Can we use HIP-data in Daisy?

An introduction

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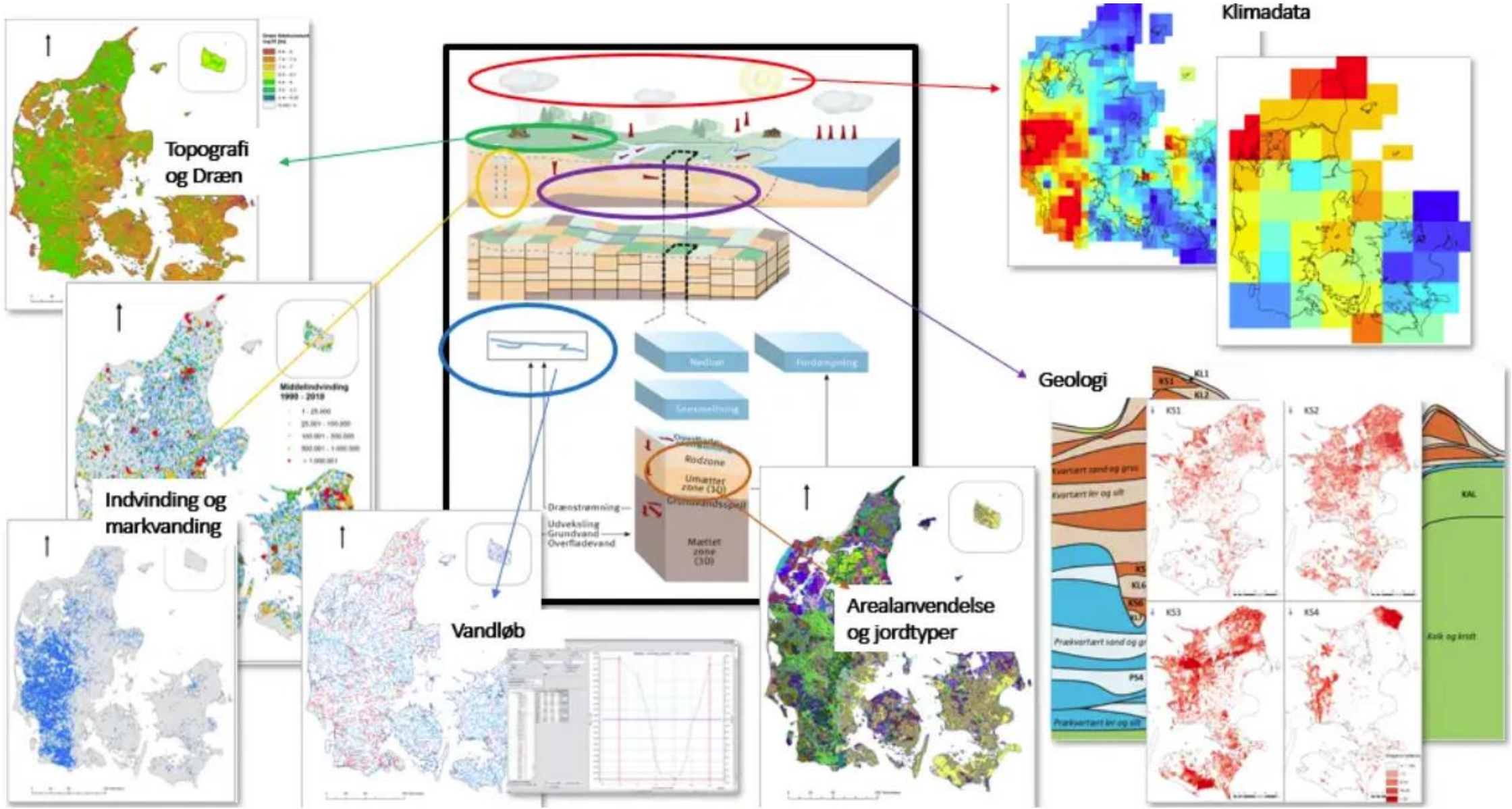
HIP = Hydrologisk Informations- og Prognosesystem

- Where to find it?
- https://hip.dataforsyningen.dk/

What is it?

