



Ribasim gelumpt oppervlaktewater

Huite Bootsma

18 januari 2024

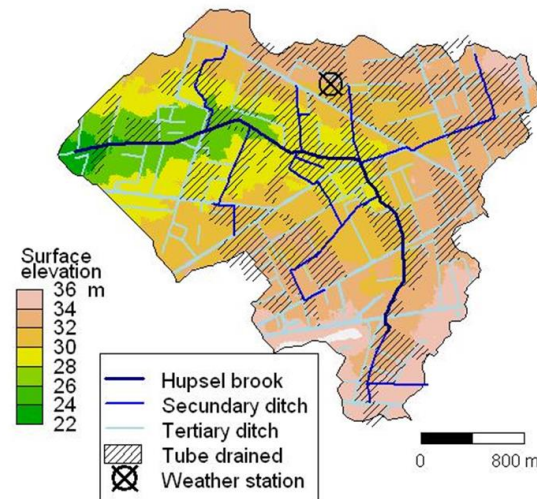
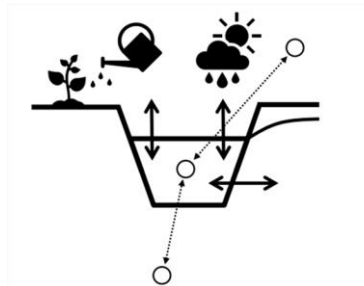
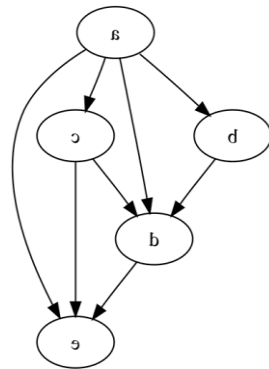


