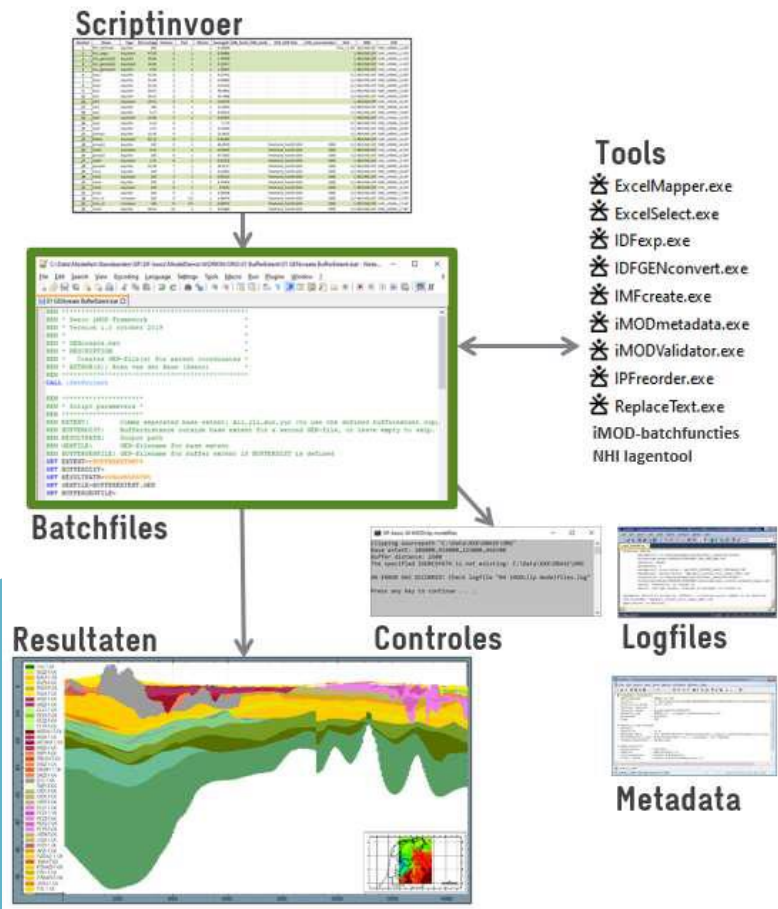


NHI grondwaterdata en tooling

Modelling on the fly

Koen van der Hauw - Sweco
Wouter Swierstra – RHDHV

18 januari 2024



Inhoud

- iMOD en Workflow concepten
- Modelling on the fly
- NHI onverzadigde zone projectresultaat
- Demo Workflow



Royal
HaskoningDHV
Enhancing Society Together



Deltares

Modelinstrumentarium

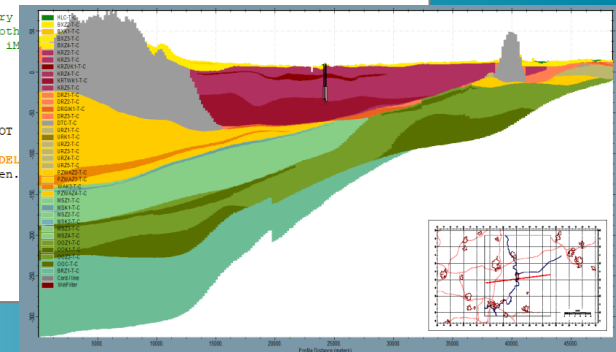
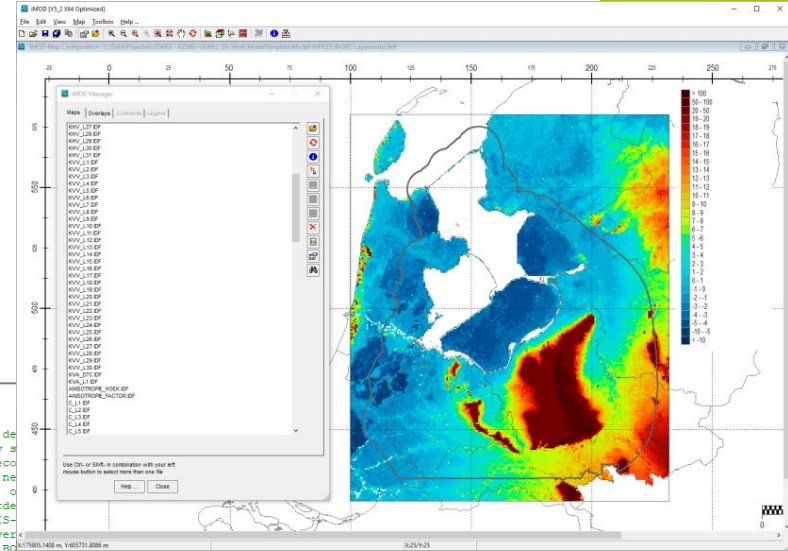
Intro iMOD en workflow concepten

Koen van der Hauw - Sweco
Wouter Swierstra – RHDHV

18 januari 2024

```

REM *****
REM * Script parameters *
REM *****
REM Note: an IMF-file is created with an INI de
REM an existing INI-file can be used by s
REM the GEN-files as defined in the Sweco
REM CREATEINI: Use value 1 to create a ne
REM REGISPATH: Path to REGIS IDF-files, 0
REM REGISORDER: Path to textfile with orde
REM REGISCOLORS: Either TNO (for TNO REGIS-
REM MODELTOPBOTPATH: Specify path to modellayer
REM MODELLINECOLOR: RGB colors for TOP- and BOT
REM IMODFILES: Comma separated list of iMOD-files (or path with filter) to be added before REGIS-files. Use double quotes around
REM IMODLEGENDS: Comma separated list of iMOD-legends for one or more of the IDF-files/paths. The last legend is used for remainin
REM FILESELECTIONS: Comma separated list of 0/1-values to specified if iMOD-file/path should be selected/highlighted in IMF-file
REM EXTENT: Extent of the IMF-file datafiles (llx,lly,urx,ury or llx lly urx ury)
REM RESULTPATH: Result path for IMF-file
REM IMFFILENAME: Specify result filename for IMF-file
REM ISADDCDTOIMF: Use value 1 to add the name of the current subdirectory
REM ISOPENIMOD: Specify with value 1 if iMOD should be opened, use 0 oth
REM IMODEXE: path to iMOD-executable, or use %IMODEXE% to refer to im
REM IMFCREATEEXE: path to IMFCreate-executable
SET CREATEINI=1
SET REGISPATH=
SET REGISORDER=
SET REGISCOLORS=
SET MODELTOPBOTPATHS=%BASEPATH%\%MODELREF1%\TOP;%BASEPATH%\%MODELREF1%\BOT
SET MODELLINECOLOR=25,25,25;100,100,100
SET IMODFILES=%BASISDATAPATH%\Maairveld\AHN3-WSS_25M.IDF", "%BASEPATH%\%MODE
SET IMODLEGENDS=%LEGENDPATH%\Maairveld_10-100.Leg", "%LEGENDPATH%\kh-waarden.
SET FILESELECTIONS=1,0,0,0,0
SET EXTENT=%MODELEXTENT%
SET RESULTPATH=%IMFFILESPTH%
SET IMFFILENAME=%MODELREF1% Layermodel
SET ISADDCDTOIMF=0
SET ISOPENIMOD=1
SET IMODEXE=%IMODEXE%
SET IMFCREATEEXE=%TOOLSPATH%\IMFCreate.exe
  
```



iMOD - GUI

iMOD Manager

Maps | Overlays | Comments | Legend

- HEAD_STEADY-STATE_L1.IDF
- HEAD_STEADY-STATE_L2.IDF
- HEAD_STEADY-STATE_L3.IDF
- HEAD_STEADY-STATE_L4.IDF
- HEAD_STEADY-STATE_L5.IDF
- HEAD_STEADY-STATE_L6.IDF
- HEAD_STEADY-STATE_L7.IDF
- HEAD_STEADY-STATE_L8.IDF
- HEAD_STEADY-STATE_L9.IDF
- KALIBRATIESET_STAT_L1.IPF
- KALIBRATIESET_STAT_L2.IPF
- KALIBRATIESET_STAT_L3.IPF
- KALIBRATIESET_STAT_L6.IPF
- KALIBRATIESET_STAT_L7.IPF
- KALIBRATIESET_STAT_L8.IPF
- KALIBRATIESET_STAT_L9.IPF
- TEST.IDF
- TEST.GEN

Use Ctrl- or Shift- in combination with your left mouse button to select more than one file