- A database where you can access a range of measurements and modelled information about groundwater (and watercourses + sea level).
- Modelled data are based on the DK-model
  - Not the truth,
  - "Strange" weather corrections
  - Calibrated on all available gw-measurements and stream flow

DK-model (MIKE-SHE, GEUS)



Let's have a look at the homepage!

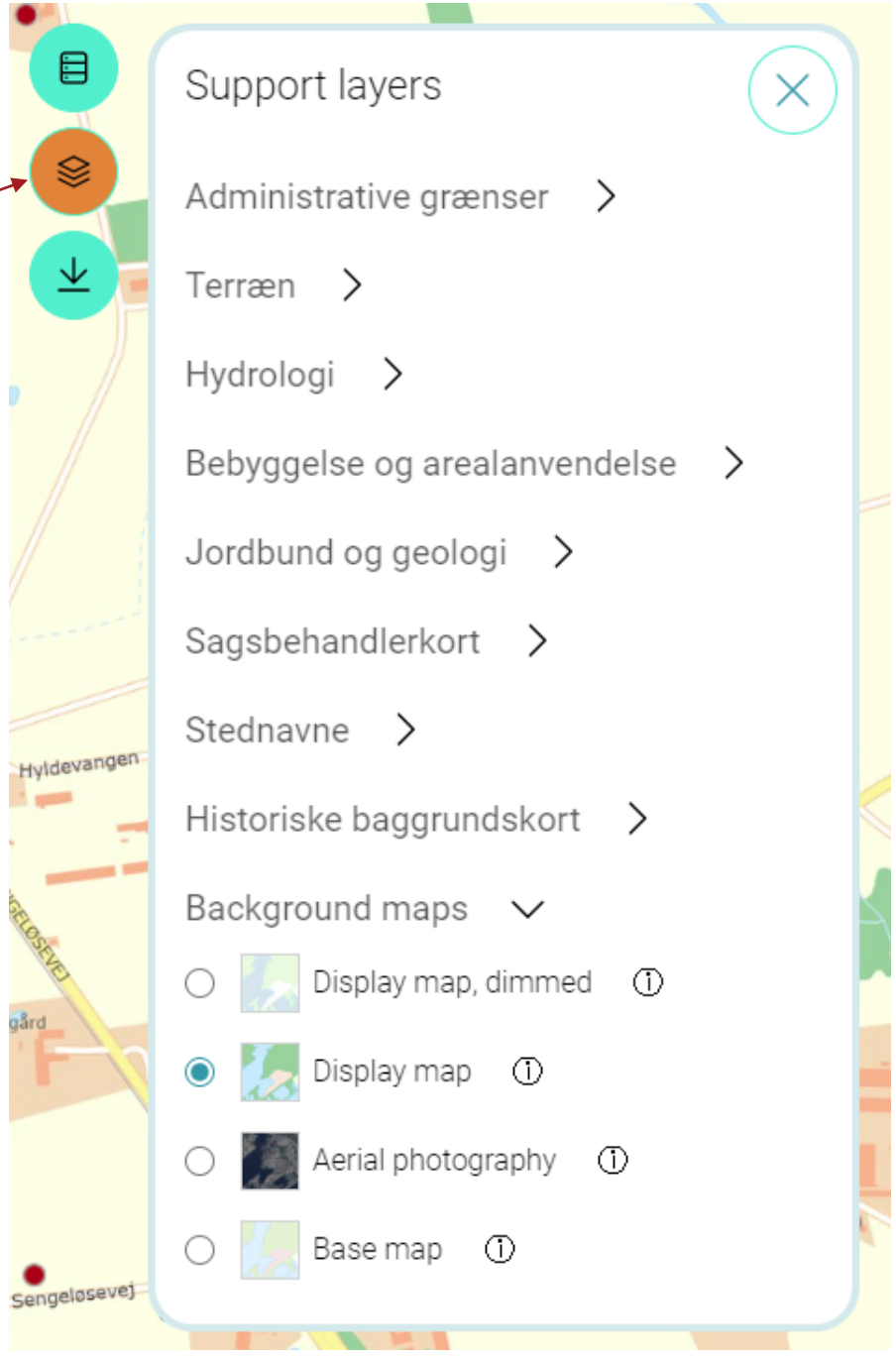
- Background maps
- Measurements (use the time slide to see observations)
- Model calculations 100 m (shallow groundwater over time)
- Model calculations + Machine learning, 10 m grid (statistics)
- Points and time series
- Future scenarios

- NB: Groundwater here is groundwater level with drains included – if they are included in the model at the site. Percolation includes drain water, as water reaches groundwater before draining off in MIKE SHE.

