

MIKE SHE

Integrated catchment modelling

MIKE SHE delivers **truly integrated modelling** of groundwater, surface water, recharge and evapotranspiration. MIKE SHE includes **all important aspects of hydrology** when your project requires a fully integrated model. **No other tool or combination of tools can match MIKE SHE** in terms of seamless integration of all the important processes of the hydrological cycle.

APPLICATIONS

MIKE SHE is ideal when surface processes affect subsurface conditions and vice versa. MIKE SHE internalises traditional boundaries and effectively partitions rainfall into Evapotranspiration, Runoff and Groundwater Recharge.

TYPICAL APPLICATIONS

The list of potential MIKE SHE applications is huge including, for example:

- Integrated catchment hydrology
- Conjunctive use and management of surface water and groundwater
- Irrigation and drought management
- Wetland management and restoration
- Environmental river flows
- Floodplain management
- Groundwater-induced flooding
- Land use and climate change impacts on groundwater and surface water
- Nutrient fate and management
- Integrated mine water management

FEATURES

MIKE SHE is a flexible modelling framework that includes a range of numerical methods for each hydrological process. It has an advanced, conceptual, model-independent user interface with full water balance accounting for all hydrological processes.

It is possible to combine the hydrological processes and numerical methods depending on the requirements of your application and the availability of data.

All numerical engines in MIKE SHE are parallelised to make efficient use of available multicore resources.

OVERLAND FLOW

MIKE SHE uses a 2D, diffusive wave, finite difference method for detailed runoff and flood modelling, with two-way dynamic exchange between the floodplain and the river.

In parallel, MIKE SHE can route rainfall to nearby streams and channels via a conceptual drainage network.

FEATURES

RIVER FLOW

You can simulate channel flow using full, 1D hydrodynamics, including operation of hydraulic structures such as gates, pumps and weirs. For larger networks, a faster and less data intensive flow routing method is also available.

UNSATURATED ZONE

For detailed, vertical unsaturated flow, you can use the 1D, finite difference multilayer method based on either Richards' equation or gravity flow.

Alternatively, you can use a two-layer root zone model for simple water balance accounting in the unsaturated zone.

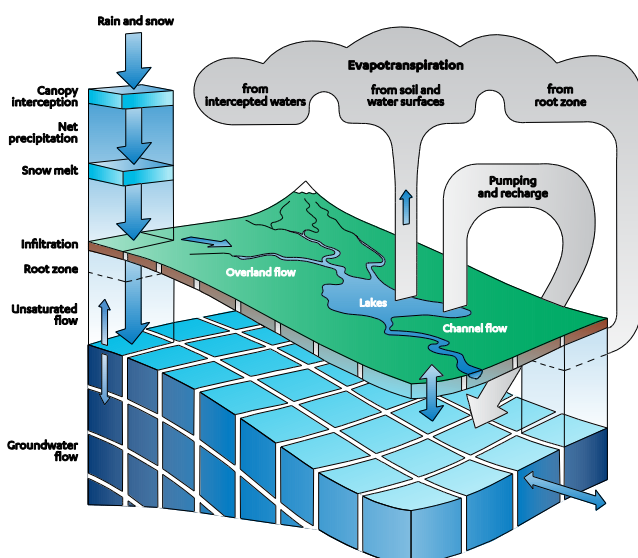
Green and Ampt infiltration can be used in dry soils when capillarity is ignored. Bypass flow can be used to account for soil macropores and sub-grid variability of infiltration.

EVAPOTRANSPIRATION

Rainfall and evapotranspiration are the largest parts of the water balance. In MIKE SHE, vegetation-based actual evapotranspiration is calculated from interception, soil, ponded water, the root zone and groundwater.

SNOW

In cold climates, MIKE SHE converts elevation corrected precipitation into wet and dry snow storage. Snow is converted to surface water using an extended degree-day method, including elevation corrected temperature, radiation and rain-on-snow.





FEATURES

GROUNDWATER

For detailed groundwater-surface water interaction, MIKE SHE includes 3D, finite difference groundwater flow that discharges groundwater drainage directly to surface water.

A linear reservoir groundwater method is also available for basin-wide water balance and management, or fully distributed rainfall-runoff modelling.

WATER QUALITY

With MIKE SHE, you can simulate fully integrated solute transport between surface water and the subsurface, including decay, sorption, precipitation and selective uptake.

You can also include more complex, multispecies, kinetic reactions, comprising all aspects of eco-hydrology, with MIKE ECO Lab. See more on page 24.

For source water protection and groundwater age analysis, fully dynamic random walk particle tracking is available in the saturated zone.

WATER BALANCE

MIKE SHE includes a comprehensive and flexible water balance utility for complete local and model wide water balances - for any time period.

COLLECTION SYSTEM

Collection system leakage can have impacts on groundwater levels in urban areas. The MIKE+ Collection System coupling enables coupling with a sewer network model to quantify these impacts.

FEATURES

ADDITIONAL FEATURES

Deficit-driven irrigation from multiple sources, such as rivers and groundwater subject to control and license limits.

AUTOCAL is a general tool for parameter estimation and sensitivity analysis that automatically uses available CPU cores.

Python scripting is available in MIKE SHE for users to integrate MIKE SHE into decision support systems, or to build their own plugins to modify or create additional processes

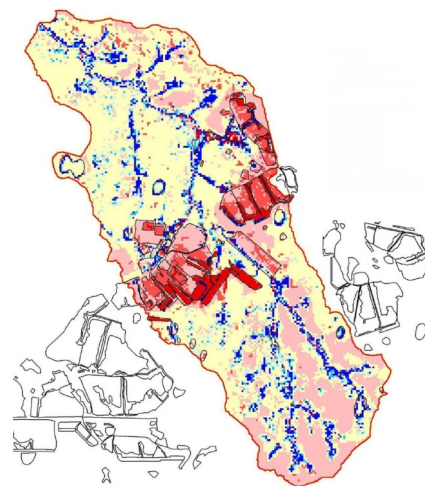
BENEFITS

DHI has more than 30 years of experience in integrated hydrological modelling — more than any other organisation in the world.

It is this experience that is embedded in MIKE SHE and is available to you in our unparalleled technical support and training.

If you need to accurately partition rainfall into runoff, evapotranspiration and groundwater recharge, MIKE SHE is the fastest, most dependable way to produce accurate integrated models.

With MIKE SHE, you can tailor the complexity of your model and truly explore the impact of hydrologic change.



Fully distributed map of groundwater recharge (in red) and discharge (in blue).