Results documentation

Justus Krantz

Table of contents

[NOTE: prior to running this script, make sure the scripts 4.1, 4.2, 4.3 have been run, to ensure this script refers to the latest results of the metamodel]

1 Model setup

- starting concentrations: a column of saline groundwater at the sea, the rest is fresh
- runtime: 39y of simulation

2 Review of first results

Before using the metamodel to test the state-of-the-art knowledge of the fresh/saline groundwater interface, its accuracy with the original model (OM) needs to be reviewed. The metamodel's output's accuracy can be expressed by examining three major outputs for which the OM is currently used:

1. Hydraulic heads
2. Budgets
3. Groundwater salinity

To review the metamodel's output with the OM, the results of the OM (25m scale) are regridded to the (larger) cell size of 250m using a corresponding regridding technique. These regridded results can then be compared to the metamodel's output, by:

- Plotting cross sections for heads and salinity to investigate their distributions
- Looking at errors of output of metamodel vs original model

Given that the model's domain is larger than the study area, the metamodel's accuracy inside the study domain has the highest priority. Therefore, accuracy of the metamodel can be expressed more specifically for the study domain for all three major outputs.

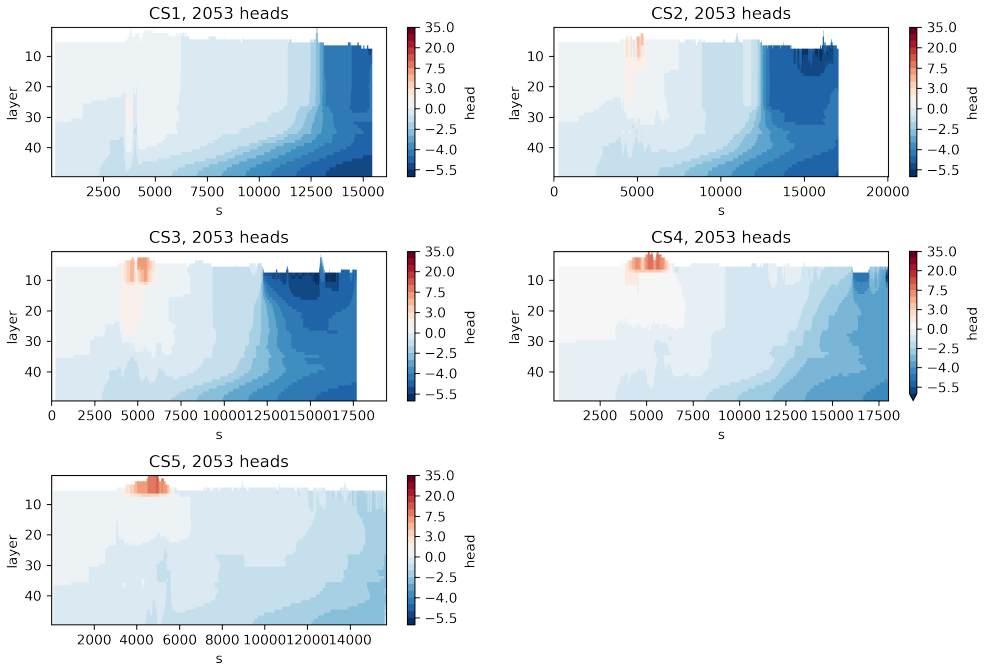
2.0.1 Last changes

The last run was made with different conductivities for the infiltration ponds. The infiltration ponds["cond"] was regridded, resulting in the loss of small flows on 25m scale (horizontal/radial flows) after regriddind. To avoid this, the model budgets/flows as calculated by the 25m model have been regridded to 250m, followed by assigning a conductance to the infiltration pond cells that would result in this budget change..