Background maps

With the center button to the left, you can choose a range of background maps, that can help you find a location or analyse your problem.

For location, you can also look at the coordinates in the lower left corner.

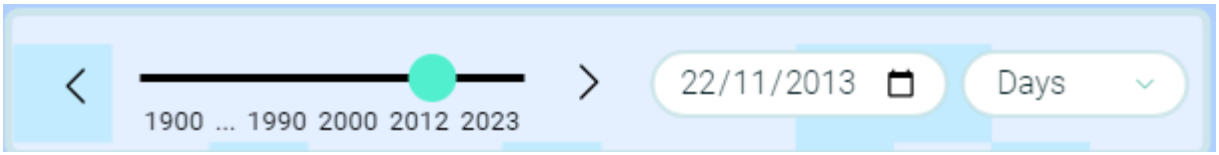


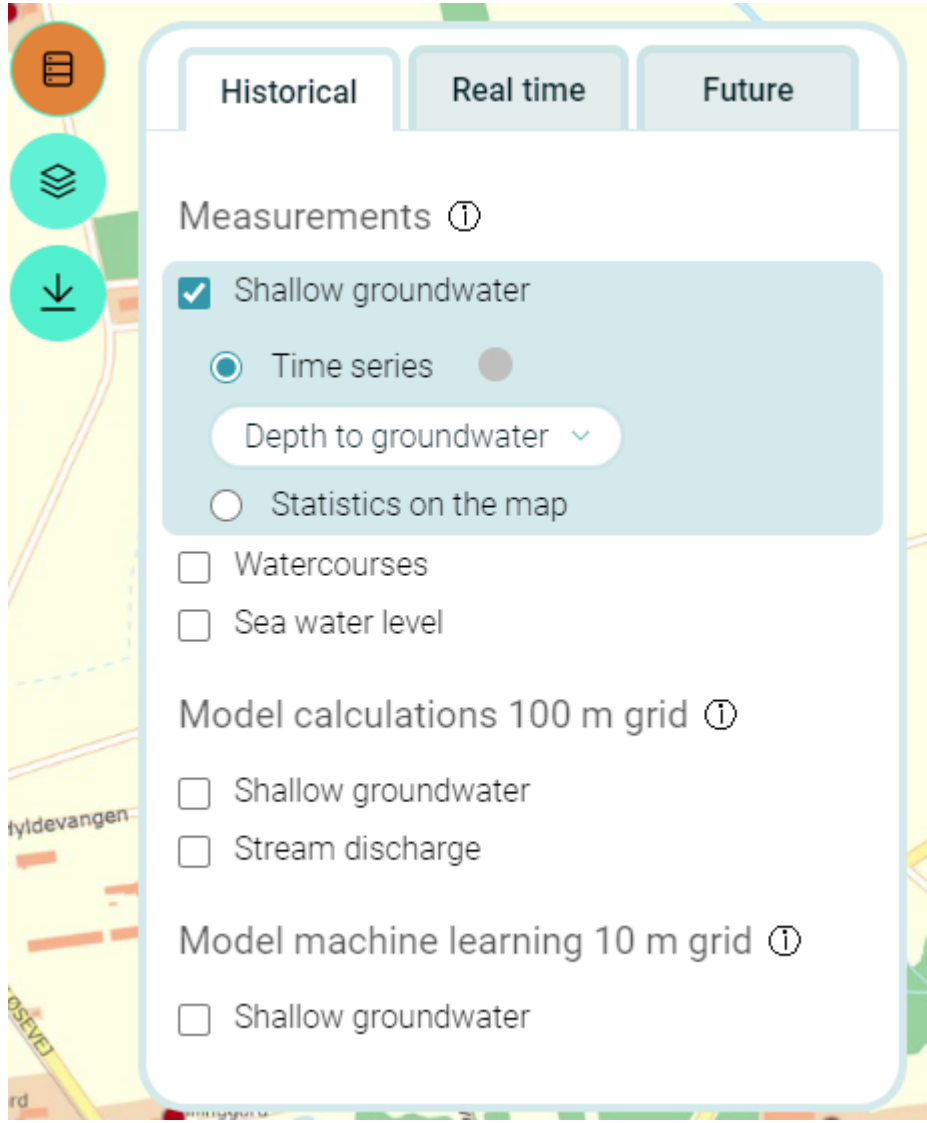
Measurements and model results

With the top button to the left, you can choose to see measurements, model calculations at 100 m grid resolutions or model/machine-learning data at 10 m grid resolution.

You can move in time, using the slide found mid bottom.

Check uncertainty.