Help ... Close

Map Value

Current Location x = 213796.988 m, y = 463218.848 m

IDF	Value	Cell Indices
HEAD_STEADY-STATE_L1.IDF	7.260	C86.R33
HEAD_STEADY-STATE_L2.IDF	7.259	C86.R33
HEAD_STEADY-STATE_L3.IDF	7.488	C86.R33
HEAD_STEADY-STATE_L4.IDF	7.384	C86.R33
HEAD_STEADY-STATE_L5.IDF	7.319	C86.R33
HEAD_STEADY-STATE_L6.IDF	7.375	C86.R33
HEAD_STEADY-STATE_L7.IDF	7.375	C86.R33
HEAD_STEADY-STATE_L8.IDF	7.375	C86.R33
HEAD_STEADY-STATE_L9.IDF	7.370	C86.R33

Value Format: Real | Decimal places: 3

Help ... Close

iMOD [V5.3 X64 Optimized]

File Edit View Map Toolbox Help ...

iMOD-Map Configuration

202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219

462 463 464 465 466 467 468 469 470 471 472 473 474

4X206791.1120 m, Y:462396.3528 m | X:1;Y:1 | Visible Map

IDF Edit Select

Evaluate IDF A:

IDF-file: HEAD_STEADY-STATE_L1.IDF | Logic: <= | Value: 7.0000

Skip NoDataValue (0.3402823E+39)

Include extra statement: AND

Evaluate IDF B:

IDF-file: HEAD_STEADY-STATE_L1.IDF | Logic: >= | Value: 6.0000

Skip NoDataValue (0.3402823E+39)

Define Selection

New | Add to | Delete From | Subset | Select for Polygon

1352 cells selected out of 23750

Get Selection | Help ... Close

Legend

Classes | Stretches

Upper	Lower	Colour	Label	Freq. (%)
14.000	13.000	14		
13.000	12.000	13		
12.000	11.000	12		
11.000	10.000	11		
10.000	9.0000	10		
9.0000	8.0000	9		
8.0000	7.0000	8		
7.0000	6.0000	7		
6.0000	5.0000	6		
5.0000	4.0000	5		
4.0000	3.0000	4		

Apply | Help ... Cancel

IDF Edit Calculation

Define Value BY:

NoDataValue

New Value = [] [1p.00]

Take From: = [] HEAD_STEADY-STATE_L1.IDF

Smooth

Buffersize around (row/column): [1]

Apply smoothing for following times: [2]

Interpolate

Bivariate | PCG | Kriging

Table from: HEAD_STEADY-STATE_L1.IDF

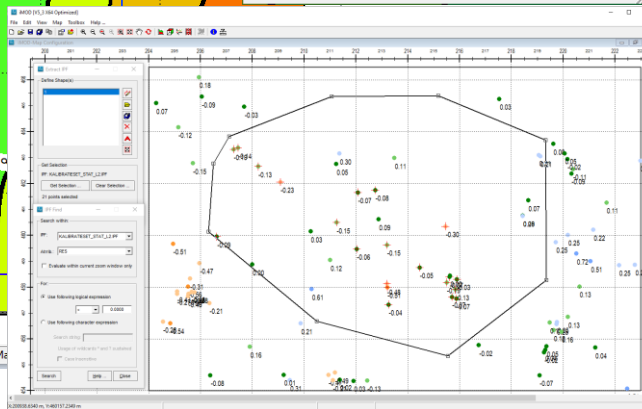
Assign Value TO:

Available IDF-File: HEAD_STEADY-STATE_L1.IDF

Save as New IDF-File: []

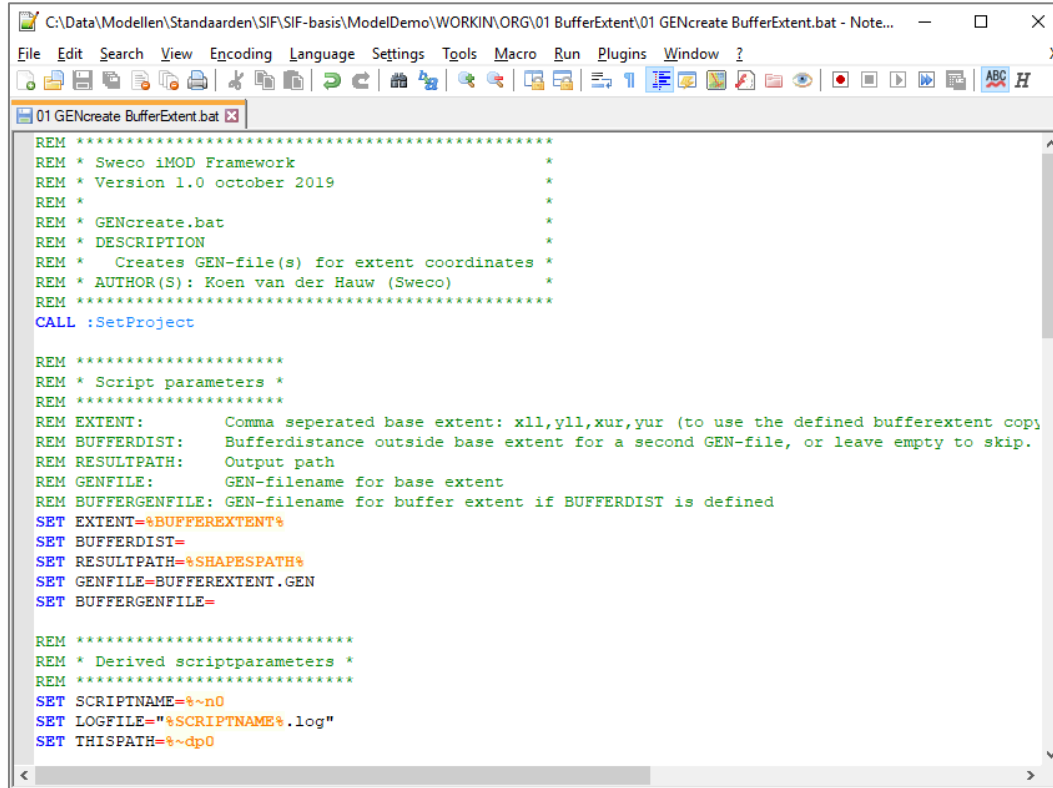
[] ... enter IDF file ...

Calculate | Help ... Close ...



IDF Editing in iMOD

Batchfiles



```
01 GENcreate BufferExtent.bat
REM *****
REM * Sweco iMOD Framework *
REM * Version 1.0 october 2019 *
REM * *
REM * GENcreate.bat *
REM * DESCRIPTION *
REM * Creates GEN-file(s) for extent coordinates *
REM * AUTHOR(S): Koen van der Hauw (Sweco) *
REM *****
CALL :SetProject

REM *****
REM * Script parameters *
REM *****
REM EXTENT:          Comma seperated base extent: x11,y11,xur,yur (to use the defined bufferextent copy)
REM BUFFERDIST:     Bufferdistance outside base extent for a second GEN-file, or leave empty to skip.
REM RESULTPATH:     Output path
REM GENFILE:         GEN-filename for base extent
REM BUFFERGENFILE:  GEN-filename for buffer extent if BUFFERDIST is defined
SET EXTENT=%BUFFEREXTENT%
SET BUFFERDIST=
SET RESULTPATH=%SHAPESPATH%
SET GENFILE=BUFFEREXTENT.GEN
SET BUFFERGENFILE=

REM *****
REM * Derived scriptparameters *
REM *****
SET SCRIPTNAME=%~n0
SET LOGFILE="%SCRIPTNAME%.log"
SET THISPATH=%~dp0
```

Example SIF-batchfile

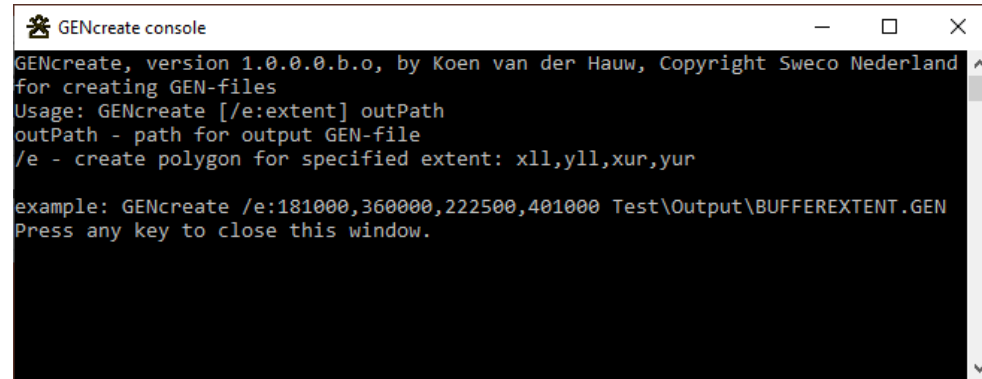
Batchfiles are:

- Link between model input, tools, checks, logging
- Powerful, standard and relatively simple
- readable with comments and settings in upper part
- Flexible, allowing settings and relative paths with environment-variables

SIF-tools

- Small, flexible tools
- Less risk for errors
- Replaceable
- Mostly executables
- Fast
- Extendable
- Started via batchfiles
- TortoiseSVN for version management

Del2Bin.exe	IDExp.exe	iMODdel.exe	ISGinfo.exe
ExcelMapper.exe	IDFGENconvert.exe	iMODmetadata.exe	LayerManager.exe
ExcelSelect.exe	IDFinfo.exe	iMODstats.exe	NumberRounder.exe
GEN3D2DAT.exe	IDFmath.exe	iMODValidator.exe	ReplaceLine.exe
GENcreate.exe	IDFresample.exe	IPFcolidx.exe	ReplaceText.exe
GENsplit.exe	IDFselect.exe	IPFreorder.exe	ResidualAnalysis.exe
HydroMonitorIPFconvert.exe	IMFcreate.exe	IPFsample.exe	Tee.exe
IDFbnd.exe	iMODclip.exe	IPFsplit.exe	CreateLink.vbs



```
GENcreate, version 1.0.0.0.b.o, by Koen van der Hauw, Copyright Sweco Nederland
for creating GEN-files
Usage: GENcreate [/e:extent] outPath
outPath - path for output GEN-file
/e - create polygon for specified extent: x11,y11,xur,yur

example: GENcreate /e:181000,360000,222500,401000 Test\Output\BUFFEREXTENT.GEN
Press any key to close this window.
```

Example info for tool syntax

External tools: Python scripts, iMOD batchfunctions, etc.

Possible integration with script languages, for example Python

```
PlotMeetreksen.py - C:\Data\Projecten\S1006738 - SIF-Pilot Dommel\W300 Uitvoering\Demos\SIF\Pyth...
File Edit Format Run Options Window Help
# -*- coding: utf-8 -*-
# PlotMeetreksen by Robin Opdam, 11-1-2021
# Copyright (C) 2021 Sweco Nederland B.V.

# Import packages
from os.path import join
from pathlib import Path
import glob
import matplotlib.pyplot as plt
import sys
import imod

# Definieer functie en inputvariabelen
def PlotMeetreksen(input_map, output_map):
    ...
    Deze functie maakt een grafiek van de gemeten grondwaterreeksen en de berekende reek
    Parameters:
        input_map (str): Tekst met naam inputmap
        output_map (str): Tekst met naam outputmap
    Benodigde packages:
        os, pathlib, glob, matplotlib, sys, imod
    Returns:
        Grafieken
    ...
# Maak outputmap
Path(output_map).mkdir(parents=False, exist_ok=True)

# Maak een lijst van alle IPF-bestanden met reeksen in de inputmap
search_criteria = "*.IPF"
q = join(input_map, search_criteria)
ipf_list = glob.glob(q)

# Alle IPF bestanden worden per laag gelezen en daaruit wordt de modellaag en een li
# Bij het inlezen (ipf.read) worden de onderliggende .txt files met de metingen dize
# Tevens is er een error in iMOD gecorrigeerd, bij de berekende reeksen kent iMOD de
for i in ipf_list:
    df = imod.ipf.read(i)
    print("reading... " + i)
    laagbestand = i.split('.')[-1]
    laag = laagbestand.split('.')[0]

    df['Peilbuis'] = df['NAME'] + "." + df['FILTERNR'].map(str)
    df['Gemeten'] = df['Calculated']

    peilfilters = list(df.Peilbuis.unique())
```

Python scripts with use of imod-python

```
REM *****
REM * Script variables *
REM *****
REM INPUT_MAP: Specify input folder
REM OUTPUT_MAP: Specify output folder
SET INPUT_MAP=Test\Input
SET OUTPUT_MAP=Test\Output\Plots

REM *****
REM * Derived variables *
REM *****
REM Use PUSHD to force temporary drive letter to be used for UNC-paths
PUSHD %~dp0
SET THISPATH=%~dp0
SET SCRIPTNAME=%~n0
SET LOGFILE="%THISPATH%\%SCRIPTNAME%.log"

REM Define scriptname, conda environment and searched conda path(s). Note: CONDBASEPA
SET PYSCRIPT=PlotMeetreksen.py
SET SCRIPTPARS="%INPUT_MAP%" "%OUTPUT_MAP%"
SET CONDAENV=imod
SET CONDAENVPATHS=C:\Anaconda3\envs,C:\Users\%USERNAME%\Miniconda3\envs,C:\Users\%USERN
SET CONDBASEPATHS=C:\Users\%USERNAME%\AppData\Local\Continuum\Miniconda3,C:\ProgramDat
CALL :FindConda
IF NOT DEFINED CONDAENVPATH GOTO error
IF NOT DEFINED CONDBASEPATH GOTO error

REM *****
REM * Script commands *
REM *****
TITLE SIF-plus: %SCRIPTNAME%

ECHO Starting script '%SCRIPTNAME%' ...
ECHO Starting script '%SCRIPTNAME%' in '%THISPATH%' > %LOGFILE%

REM Check input and output paths
IF NOT EXIST "%INPUT_MAP%" (
    ECHO Input path not found: %INPUT_MAP%
    ECHO Input path not found: %INPUT_MAP% >> %LOGFILE%
    GOTO error
)
IF NOT EXIST "%OUTPUT_MAP%" MKDIR "%OUTPUT_MAP%"

REM Activate conda environment if specified
SET ACTIVATE=%CONDBASEPATH%\Scripts\activate.bat
IF DEFINED CONDAENV (
    ECHO Using environment path: %CONDAENVPATH%\%CONDAENV% >> %LOGFILE%
    ECHO activating environment '%CONDAENV%' ...
    ECHO CALL "%ACTIVATE%" "%CONDAENVPATH%\%CONDAENV%" >> %LOGFILE%
    CALL "%ACTIVATE%" "%CONDAENVPATH%\%CONDAENV%" >> %LOGFILE%
```

SIF-batchfile wrapper for running Python script

Checks, logfiles and metadata

- Checks
- Error messages
- Logfiles
- Metadata

```
SIF-basis: 04 iMODclip modelfiles
Clipping sourcepath "C:\Data\XXX\DBASE\ORG"
Base extent: 204000,454000,223000,466500
Buffer distance: 2500
The specified SOURCEPATH is not existing: C:\Data\XXX\DBASE\ORG

AN ERROR HAS OCCURRED! Check logfile "04 iMODclip modelfiles.log"

Press any key to continue . . .
```

Tool console window

```
Clipping sourcepath "C:\Data\XXX\DBASE\ORG"
BASEEXTENT=204000,454000,223000,466500
BUFFERDIST=2500
The specified SOURCEPATH is not existing: C:\Data\XXX\DBASE\ORG

AN ERROR HAS OCCURRED! Check logfile "04 iMODclip modelfiles.log"
```

Tool logfile with error message

```
# Algemene informatie
-----
- Bestandsnaam      : iPEST_KHV_17_ZONEEx2.IDF
- Locatie           : C:\Temp\iMODInstrumentariumTest\Model-vb1\Model\DBASE\BASIS1\KHV
- Publicatie datum : 9-2-2017
- Versienr bestand : 1
- Versienr model   : TESTPROJECT BASIS1
- Beschrijving     : Verhoging van KHV iPEST_KHV_17 met factor 2
- Producent        : Sweco
- Type             : IDF

# Beschrijving dataset
- Eenheid          :
- Resolutie        :
- Herkomst/Bron    : WORKIN\BASIS1\01 KHV aanpassen\resultaat\KHV\iPEST_KHV_17_ZONEEx2.IDF
- Procesbeschrijving: WORKIN\BASIS1\01 KHV aanpassen\01 Verander KHV7x2.bat
- Toepassingsschaal : TESTPROJECT

# Administratie
- Organisatie      : Sweco
- Website          : www.sweco.nl
- Contactpersoon   : Ie Mand
- E-mail adres     : ie.mand@sweco.nl
```