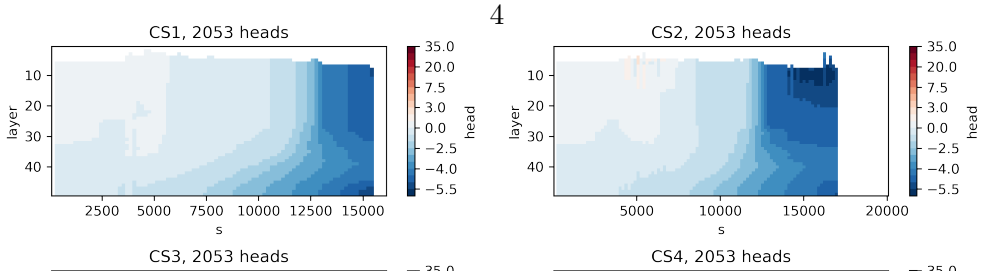
2.1 1. Hydraulic heads

2.1.1 Cross sections of distribution

hydraulic heads cross sections of original model, perpendicular to coastline



hydraulic heads cross sections of metmamodel, perpendicular to coastline



2.1.2 Errors

- Entire domain: 0.029m
- Study area: -0.056m

2.2 Observations

- The model has a lower accuracy in the study area than in the entire domain. It's average error in the study area is about -5.6cm.
- Looking at the cross sections, the main features of the hydraulic head gradient in the OM seem to be represented by the metamodel's output

2.3 2. Budgets

2.3.1 Plots

2.3.2 Errors

- budget river error = 1.80m^3 (entire domain - need for study domain?)
- budget drain error = -2.56m^3 (entire domain - need for study domain?)
- budget wel error = -1.58e-10 m^3

2.3.3 Observations

- The budget errors are half the size of those from the previous results.
- Plots: The shape of the coastline can still be seen in the plots for drn and riv errors

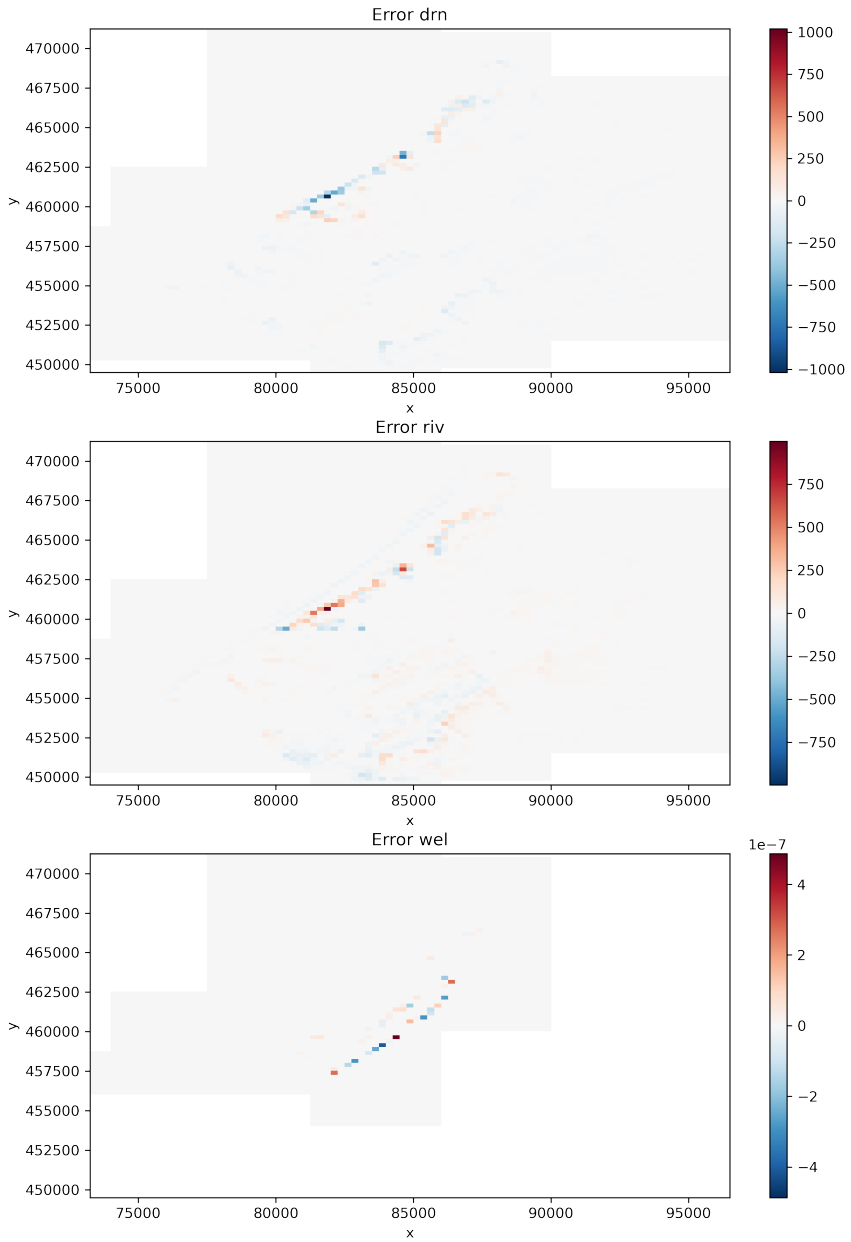
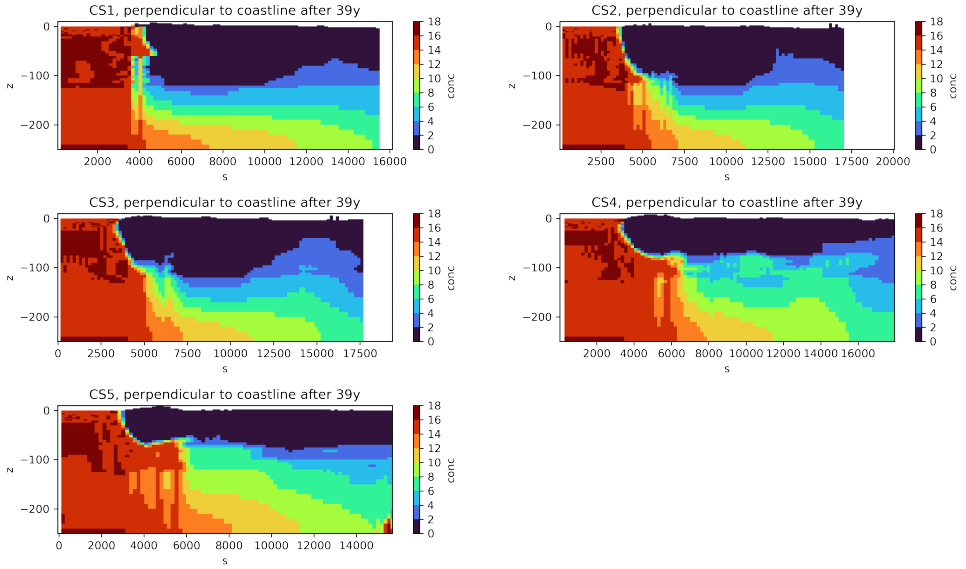