RIBASIM

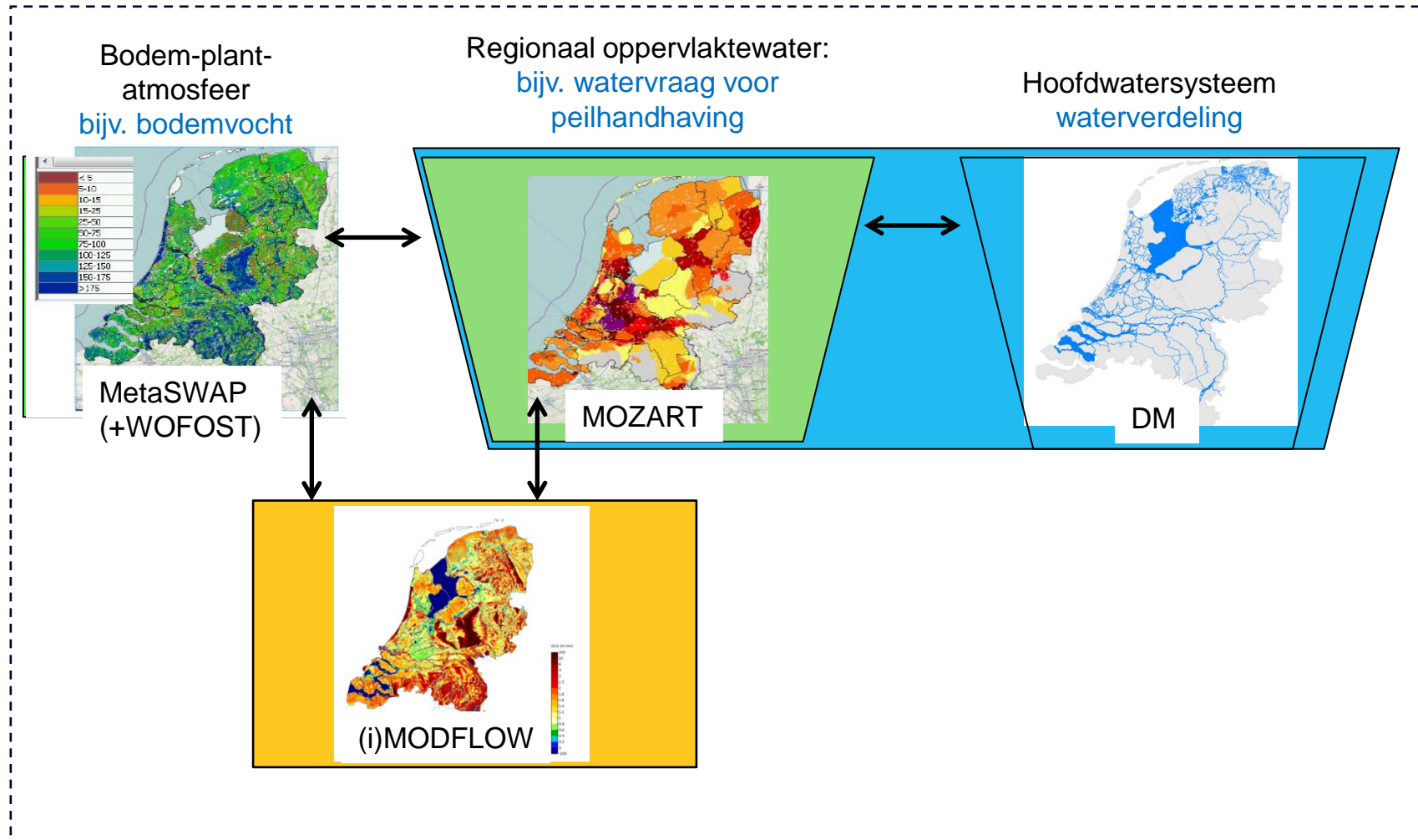
github.com/Deltares/Ribasim

Ribasim – River basin planning and management

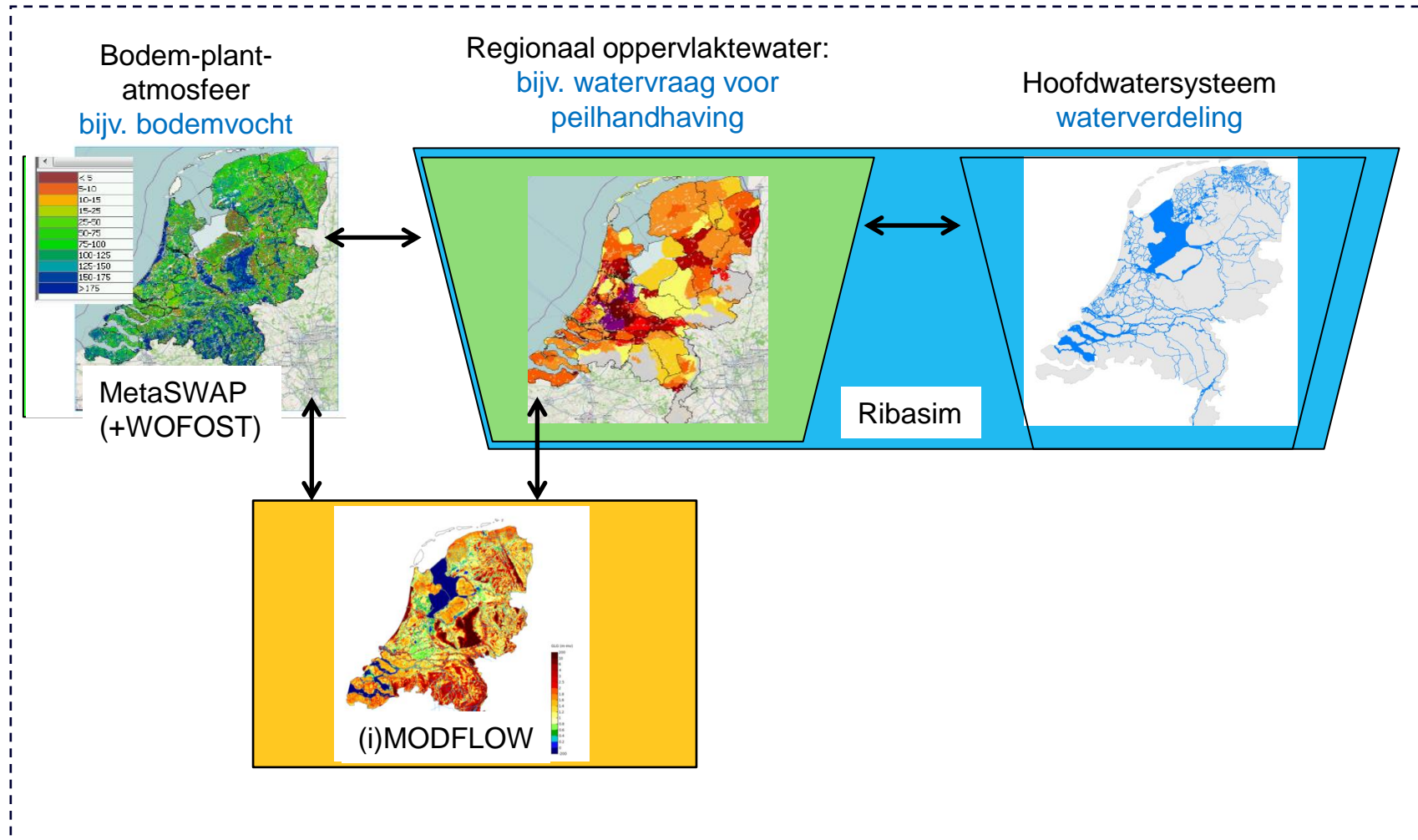
- Simuleert de stroming van oppervlaktewater (in- en uitstroom,
- Simuleert de watervraag en -toewijzing in een oppervlaktewater netwerk op basis van prioriteiten
- Typisch in combinatie met grondwater model toe te passen
- Vervanger van MOZART, DM (LHM) & SIMRES (regionaal)
- Nieuwe versie in ontwikkeling (Julia) in TKI-project, in zomer 2024 1^e versie verwacht
- Open-source, vrij te downloaden en gebruiken: <https://github.com/Deltares/Ribasim>