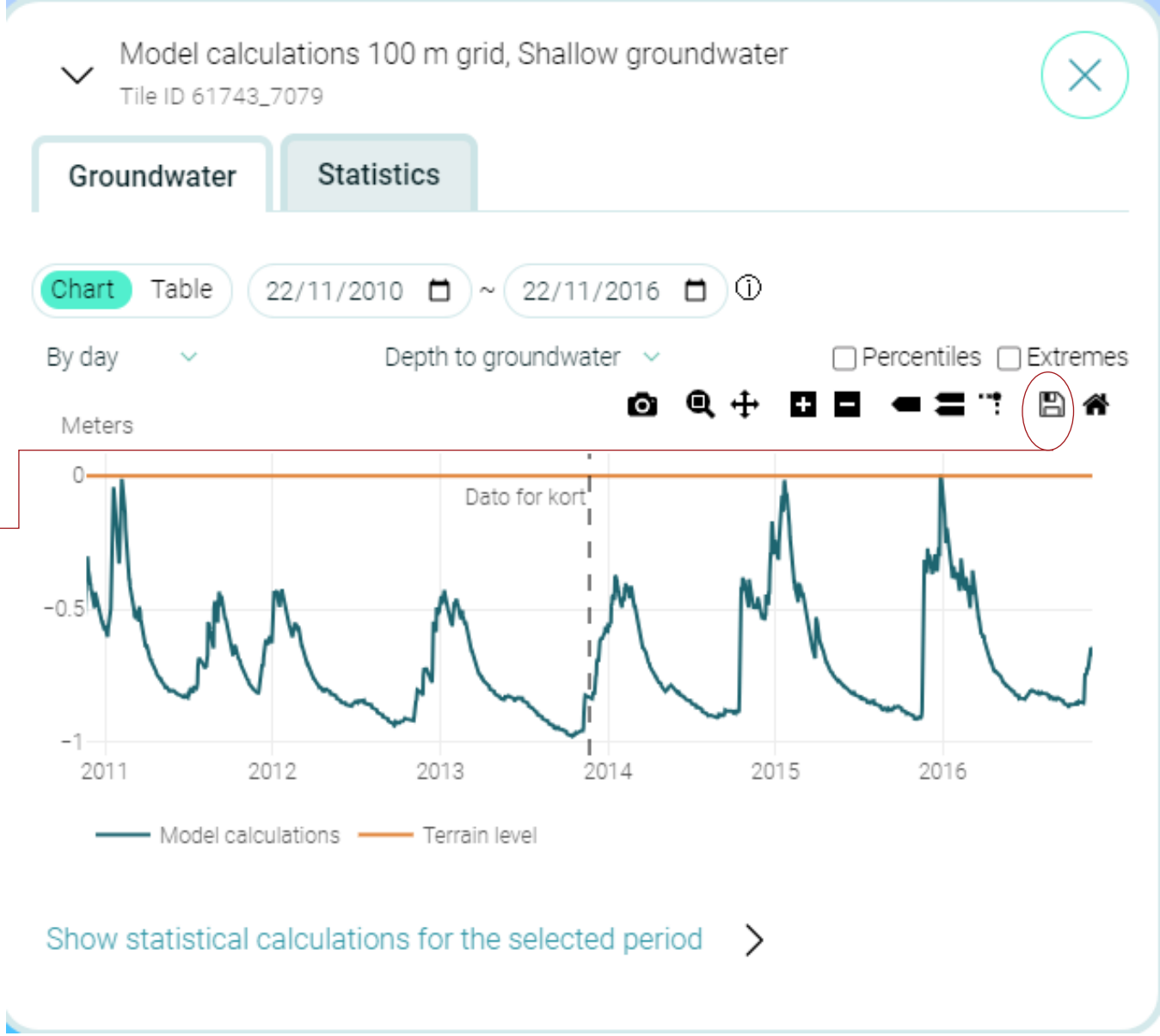
Measurements and model results

With shallow groundwater measurements or model activated, you can click on the map and get a time series.

The time series can be downloaded.

You can also get 5, 25, 75 and 95 percentiles on the graph.