Tool example – IDFexp

```
REM Example INI-script for IDFexp-tool
REM Example with use of assigning IDF-file to variabele and simple math
COND=cond_s_10.IDF
COND=COND*2

REM Example with use of NoData and scientific notation
SomeGrid=NoData
Horst=HORST.IDF
E6=HORST.IDF
Horst2=E6-6E-07+Horst
I3 = if(Horst>=0, NoData, 6E-07)

REM Example with use of min/max functions
I1 = Horst
I2 = if(Horst==1, Horst+1, Horst-1)
Imin = min(I1, I2)
Imax = max(I1, I2)

REM Example with nested expressions and multiple line expression
Test=(5 + 7 * if(Horst==1,
                 if(I3!=NoData || I2>0, Imin , Imax),
                 NoData)) + 2

REM Example with constant values and calculation of transmissivity out of course sand fractions
kZUG=50
kZZG=35

dL1_ZUG_Horst=dL1_ZUG.IDF
dL1_ZUG_Slenk=dL1_ZUG.IDF
dL1_ZUG=if(Horst==1,dL1_ZUG_Horst,dL1_ZUG_Slenk)

dL1_ZZG_Horst=dL1_ZZG.IDF
dL1_ZZG_Slenk=dL1_ZZG.IDF
dL1_ZZG=if(Horst==1,dL1_ZZG_Horst,dL1_ZZG_Slenk)

TX1=dL1_ZUG*kZUG + dL1_ZZG*kZZG
```

*Input INI-file for
IDFexp-tool:
a notepad for
readable IDF-
expressions*

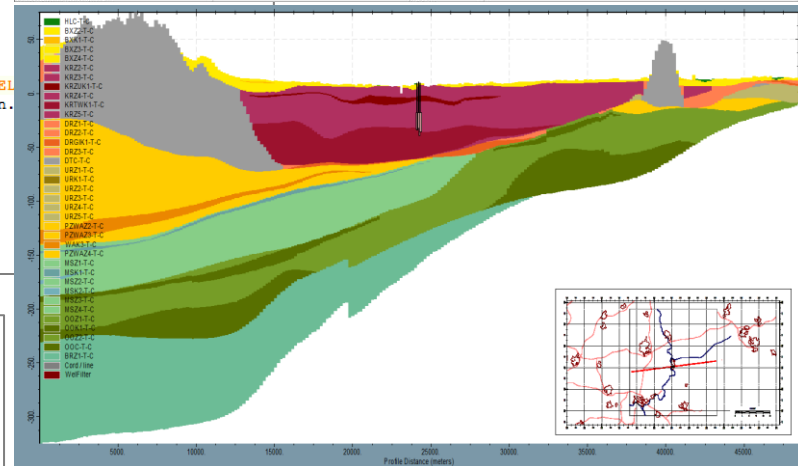
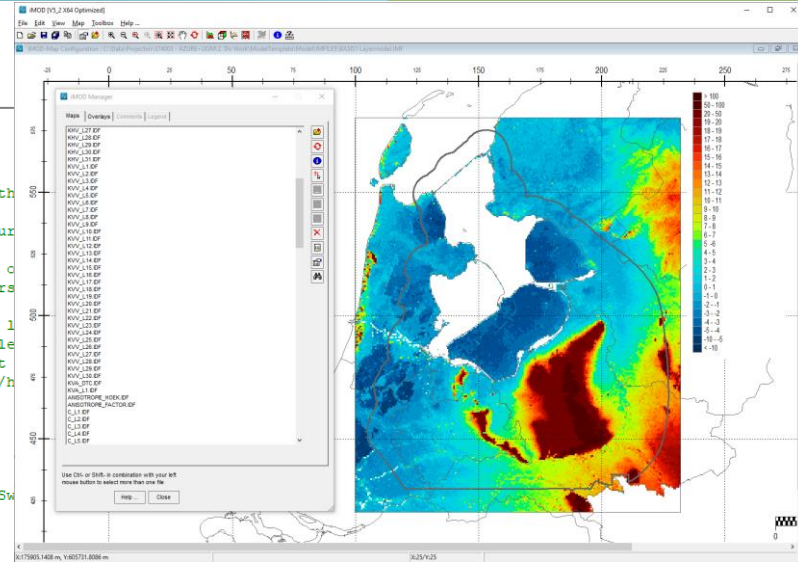
Tool example – IMFcreate

```

REM *****
REM * Script parameters *
REM *****
REM Note: an IMF-file is created with an INI definition file. See below for syntax and all possibilities.
REM      an existing INI-file can be used by setting CREATEINI=0, otherwise a new INI-file is created with
REM      the GEN-files as defined in the Sweco.iMOD.settings.bat file.
REM CREATEINI:      Use value 1 to create a new INI-file with settings below, or 0 or empty to use the cur
REM REGISPAT:       Path to REGIS IDF-files, or leave empty when no REGIS-files have to be used for IMF
REM REGISORDER:     Path to textfile with ordered REGIS prefixes in separate lines (with a single prefix o
REM REGISCOLORS:    Either TNO (for TNO REGIS-colors), AQF (or empty, for yellow/green colors for aquifers
REM MODELTOPBOTPATH: Specify path to modellayer TOP and BOT-files, or leave empty to skip
REM MODELINESCOLOR: RGB colors for TOP- and BOT-lines seperated by a semicolon (e.g. 225,0,0;175,0,0) or 1
REM IMODFILES:      Comma separated list of iMOD-files (or path with filter) to be added before REGIS-file
REM IMODLEGENDS:    Comma separated list of iMOD-legends for one or more of the IDF-files/paths. The last
REM FILESELECTIONS: Comma separated list of 0/1-values to specified if iMOD-file/path should be selected/h
REM EXTENT:         Extent of the IMF-file datafiles (llx,illy,urx,ury or llx illy urx ury)
REM RESULTPATH:    Result path for IMF-file
REM IMFFILENAME:   Specify result filename for IMF-file
REM ISADDCDTOIMF:  Use value 1 to add the name of the current subdirectory to the IMF-file
REM ISOPENIMOD:    Specify with value 1 if iMOD should be opened, use 0 otherwise
REM IMODEXE:       path to iMOD-executable, or use %IMODEXE% to refer to iMOD-executable as defined in Sw
REM IMFCREATEEEXE: path to IMFcreate-executable
SET CREATEINI=1
SET REGISPAT=
SET REGISORDER=
SET REGISCOLORS=
SET MODELTOPBOTPATHS=%DBASEPATH%\%MODELREF1%\TOP;%DBASEPATH%\%MODELREF1%\BOT
SET MODELINESCOLOR=25,25,25;100,100,100
SET IMODFILES=%BASISDATAPATH%\Maaiveld\AHN3-WSS_25M.IDF", "%DBASEPATH%\%MODELREF1%\KHV", "%DBASEPATH%\%MODEL
SET IMODLEGENDS=%LEGENDPATH%\maaiveld_-10-100.leg", "%LEGENDPATH%\kh-waarden.leg", "%LEGENDPATH%\kv-waarden.
SET FILESELECTIONS=1,0,0,0,0
SET EXTENT=%MODELEXTENT%
SET RESULTPATH=%IMFILESPATH%
SET IMFFILENAME=%MODELREF1% Layermodel
SET ISADDCDTOIMF=0
SET ISOPENIMOD=1
SET IMODEXE=%IMODEXE%
SET IMFCREATEEEXE=%TOOLSPATH%\IMFcreate.exe
    
```

IMFcreate

Creates iMOD IMF-file with specified IDF-files, sorted REGIS-layers, modellers, legends, labels, selection, cross sections legend



Run workflows with Runscripts

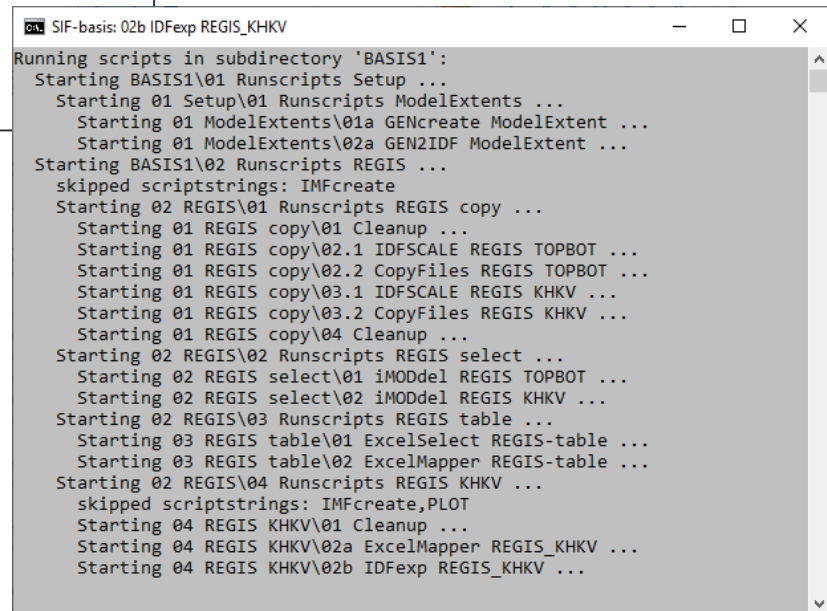
02b Runscripts IDFexp REGIS_KHKV.bat

```
REM *****  
REM * Script parameters *  
REM *****  
REM BASEPATH:      Basepath to search specified SUBDIR-directory from, or leave empty to use  
REM SUBDIR:        Subdirectory to run batchfiles from, or leave empty to use filename of the  
REM SKIPPEDSCRIPTS: Comma separated list of substrings in scriptnames or subdirs that should be  
REM ISRECURSIVE:    Specify (with value 1) that all batchfiles in all subdirectory's of the sp  
REM ISSUBLOGSHOWN: Specify (with value 1) that console messages of called lower level batchfi  
REM ISSKIPSHOWN:    Specify (with value 1) that messages for skipped batchfiles should be show  
SET BASEPATH=  
SET SUBDIR=  
SET SKIPPEDSCRIPTS="00 settings",IMFcreate  
SET ISRECURSIVE=  
SET ISSUBLOGSHOWN=  
SET ISSKIPSHOWN=
```

Starting (sub)workflows

With Runscripts batchfile all batchfiles in specified underlying directories are executed in alfabetic order.