Huidige deelmodellen LHM

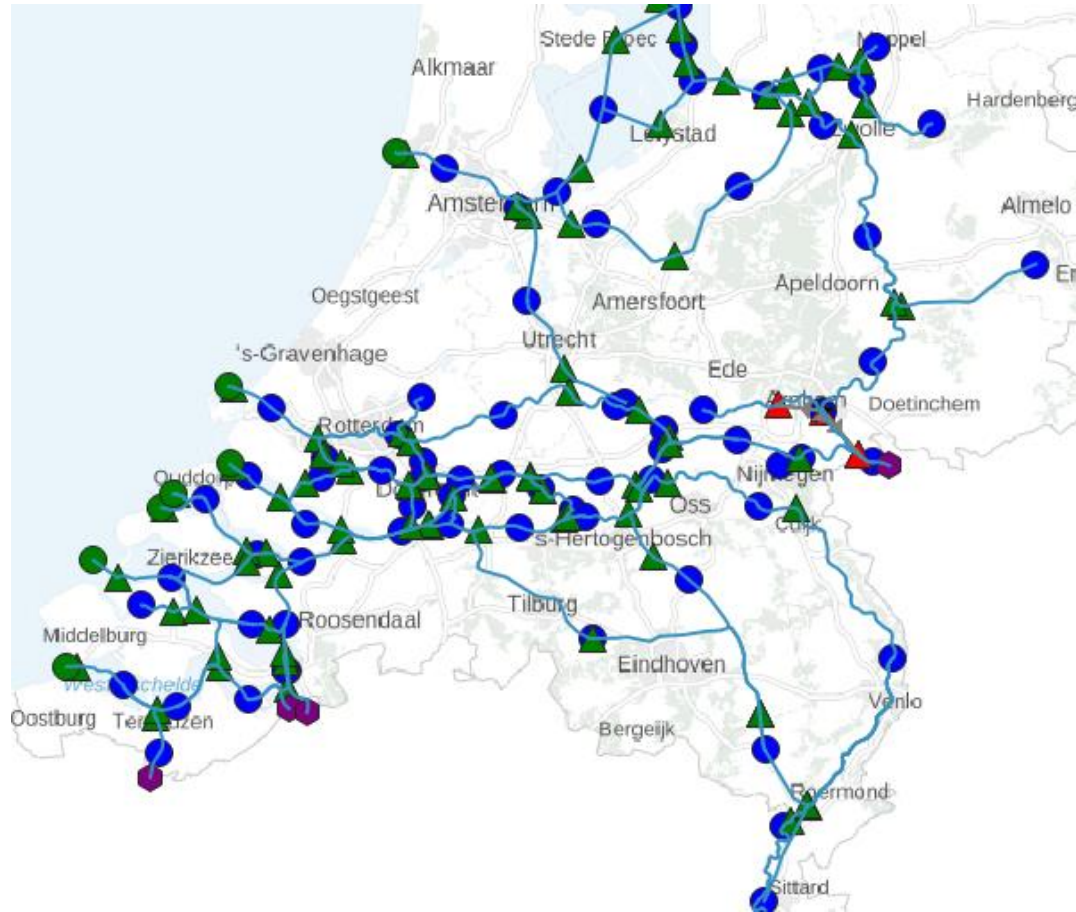


Ribasim in deelmodellen LHM



Bakjes, groot en klein

Keuze modelleur: waterlopen volgen of lumpen



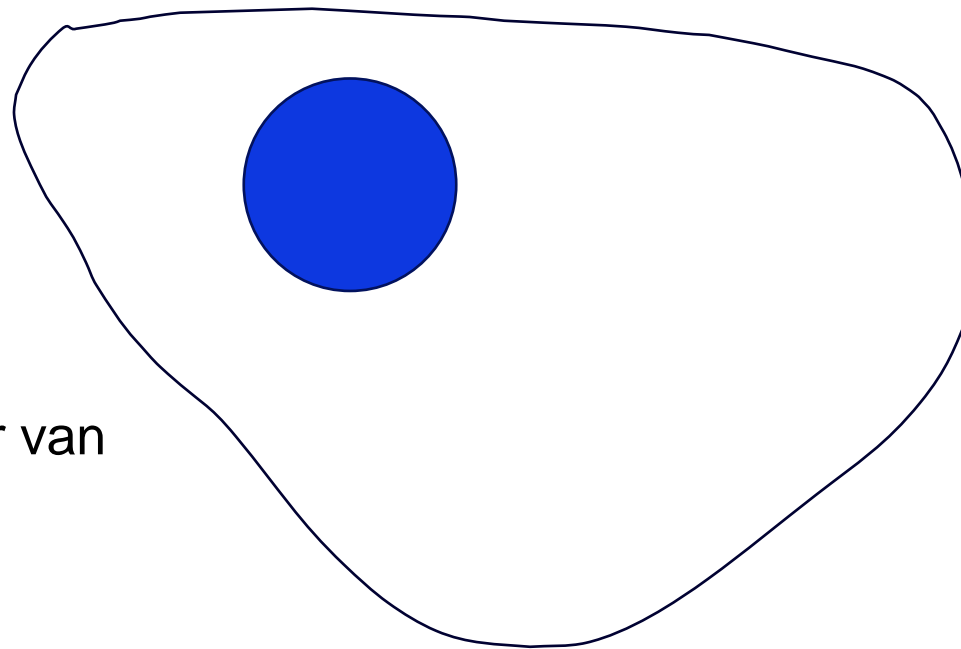
Bakje: bovenaanzicht

Detailniveau afhankelijk van de toepassing

Kan zijn:

- Peilgebied
- KRW waterlichaam
- Meer
- Rivier segment
- Scheiden doorlopend water van haarvaten
- ...

Oppervlakte A (m²)