Note tile coordinates above.

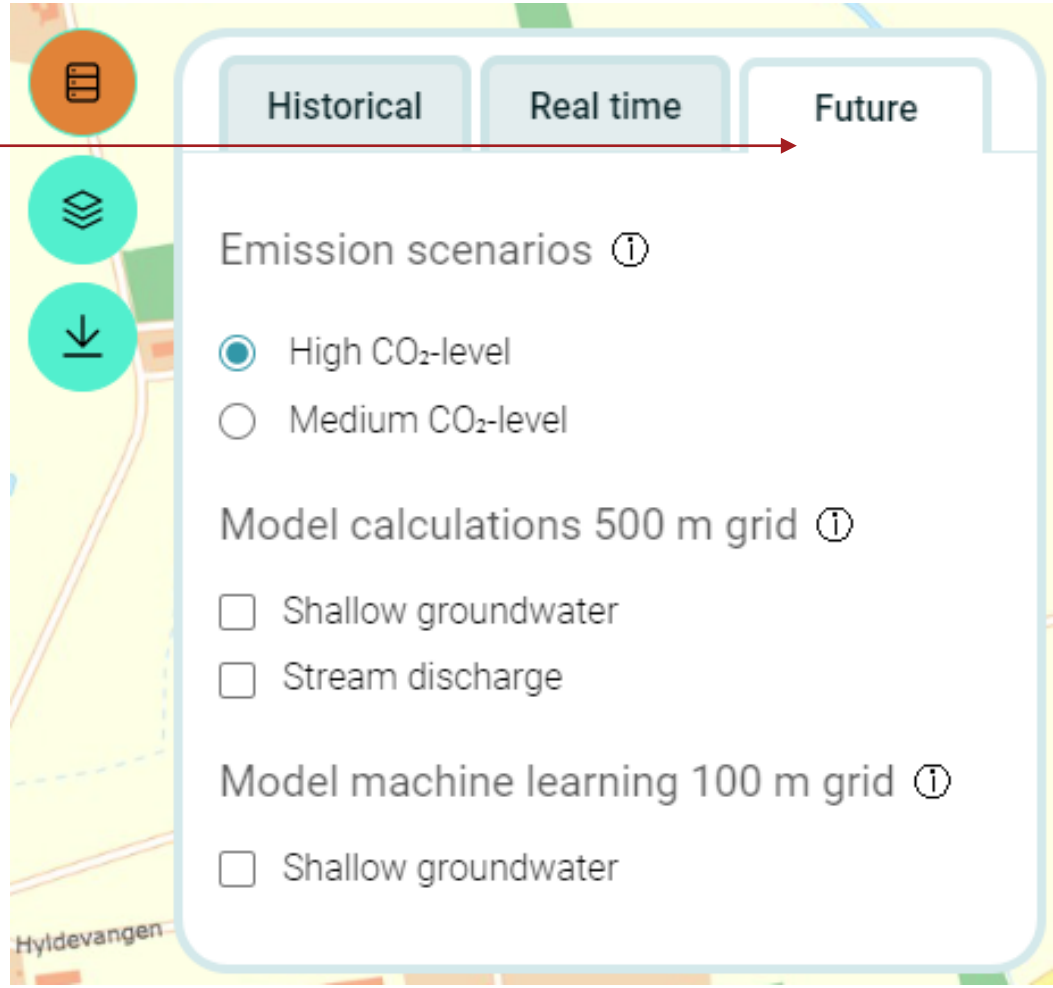


Other options

Presently not much on “real time”. Soon there will be “up to date” values, which could be of interest for some management decisions.