Script stops when errors occur.



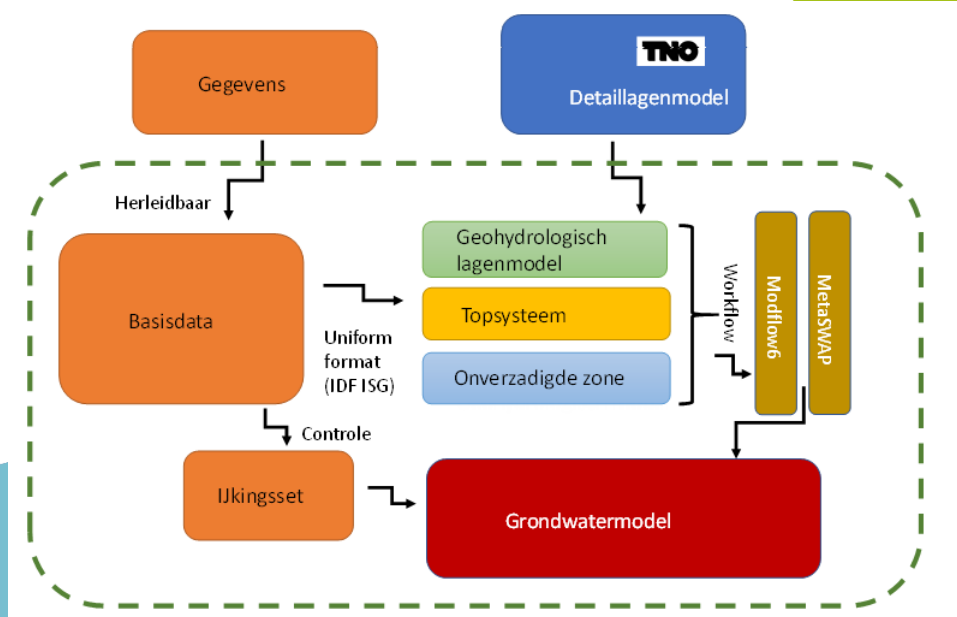
```
SIF-basis: 02b IDFexp REGIS_KHKV  
Running scripts in subdirectory 'BASIS1':  
Starting BASIS1\01 Runscripts Setup ...  
Starting 01 Setup\01 Runscripts ModelExtents ...  
Starting 01 ModelExtents\01a GENcreate ModelExtent ...  
Starting 01 ModelExtents\02a GEN2IDF ModelExtent ...  
Starting BASIS1\02 Runscripts REGIS ...  
skipped scriptstrings: IMFcreate  
Starting 02 REGIS\01 Runscripts REGIS copy ...  
Starting 01 REGIS copy\01 Cleanup ...  
Starting 01 REGIS copy\02.1 IDFSCALE REGIS TOPBOT ...  
Starting 01 REGIS copy\02.2 CopyFiles REGIS TOPBOT ...  
Starting 01 REGIS copy\03.1 IDFSCALE REGIS KHKV ...  
Starting 01 REGIS copy\03.2 CopyFiles REGIS KHKV ...  
Starting 01 REGIS copy\04 Cleanup ...  
Starting 02 REGIS\02 Runscripts REGIS select ...  
Starting 02 REGIS select\01 imODdel REGIS TOPBOT ...  
Starting 02 REGIS select\02 imODdel REGIS KHKV ...  
Starting 02 REGIS\03 Runscripts REGIS table ...  
Starting 03 REGIS table\01 ExcelSelect REGIS-table ...  
Starting 03 REGIS table\02 ExcelMapper REGIS-table ...  
Starting 02 REGIS\04 Runscripts REGIS KHKV ...  
skipped scriptstrings: IMFcreate,PLOT  
Starting 04 REGIS KHKV\01 Cleanup ...  
Starting 04 REGIS KHKV\02a ExcelMapper REGIS_KHKV ...  
Starting 04 REGIS KHKV\02b IDFexp REGIS_KHKV ...
```

Modelinstrumentarium

Van Basisdata naar model

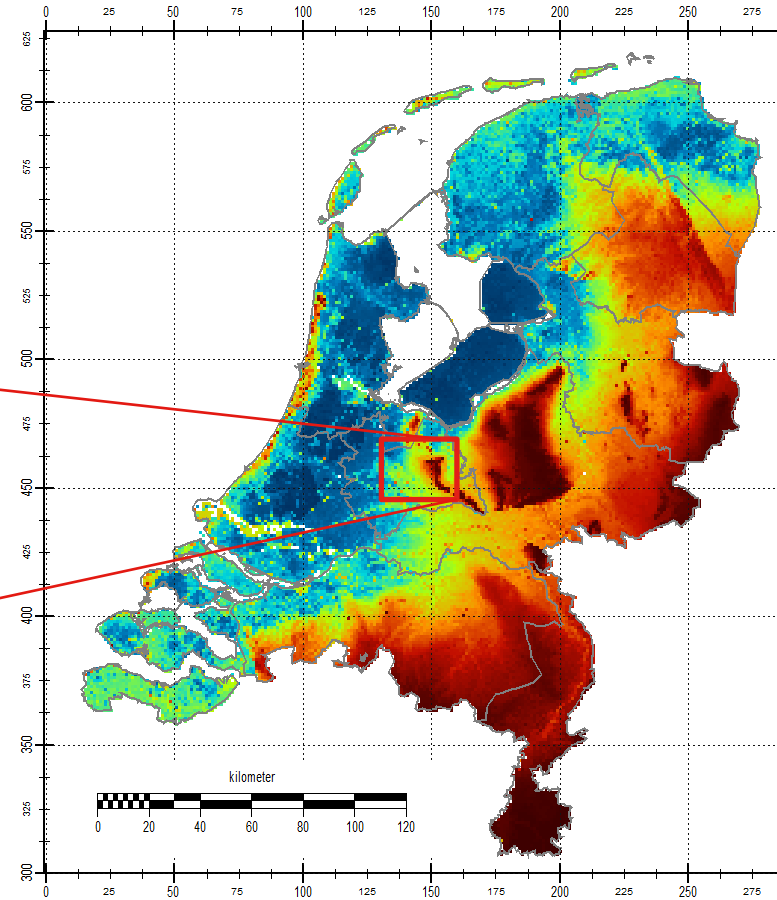
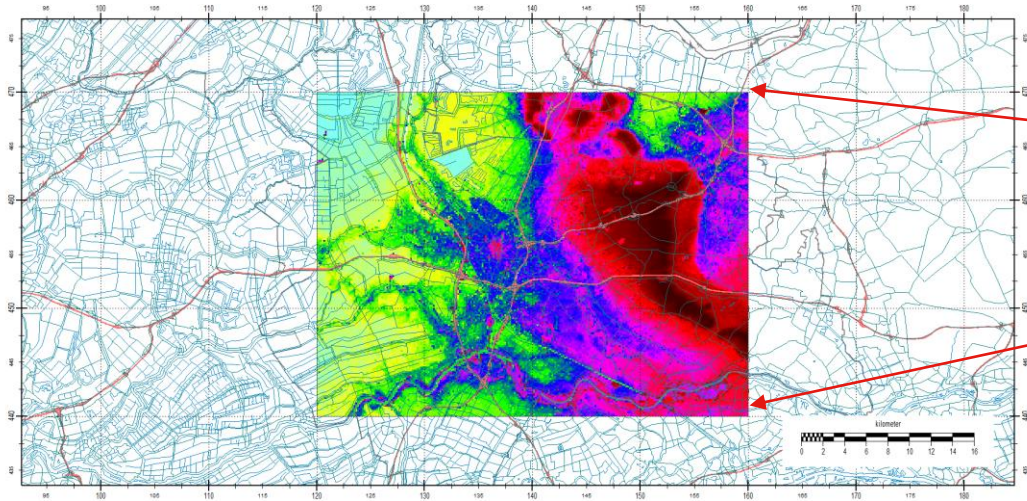
Koen van der Hauw - Sweco
Wouter Swierstra – RHDHV