Figure 1: Budget errors

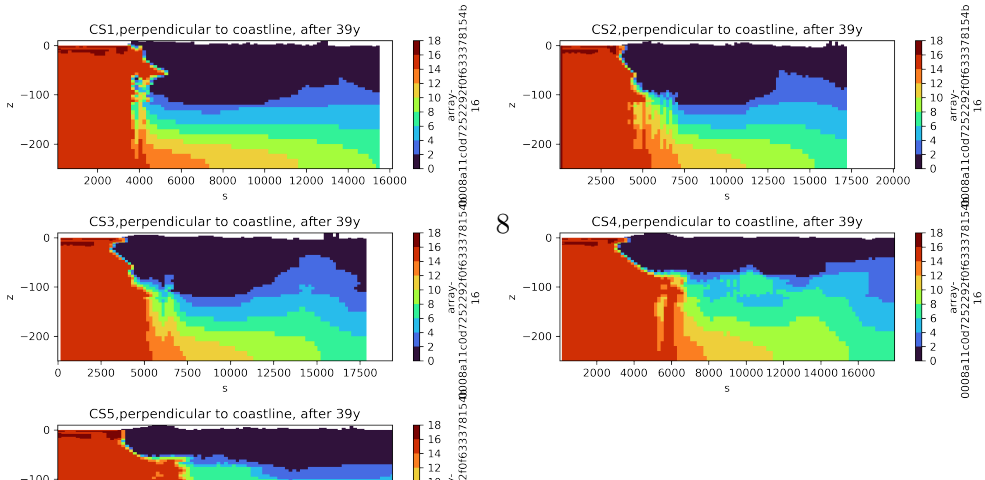
2.4 3. Groundwater salinity

2.4.1 Cross sections [Cl]

Groundwater salinity [Cl-] of metamodel



Groundwater salinity [Cl-] of original model



2.4.2 Depth of fresh-saline interface

2.4.3 Errors

Deph of fresh saline interface:

- Entire domain: 1.73 m
- Study area: -7.09 m

Groundwater salinity [Cl]:

- Entire domain: -0.08 [g/l]
- Study area: -0.48 [g/l]

2.4.4 Observations

- Cross sections: The main features are represented by the output of the metamodel. The intrusion of salt water is represented in the metamodel, the shape of the freshwater is also reproduced by the metamodel.
- Depth interface plots: near the coastline in the study area, it can be seen that the depth of the fresh-saline interface is deeper in the metamodel than in the OM
- Errors: in an absolute sense, the error inside the study area has been lowered. This has gone at the cost of accuracy outside of the study area

3 Interpretation

- Previous results showed a higer head inside the study domain. This was linked to the depth of the fresh-saline interface, which was deeper, presumed as a result of excess infiltration.
- Currently, the heads calculated by the metamodel inside the study area are about 6cm lower than the OM and the error of depth of the fresh-saline interface changed from (1.38m entire domain, -8.95m SA) to (1.73m entire domain, -7.09m SA). There may be other factors affecting the excess saline intrusion to investigate.
- The budget errors seem to be half that of the previous results. There is now less infiltration in the study area (river budgets) than before
- Overall, the increased accuracy in the study area seems to have gone at the cost of accuracy elsewhere in the model domain.
-

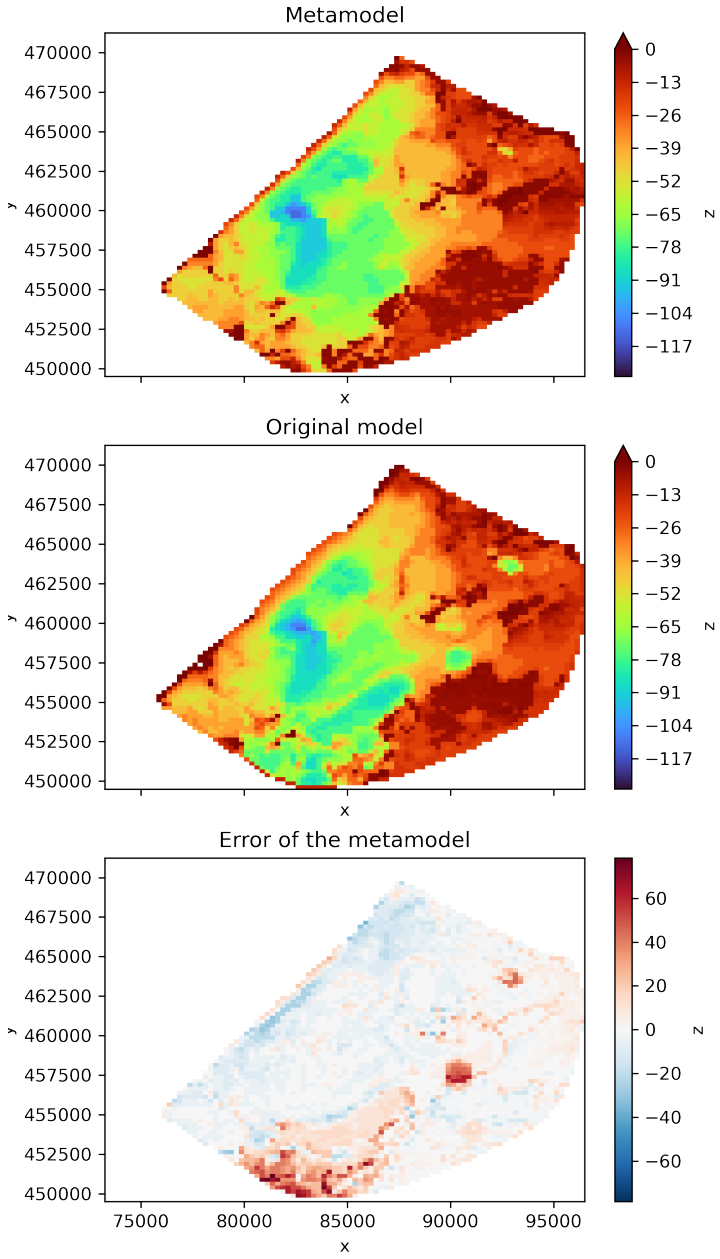


Figure 2: Depth of fresh-saline interface