Under “Future, there are results from scenario calculations done in 500 m-grid and model-machine learning estimates for 100 m grids. These may also be interesting for scenario calculations.

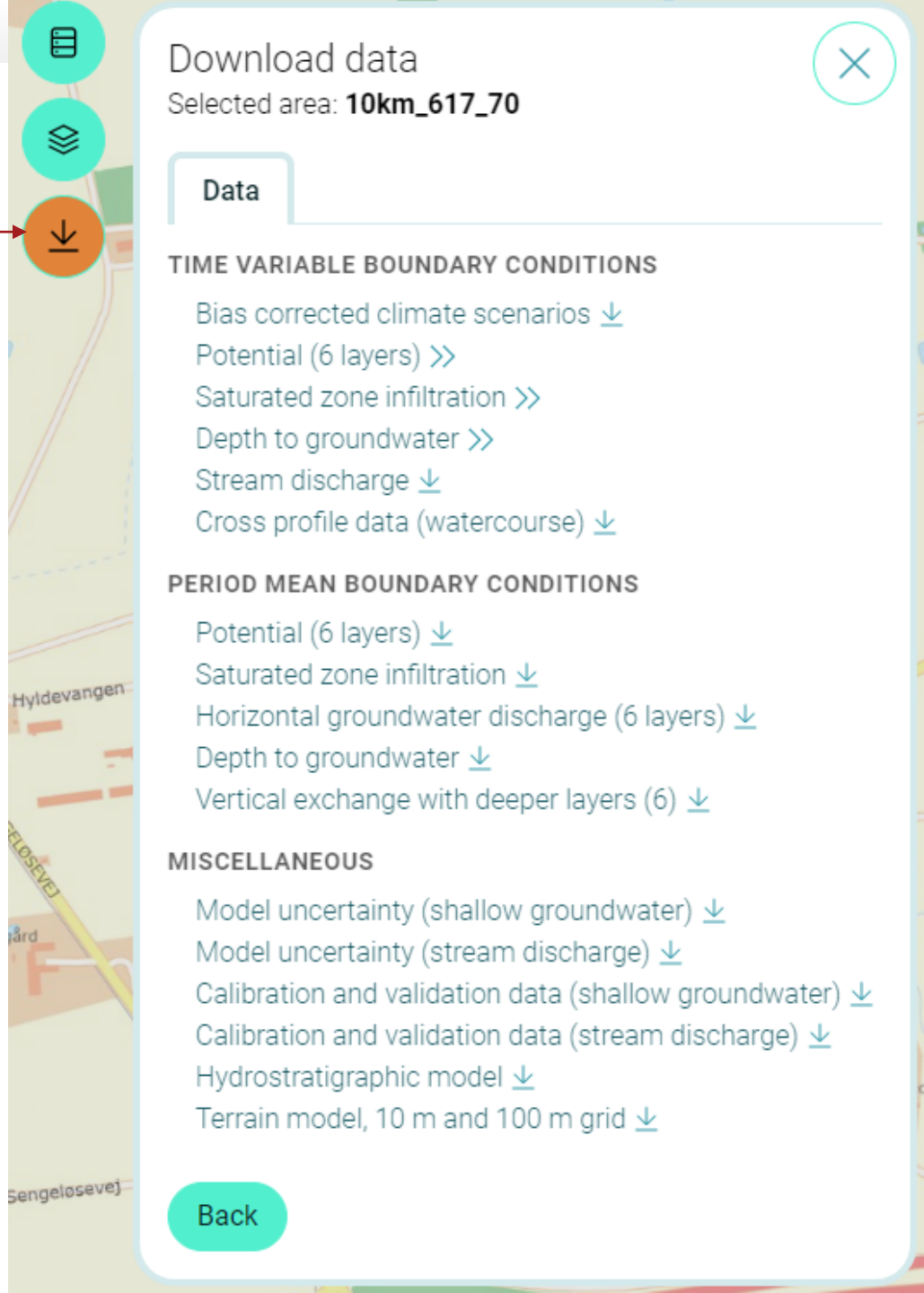
Read documentation on homepage.