18 januari 2024



Modelling on the fly

- Overall in Nederland een model afleiden



Basisdata

- [Boundary]
- [Breuken]
- [GeoTOP]
- [GeoTOP-CSV]
- [LHM]
- [Maaiveld]
- [Measurements]
- [MetaSWAP]
- [Meteo]
- [Onttrekkingen]
- [Oppervlaktewater]
- [REGIS]
- [REGISzones]
- [SHD]
- [Stuwwallen]
- [Verrijkingsdata]

DBASE

- [ANI]
- [BND]
- [BOT]
- [DRN]
- [HFB]
- [ISG]
- [KDC]
- [KDCKVA]
- [KHV]
- [KVA]
- [KVV]
- [LinkTable]
- [Maaiveld]
- [MEASUREMENTS]
- [METASWAP]
- [OLF]
- [REGIS+]
- [REGIS+_KDC]
- [REGIS+_KHKV]
- [RIV]
- [SHD]
- [STO]
- [TOP]
- [WEL]

Modflow 2005 groundwater model

- [BAS6]
- [DIS6]
- [DRN7]
- [ISG7]
- [LPF7]
- [RIV7]
- [WEL7]
- IBR30_BASIS1_TA BAS6
- IBR30_BASIS1_TA DIS6
- IBR30_BASIS1_TA DRN7
- IBR30_BASIS1_TA DXC
- IBR30_BASIS1_TA ISG7
- IBR30_BASIS1_TA LPF7
- IBR30_BASIS1_TA MET7
- IBR30_BASIS1_TA OC
- IBR30_BASIS1_TA PCG7
- IBR30_BASIS1_TA RIV7
- IBR30_BASIS1_TA WEL7

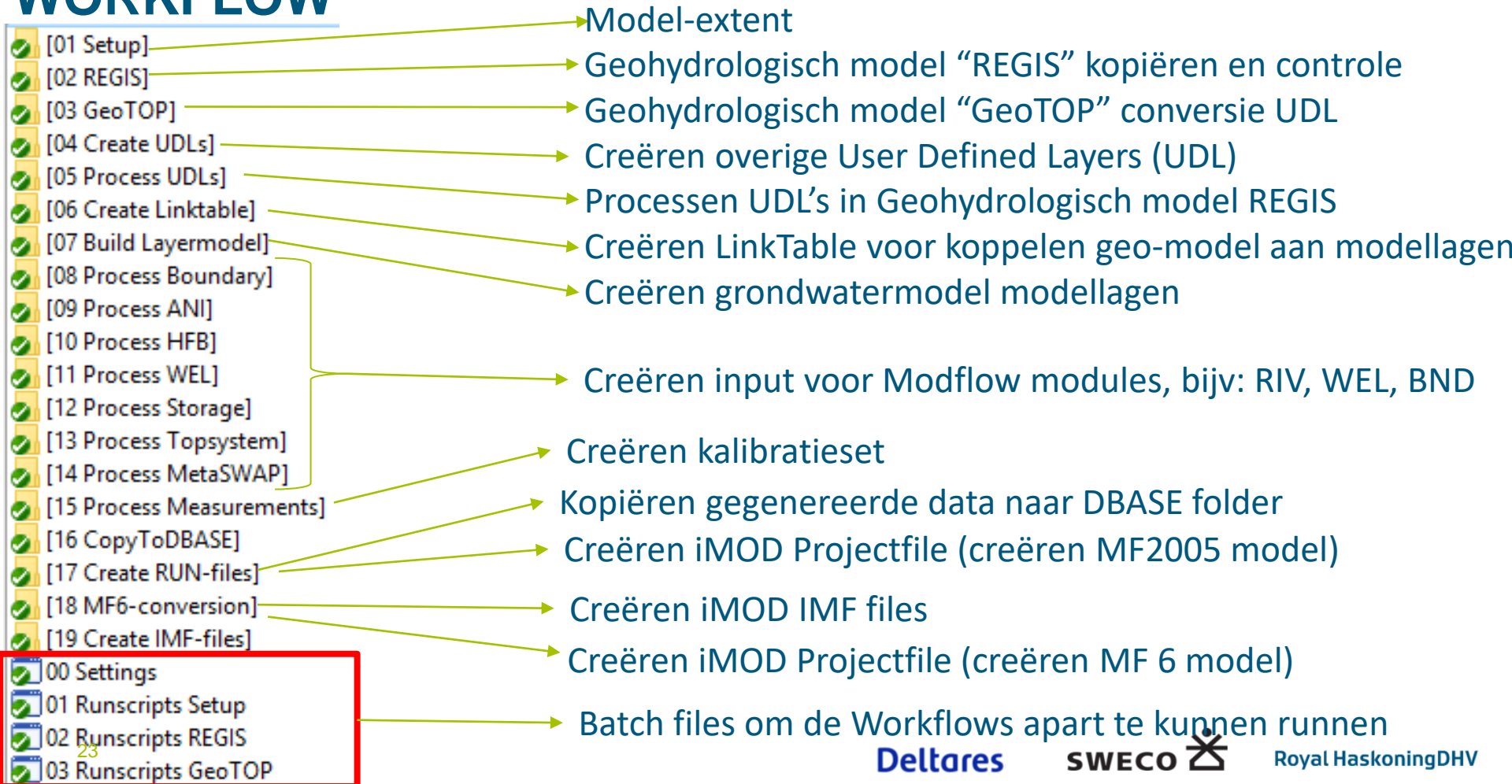
Modflow 6 groundwater model

- [CHD6]
- [DIS6]
- [DRN6]
- [IC6]
- [NPF6]
- [RCH6]
- [RIV6]
- [WEL6]
- IBR30_BASIS1_STAT_MF6_SYS1 CHD6
- IBR30_BASIS1_STAT_MF6_SYS2 CHD6
- IBR30_BASIS1_STAT_MF6_SYS3 CHD6
- IBR30_BASIS1_STAT_MF6_SYS4 CHD6
- IBR30_BASIS1_STAT_MF6_SYS5 CHD6
- IBR30_BASIS1_STAT_MF6_SYS6 CHD6
- IBR30_BASIS1_STAT_MF6_SYS7 CHD6
- IBR30_BASIS1_STAT_MF6_SYS8 CHD6
- IBR30_BASIS1_STAT_MF6_SYS9 CHD6

Model afleiden in 4 clicks

- Stap 1: CopyClipModelTemplate.
 - Kopieert workflow voor gewenste modeextent naar modelfolder
- Stap 2: Clip Basisdata
 - Clipt de basisdata op de modeextent (batch onderdeel van de workflow)
- Stap 3: Run Workflow 1 t/m 6
 - Genereert het detail lagenmodel (REGIS+) en LinkTable
- Stap 4: Run Workflow 7 t/m 19
 - Genereert lagenmodel en andere Modflow packages invoer
 - Genereert iMOD Projectfiles voor MF2005 en MF6, stationair en tijdsafhankelijk

