm for RASF computation**: ABM Lab templates can contain Remote Area Search Functions (RASFs) to query other particles or concentration-based variables within a defined radius around a particle. The algorithm to compute these RASFs for concentration-based variables has completely been rewritten. Depending on the computational mesh size and search radius this new algorithm can have a greatly improved performance.
MIKE ECO Lab	**New pseudo-random number generator**: The basic pseudo-random number generator (PRNG) used in MIKE ECO Lab has been replaced and coordinated with MIKE 21/3 FM. Additionally, ABM (and PT) particles now 'carry' their own state and seed.
MIKE ECO Lab	**Particle spawning from standard MIKE ECO Lab expressions**: This update release allows the creation of new particles from normal, standard MIKE ECO Lab expressions. The syntax has been enhanced with two new parameters, defining where in the horizontal and vertical the new particles will be placed.
MIKE 21 Flow Model FM	**Advance notice of end of support for 'Maxwell' and 'Kepler' type NVIDIA GPU cards.** The **2023 Release** of MIKE 21 Flow Model FM utilising GPU acceleration will require NVIDIA graphics cards with compute capability 6.0 or higher. Accordingly, from this next release, MIKE 21 Flow Model FM will no longer support 'Maxwell' and 'Kepler' type NVIDIA GPU cards.

Fixed issues

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Module/type	Error/Inconvenience
General	Numerous corrections, stability and performance fixes.
MIKE Zero	Lambert Conformal Conic (both 1 and 2 standard parallel versions) projections have been updated.
MIKE 21 Flow Model FM	A correction has been made to the Mud Transport module where the hindered settling did not work as intended.
MIKE 21 Mooring Analysis	An issue has been corrected where the order of drawing vessel-vessel lines in the GUI could affect the results.
MIKE 21 Mooring Analysis	An issue related to drift forces for multibody setups has been corrected where incorrect reading of an input file could affect the results.
MIKE 21 Mooring Analysis	When a 2D wave input is used and the map projection for vessel position (on the Mooring Setup page) is different to the map projection for the domain, an issue has been corrected that could affect the results.
MIKE 21 Mooring Analysis	When the map projection for vessel position (on the Mooring Setup page) is different to the map projection for the domain, an issue has been corrected in relation to the calculated position of vessel-vessel fenders that could affect the results.
MIKE 21 Mooring Analysis	A correction has been made to the line position output coordinates.

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New features

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MIKE Zero	New tab-based navigation between editors, including 'tear-off' functionality to support multiple monitor setups, has been added to the MIKE Zero user interface.
MIKE Zero	Time Series editor has been extended and improved with new import and export functionality. Additional options now include import from Excel and KMD files.
MIKE 21 Spectral Waves FM	**Comprehensive scientific update of MIKE 21 Spectral Waves FM** Using the fully spectral formulation, the '**Modified WAM Cycle 4**' option for the parameterisation of the source term corresponds to the parameterisation used in Release 2021 Update 1, but there have been some changes to the implementation: • New default values for separation of wind and swell, wind input and white capping have been included. • For the calculation of the cut-off frequency, the scaling factor for the Pierson-Moskowitz frequency has been changed from 4 to 3. • When the coupled air-sea interaction formulation is used, a direct calculation of the friction velocity as function of the sea roughness and the wind stress is employed. In this calculation, a maximum value for wave stress is applied (the maximum value is 5). This corresponds to the maximum value used in the tabular-based implementation in Release 2021 Update 1. • When the coupled air-sea interaction formulation is used, a direct calculation of the diagnostic part of the wave stress is employed. • When the uncoupled air-sea interaction formulation is used, a direct calculation of the friction velocity as function of the sea roughness and the wind speed is employed. • A swell dissipation term has been added to the existing source terms for atmospheric interaction. • The wind input term and the wave stress have been extended to the shallow water formulation. In addition, for the fully spectral formulation, a new '**Ardhuin et al.**' option for the parameterisation of the source terms for atmospheric interaction (wind input and swell dissipation) and white capping has been added following Ardhuin et al. (2010). The basic parameterisation for wind input has not been changed, but there are some differences in the implementation.

	Finally, for the fully spectral formulation, the following new functionality has been implemented: • For separation of wind sea and swell a new option has been included that allows the selection of the wave age approach. • A new neutral wind speed correction can be calculated based on water (for example, temperature and salinity) and air properties. • Water density can now be specified or calculated as function of water temperature and salinity. • Air density can now be specified or calculated as function of surface pressure, air temperature or relative humidity.
MIKE 21 Spectral Waves FM	The following new output items have been included in MIKE 21 Spectral Waves FM: • Stokes drift. • Neutral wind speed. • Water density. • Air density. In addition, a more flexible output specification of the separation of wind sea and swell has been included.
MIKE 21 Flow Model FM	A new sea bed (ground) to water heat transfer based upon the ground equilibrium temperature, depth of ground equilibrium temperature and the conductivity of soil or rock has been added.
MIKE 21 Flow Model FM	Improved performance for inland flooding applications using MIKE 21 Flow Model FM with GPU acceleration: • Tuning of timings and numerous small tweaks. • OpenMP parallelisation for pre-processing of infrastructure. • Pre-processing of boundary conditions (initialisation). • Optimised data transfer on inundation output. In addition, when using the 'Inland Flooding' option, a new dynamic list approach is used together with optimised gradient calculation for forcing calculations.

Fixed issues

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Module/type	Error/Inconvenience
General	Numerous corrections, stability and performance fixes.
MIKE Zero	Performance of short notation map projection string handling has been improved.
MIKE Zero	Rendering of box contours in both orthogonal grids (dfs2 files) and curvilinear grids has been improved.
MIKE Zero	Drawing of isolines in both orthogonal grids and curvilinear grids has been improved.
MIKE Zero	Performance of colour legends overlay has been significantly improved.
MIKE Zero	An error specifically related to Belgian map projections has been corrected.
MIKE Zero	Rendering of shaded contours in curvilinear grids has been improved.

MIKE 21 Mooring Analysis	Improved stability and operability of the MIKE 21 Mooring Analysis user interface.
MIKE 21 Mooring Analysis	An error related to the use of chains for multiple vessels has been corrected.
MIKE 21 Spectral Waves FM	Implementation of cyclic boundary conditions has been improved.
MIKE 21 Spectral Waves FM	Stability of the stationary version of MIKE 21 Spectral Waves FM has been improved.
MIKE 21 Flow Model FM	Depth correction functionality has been improved.