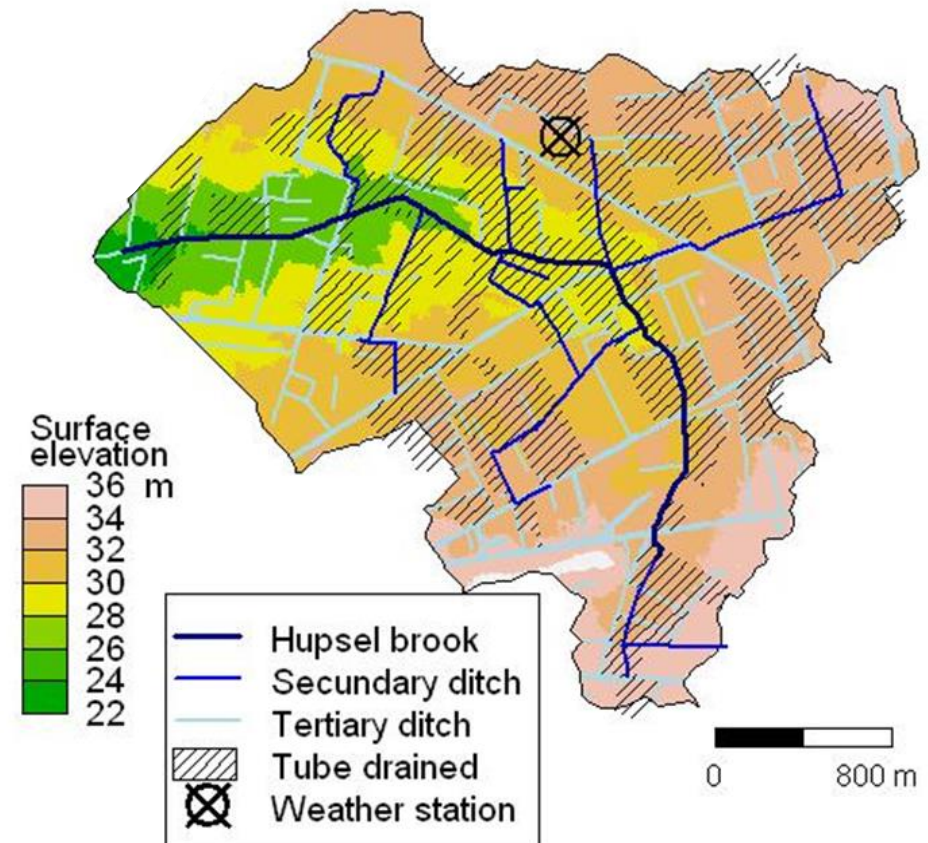


Bakje: bovenaanzicht

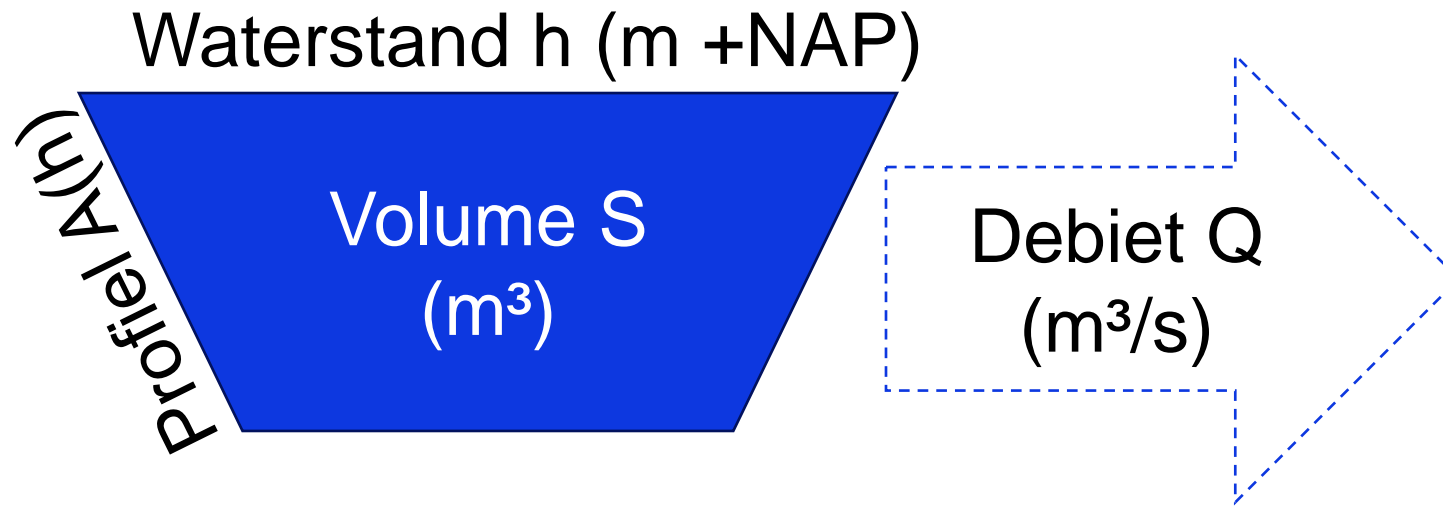
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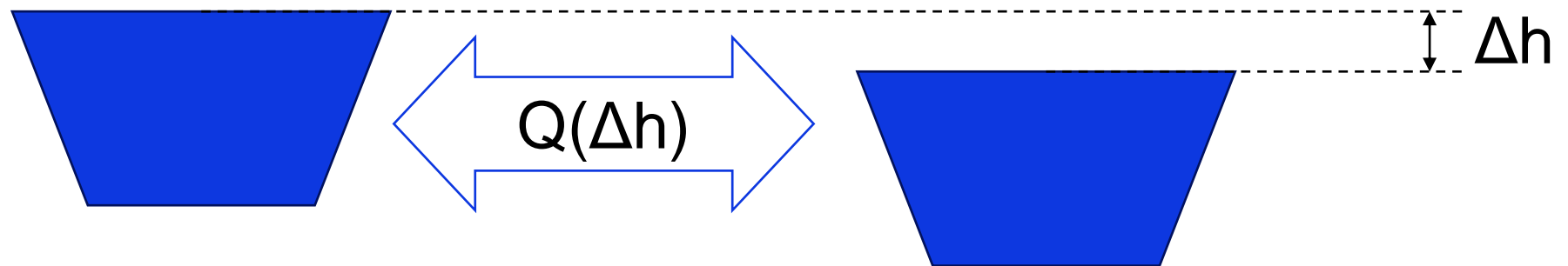