WORKFLOW



Basisdata

Bouw lagenmodel

WF 02 REGIS

Regis

Schalen

Selectie aanwezige
REGIS lagen

Controle
inconsistenties

- Aanwezige REGIS lagen
- Volgorde tabel

WF 03 GeoTOP

GeoTOP

User input:
Welke lagen
Combinatie

Controle
inconsistenties

Conversie naar REGIS formaat

- UDL's in REGIS
formaat

WF 04 Create UDL

Verrijgingsdata

Controle
inconsistenties

Conversie naar REGIS formaat

- UDL's in REGIS
formaat

WF 05 Process UDL

- UDL's
- Aanwezige REGIS lagen
- Volgorde tabel

Schalen

NHI GeoModifier

- Verrijkte REGIS (REGIS+)
- Volgorde tabel

WF 06 Create Linktabel

- Verrijkte REGIS (REGIS+)
- Volgorde tabel
- Input algemene Linktabel

Mappings algoritme

Linktabel

Hand-
matig

- Linktabel

WF 07 Build Layermodel

- Verrijkte REGIS (REGIS+)
- Linktabel

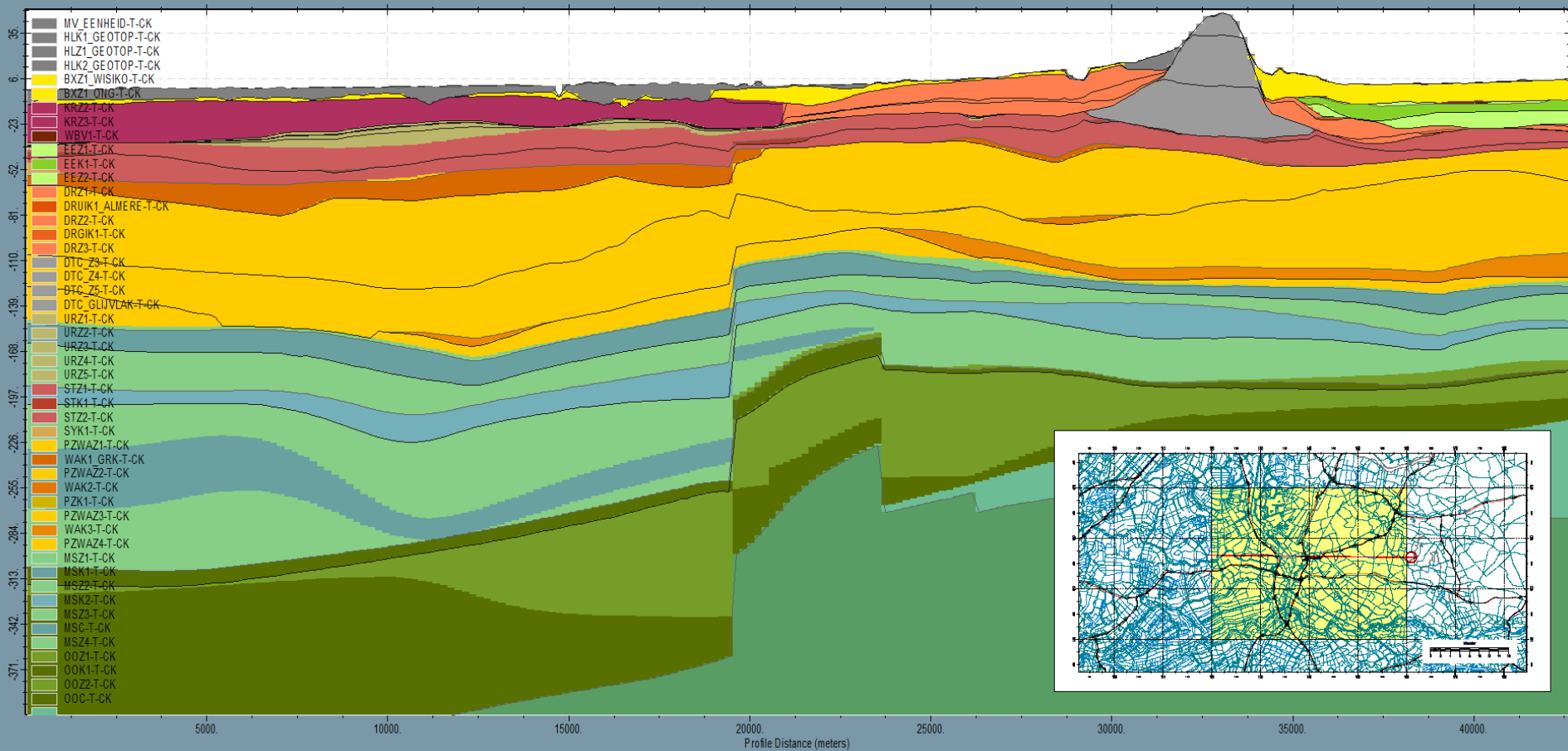
NHI Layerbuilder

- **Lagenmodel**
 - TOPBOT's
 - kD en C
 - Kh, kv en kva

Bouw lagenmodel aan de hand van LinkTable

Number	Name	Type	Percentage	Schema	Part	Kfactor	AverageK	ANI_factor	ANI_hoek	ANI_KVA	BND	SHD
1	MV_eeheid	Complex	100	1	1	1	8.88152				IBOUND.ID	SHD_MV_eeheid.IDF
2	Hlc_regis	Aquitard	25.23	-1	1	1	2.69989				IBOUND.ID	SHD_Hlc_regis.IDF
3	HLk1_geotop	Complex	11.18	-1	1	1	1.1194				IBOUND.ID	SHD_HLk1_geotop.IDF
4	HLz1_geotop	Complex	2.91	-1	1	1	6.50145				IBOUND.ID	SHD_HLz1_geotop.IDF
5	HLk2_geotop	Complex	0.28	-1	1	1	1.44029				IBOUND.ID	SHD_HLk2_geotop.IDF
6	HLz2_geotop	Complex	0.01	-1	1	1	0.37938				IBOUND.ID	SHD_HLz2_geotop.IDF
7	BXk1_xsc	Complex	0.64	-1	1	1	0.45927				IBOUND.ID	SHD_BXk1_xsc.IDF
8	bxz3	Aquifer	0	2	1	1	6.05667				IBOUND.ID	SHD_bxz3.IDF
9	bxz4	Aquifer	0	2	1	1	6.094				IBOUND.ID	SHD_bxz4.IDF
10	BXz1_xsi	Complex	0.98	2	1	1	1.84482				IBOUND.ID	SHD_BXz1_xsi.IDF
11	BXz1_wiko	Complex	16.53	2	1	1	1.79671				IBOUND.ID	SHD_BXz1_wiko.IDF
12	BXz1_wisiko	Complex	1.11	2	1	1	2.68521				IBOUND.ID	SHD_BXz1_wisiko.IDF
13	BXz1_deko	Complex	3.42	2	1	1	6.97316				IBOUND.ID	SHD_BXz1_deko.IDF
14	BXz1_ong	Complex	20.39	3	1	1	4.9651				IBOUND.ID	SHD_BXz1_ong.IDF
15	krz3	Aquifer	14.48	4	1	1	58.2137				IBOUND.ID	SHD_krz3.IDF
16	krzuk1	Aquitard	0.04	-4	1	1	0.03515				IBOUND.ID	SHD_krzuk1.IDF
17	krz4	Aquifer	12.37	4	1	1	66.7948				IBOUND.ID	SHD_krz4.IDF
18	krtwk1	Aquitard	0.83	-4	1	1	0.00058				IBOUND.ID	SHD_krtwk1.IDF
19	krz5	Aquifer	11.58	4	1	1	70.638				IBOUND.ID	SHD_krz5.IDF
20	bez1	Aquifer	18.77	4	1	1	85.188				IBOUND.ID	SHD_bez1.IDF
21	bek1	Aquitard	1.84	-4	1	1	0.02675				IBOUND.ID	SHD_bek1.IDF
22	bez2	Aquifer	24.33	4	1	1	81.7413				IBOUND.ID	SHD_bez2.IDF
23	bek2	Aquitard	0.23	-4	1	1	0.02317				IBOUND.ID	SHD_bek2.IDF
24	bez3	Aquifer	28.56	4	1	1	78.5572				IBOUND.ID	SHD_bez3.IDF
25	qrz1	Aquifer	0.24	4	1	1	27				IBOUND.ID	SHD_qrz1.IDF
26	drz1	Aquifer	1.06	5	1	1	44.4406				IBOUND.ID	SHD_drz1.IDF
27	drzik1	Aquitard	0.01	-5	1	1	0.01329				IBOUND.ID	SHD_drizik1.IDF
28	drz3	Aquifer	1.12	5	1	1	44.791				IBOUND.ID	SHD_drz3.IDF
29	DTc_z1	Aquifer	0	5	1	1	20	anisotropie_factor.IDF	anisotropie_hoek.IDF	KVA_DTC.IDF	IBOUND.ID	SHD_DTc_z1.IDF
30	DTc_z2	Aquifer	0.46	5	1	1	20	anisotropie_factor.IDF	anisotropie_hoek.IDF	KVA_DTC.IDF	IBOUND.ID	SHD_DTc_z2.IDF
31	DTc_z3	Aquifer	1.33	5	1	1	20	anisotropie_factor.IDF	anisotropie_hoek.IDF	KVA_DTC.IDF	IBOUND.ID	SHD_DTc_z3.IDF
32	DTc_z4	Aquifer	1.94	6	1	1	20	anisotropie_factor.IDF	anisotropie_hoek.IDF	KVA_DTC.IDF	IBOUND.ID	SHD_DTc_z4.IDF
33	DTc_z5	Aquifer	2.88	7	1	1	20	anisotropie_factor.IDF	anisotropie_hoek.IDF	KVA_DTC.IDF	IBOUND.ID	SHD_DTc_z5.IDF
34	DTc_glijvlak	Aquitard	2.88	-7	1	1	0.00002				IBOUND.ID	SHD_DTc_glijvlak.IDF
35	urz1	Aquifer	0.1	8	1	1	55				IBOUND.ID	SHD_urz1.IDF
36	stz1	Aquifer	1.63	8	1	1	48.1338				IBOUND.ID	SHD_stz1.IDF
37	stk1	Aquitard	0.19	-7	1	1	0.04024				IBOUND.ID	SHD_stk1.IDF
38	stz2	Aquifer	2.1	8	1	1	51.3575				IBOUND.ID	SHD_stz2.IDF

