



Education evenings 2018

*Practical introduction
to groundwater modelling*

Computer exercises
03 04 What else?

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ModelMuse





Much more functionality to be discovered!

Refer to:

- ✓ the ModelMuse manual [🔗](#)
- ✓ the ModelMuse videos [🔗](#)
- ✓ the ModelMuse help [🔗](#)

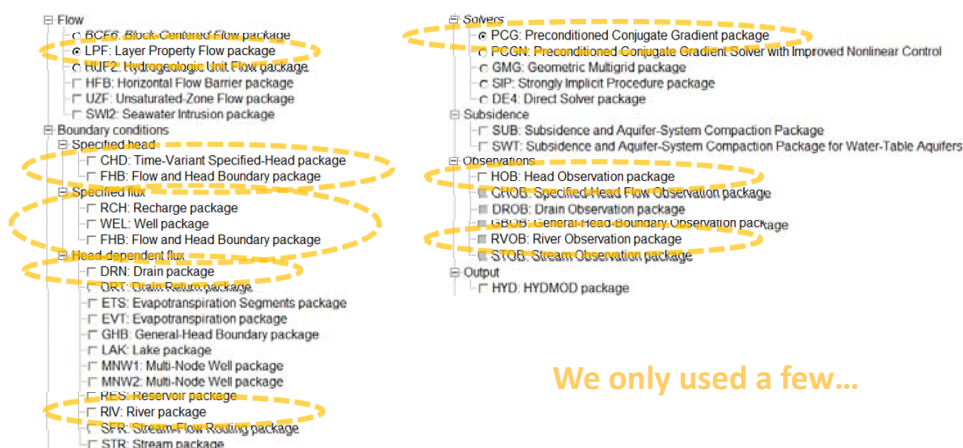
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ModelMuse and MODFLOW

- ✓ Many more packages available to use
- ✓ Compatibility with MODFLOW versions other than the core MODFLOW-2005
 - ✓ MODFLOW-LGR 
 - ✓ MODFLOW-NWT 
 - ✓ MODFLOW-OWHM 
 - ✓ MODFLOW-CFP 

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MODFLOW packages

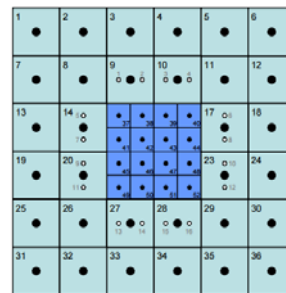


We only used a few...

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MODFLOW-LGR

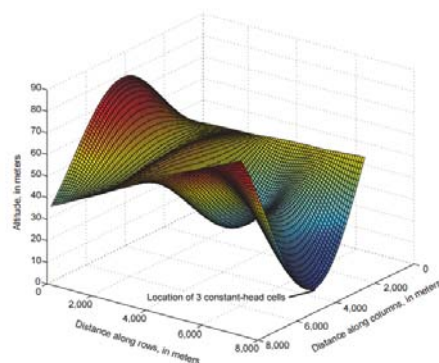
- ✓ MODFLOW-LGR allows smaller parts of a larger model domain to be refined without refining the entire model.



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MODFLOW-NWT

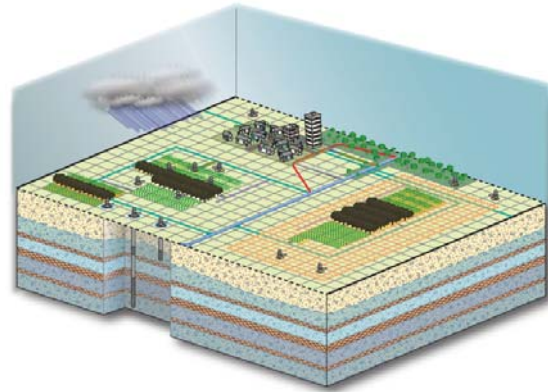
- ✓ MODFLOW-NWT is a Newton-Raphson formulation for MODFLOW-2005 to improve solution of unconfined groundwater-flow problems.
- ✓ It is intended for solving problems involving drying and rewetting nonlinearities of the unconfined groundwater-flow equation.



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MODFLOW-OWHM

- ✓ MODFLOW-OWHM, or the One-Water Hydrologic Flow Model, is an integrated hydrologic flow model (IHM).
- ✓ It is designed for the analysis of a broad range of issues related to the combined use of groundwater and surface water.
- ✓ It allows the simulation, analysis, and management of human and natural water movement within a physically-based supply-and-demand framework.

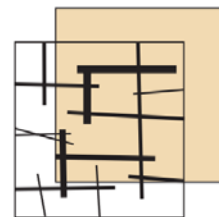


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MODFLOW-CFP

MODFLOW-CFP has the ability to simulate turbulent or laminar groundwater flow conditions by:

- ✓ coupling the traditional groundwater flow equation with formulations for a 1-dimensional discrete network of cylindrical pipes (Mode 1, CFPM1),
- ✓ inserting a high-conductivity flow layer that can switch between laminar and turbulent flow (Mode 2, CFPM2), or
- ✓ simultaneously coupling a discrete pipe network while inserting a high-conductivity flow layer that can switch between laminar and turbulent flow (Mode 3, CFPM3).



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Beyond the GUI

Several scripting language interfaces to MODFLOW exist, or are in development:

- ✓ Flopy (python) [link](#)
- ✓ Mflab (matlab) [link](#)
- ✓ RMODFLOW (R) [link](#)

These are useful for:

- ✓ Parameter estimation or uncertainty quantification that goes beyond MODFLOW parameters and/or UCODE algorithms
- ✓ Geostatistical simulation for *e.g.* material properties
- ✓ Quickly converting database information to input files
- ✓ Reproducible research/reporting
- ✓ ...

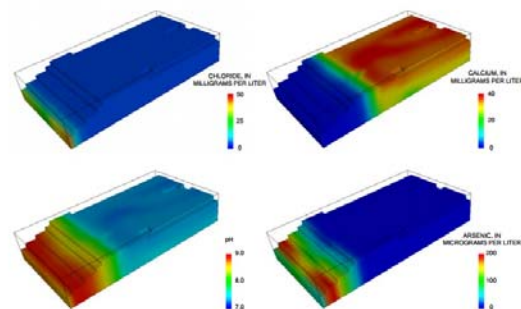
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ModelMuse and PHAST [link](#)

PHAST is a Computer Program for Simulating

- ✓ Groundwater Flow,
- ✓ Solute Transport, and
- ✓ Multicomponent Geochemical Reactions,

for which it uses PHREEQC. [link](#)

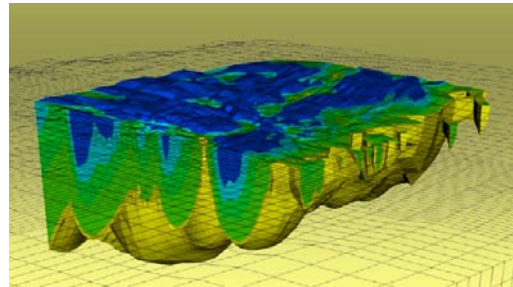


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ModelMuse and SUTRA

SUTRA is a model for

- ✓ saturated-unsaturated,
- ✓ variable-density ground-water flow,
- ✓ with solute
- ✓ or energy transport.



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*Questions? Found an error?
Please contact B. Rogiers at brogiers@sckcen.be.*

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