Download options

It is possible to download a lot of stuff from HIP for selected grids (10 km^2).

- Time variable boundary conditions,
  - Climate scenarios, potential in different layers, saturated zone infiltration and depth to groundwater, etc.
- Mean conditions
- Micellaneous
  - Uncertainty, calibration and validation data, the layers in the model used and the relevant terrain models.



What can we use in Daisy?

- Potential in different layers in the 100m-model
- The boundaries of different layers in the model
- The terrain model that fits the 100m-grids

=> Aquitard depth and pressure in aquifer?

- Saturated zone infiltration= net percolation
- Depth to groundwater
- In some cases, water level (measured or modelled) can be relevant.
- Climate scenarios (not identical to the ones from DMI).

Example of layers and numbering

Note: difference in numbering of layers in original 0-(no. of layers + 1) and HIP-model (opposite).

Tabel 1. Oversigt over lag og nummerering af disse i NetCDF-filene og i DK-model HIP

DKM2019 lag navn DK1-DK6 (DK7)	DK-model HIP NetCDF lag DK1-DK2	DK-model HIP NetCDF lag DK3	DK-model HIP NetCDF lag DK4-DK6	DK-model HIP NetCDF lag DK7		Example [m]
top2m	10	8	10	6		2
kl1	9	7	9	-		5.75
ks1 (blag1)	8 - glw1	6 - glw1	9 - glw1*	5 - glw1		0.5
kl2	7	5	9	-		0.5
ks2 (blag2)	6 - glw2	4 - glw2	9 - glw1*	4 - glw2		22.6
kl3	5	3	8	-		3.7
ks3 (blag3)	4 - glw3	2 - glw3	7- glw2	3 - glw3		0.5
kl4	3	1	6	-		1.72
ks4 (blag4)	2 - glw4	-	5 - glw3	2 - glw4		0.5
kl5	1	-	4	-		0.5
ks5 - ps1 (bla	-	-	3 - glw4*	1 - glw5		
pl2	-	-	2	-		
ps2 - ps6	-	-	1 - glw5*	-		
kalk (blag6)	0 - glw6	0 - glw6	0 - glw6	0 - glw6		49

From DK1

Topsoil

Aquitard

Where to put those?

Aquifer

Earlier report estimates Ks = 2.42 cm h^{-1} for kl1

Example

```
(defcolumn Taastrup default
  (Soil (MaxRootingDepth 150 [cm])
        (horizons (-25.00 "Taastrup Ap")
                  (-33.00 "Taastrup plow pan"
                  (-120 "Taastrup Bt")
                  (-200 "Taastrup C")))
  (Groundwater aquitard
              (K_aquitard 0.050 [cm/h])
              (Z_aquitard 200 [cm])
              (pressure_table table (file "pressure_table.ddf")))
  (Drain lateral
    (L 18 [m])
    (x 4.5 [m])
    (pipe_position -110.0 [cm])) )
```

Topsoil to 2 m

Numbers from above

2.42 cm h^{-1}

6.75 m

Example of a pressure table file

```
ddf-0.0 --- pressure table with header

---
Year    Month   Day     Level
                        cm
1990    1       1       -150
1990    3       1       -150
1990    7       1       -250
1990    9       1       -250
1991    1       1       -150
1991    3       1       -150
1991    7       1       -250
1991    9       1       -250
1992    1       1       -150
1992    3       1       -150
1992    7       1       -250
1992    9       1       -250
1993    1       1       -150
1993    3       1       -150
1993    7       1       -250
1993    9       1       -250
```

Links from Silas' presentation

You find the tool for extraction with explanation here:

- https://colab.research.google.com/drive/1MyaN1seA2qmhnx9rM_kx2wISJqON667a?usp=sharing

A new Gidhub site is being set up for Daisy, where tools etc. will become available:

- https://github.com/daisy-model