Resultaat lagenmodel

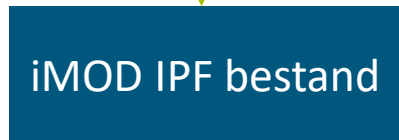


Voorbeeld Onttrekkingen (WEL Workflow)

Basisdata in Excel



Modelinvoer



1	A	B	C	D	E	F	G	H	I	J	K	L
1	Format Name	Hydromonitor - open data exchange format										
2	Format Version	1										
3	Format Definition	file://hydromonitor@iMODweb/hydromonitor_data_exchange_format.pdf										
4	Format Type	Excel										
5	Format Contents	Header	Metadata	Data								
6	Object Type	PumpingWell										
7	Object ID Fields	Name										
8		FilterNo										
9	Name	FilterNo	Alias	StartDateTime	XCoordinate	YCoordinate	XLine	YLine	SurfaceLevel	WellTopLevel	FilterTopLevel	FilterBottomLevel
10	ASLT_PP_02	(Integer)	(String)	(DateTime)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
11	ASLT_PP_03	0 NaN		01/01/1975	19930	359013 NaN	NaN	NaN	20	20	-75	-88
12	ASLT_PP_04	0 NaN		01/02/1974	19912	358974 NaN	NaN	NaN	20	20	-102	-112
13	ASLT_PP_04	0 NaN		01/01/1981	19909	359043 NaN	NaN	NaN	20	20	-85	-95
14	ASLT_PP_01A	0 NaN		01/03/1988	19919	359002 NaN	NaN	NaN	20	20	-259.75	-276
15	ASLT_PP_06	0 NaN		01/01/1988	19934	359032 NaN	NaN	NaN	20	20	-196.2	-225
16	ASLT_PP_01	0 NaN		01/02/1972	19933	359003 NaN	NaN	NaN	20	20	-96	-109
17												
18	Name	FilterNo	DistTime	Volume	QCoeff							
19	(String)	(Integer)	(Integer)	(m ³)	(Categorical)							
20	ASLT_PP_02	0	01/01/1900 00 NaN	Censored								
21	ASLT_PP_02	0	01/01/1975 00 00	0 Censored								
22	ASLT_PP_02	0	01/02/1975 00 00	3029.668921875 Censored								
23	ASLT_PP_02	0	01/03/1975 00 00	3995.668921875 Censored								
24	ASLT_PP_02	0	01/04/1975 00 00	4671 Censored								
25	ASLT_PP_02	0	01/05/1975 00 00	5398 Censored								
26	ASLT_PP_02	0	01/06/1975 00 00	5681 Censored								
27	ASLT_PP_02	0	01/07/1975 00 00	5665.668921875 Censored								
28	ASLT_PP_02	0	01/08/1975 00 00	5077.668921875 Censored								
29	ASLT_PP_02	0	01/09/1975 00 00	4592.336078125 Censored								
30	ASLT_PP_02	0	01/10/1975 00 00	4201.668921875 Censored								
31	ASLT_PP_02	0	01/11/1975 00 00	4056.336078125 Censored								
32	ASLT_PP_02	0	01/12/1975 00 00	3847.668921875 Censored								
33	ASLT_PP_02	0	01/01/1976 00 00	4201.336078125 Censored								
34	ASLT_PP_02	0	01/02/1976 00 00	4365.668921875 Censored								
35	ASLT_PP_02	0	01/03/1976 00 00	4109 Censored								

Hydromonitor

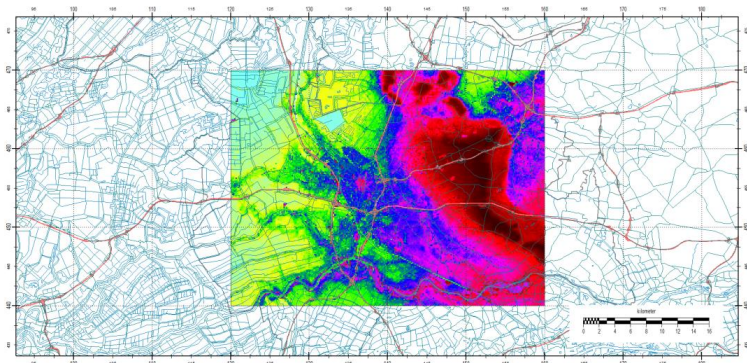
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FRACTION
ILAY
TOP
BOT
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IPF

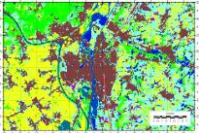
Voorbeeld Maaiveld Workflow

	A	B	C	D	E	F	G	
1	Maaiveldcorrecties: cellen in het MV-basisgrid worden eerst overschreven met de verrijgingsdata, daarna worden NoData-waarden opgevuld met MV-opvulgrid1 en tenslotte met MV-opvulgrid2 en 3							
2	MV-basisdatapad	%BASISDATAPATH%\Maaiveld						
3	MV-basisgrid	Nederland\AHN3-WSS\AHN3-WSS.IDF						
4	MV-opvulgrid1	REGIS\TOPmaximum_REGIS.idf						
5	MV-opvulgrid2							
6	MV-opvulgrid3							
7								
8	Verrijgingsdata/UDL grids (bovenste grids in tabel, dus met kleiner rijnummer, worden eerder ingebrand en hebben daarmee lagere prioriteit)							
9	Bron	Parameternaam	Correctiefactor	Methode	Pad		Waterbodem	
10	Rijkswaterstaat	Maas_bathymetrie	1.000	Inbranden	%BASISDATAPATH%\Verrijgingsdata\Bathymetrie\Rijkswaterstaat\Maas\MaasBath_2020.idf		1	
11	Provincie Limburg	Ontgrondingen	1.000	Inbranden	%BASISDATAPATH%\Verrijgingsdata\Ontgrondingen\Ontgrondingen_NAP.idf		1	
12								
13								
14								
15								

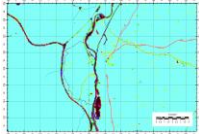


MetaSWAP Workflow

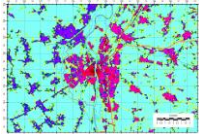
Basisdata



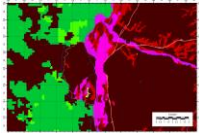
LUSE (Landuse)



NOPP (Nat oppervlak)



SOPP (Stedelijk oppervlak)



Bodemkaart

Berekening

Overlandflow

Worteldiepte

inp bestanden

Mete_grid.inp

Schalen
en default waarde
voor NoData

Grid2MetaSWAP
Invoerparameters

→ Toekennen aan modellen

→ Max(**maaiveld** en topsysteem peilen)

→ O.b.v. landgebruik en bodemtype

→ Kopieëren

Resultaat model

PRJ- en RUN-file:

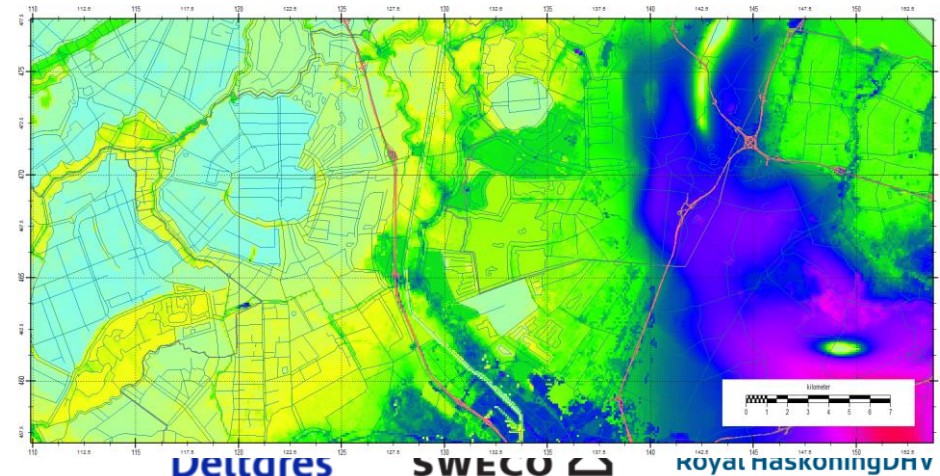
- MODFLOW-2005 Stationair
- MODFLOW-2005 Tijdsafhankelijk

PRJ-file

- MODFLOW 6 Stationair
- MODFLOW 6 Tijdsafhankelijk
- MODFLOW 6 Unconfined Stationair



Inclusief batch files om Model te runnen



Ook opgeleverd

- Workflow unstructured
- DAMO2ISG
- GeoTOP csv-conversion
- GeoTOP Voxel selection
- GeoTOP complexe opschaling
- GeoTOP split layers
- Workflow VIZ