Bakje, zijaanzicht



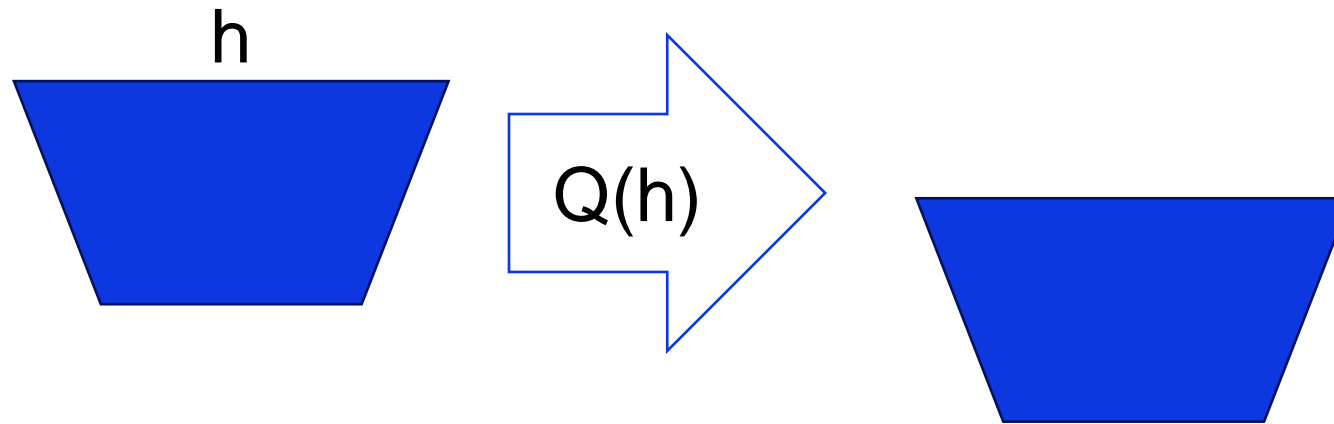
Bakjes, zijaanzicht

Peilgestuurd: Manning weerstand



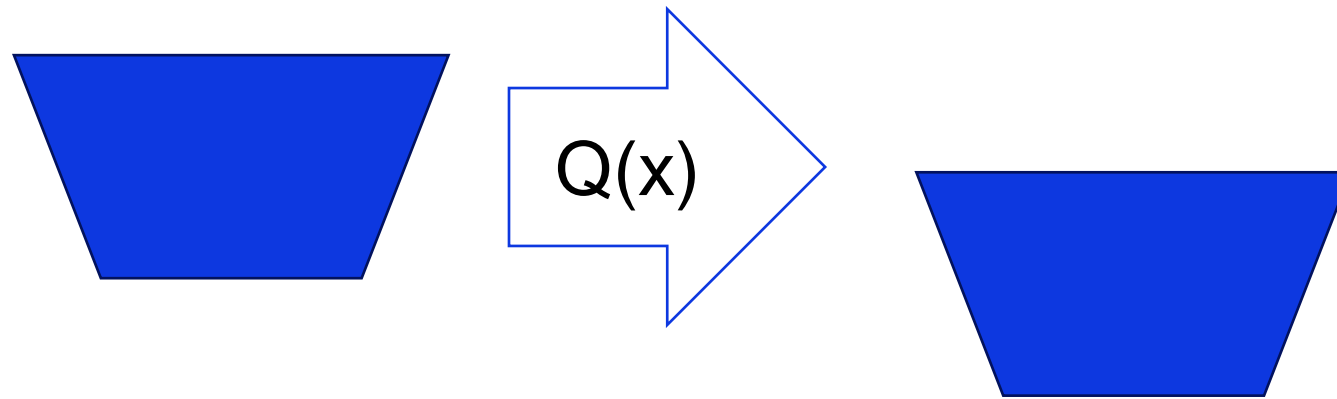
Bakjes, zijaanzicht

Vrij afwaterend: Stuw / $Q(h)$ relatie



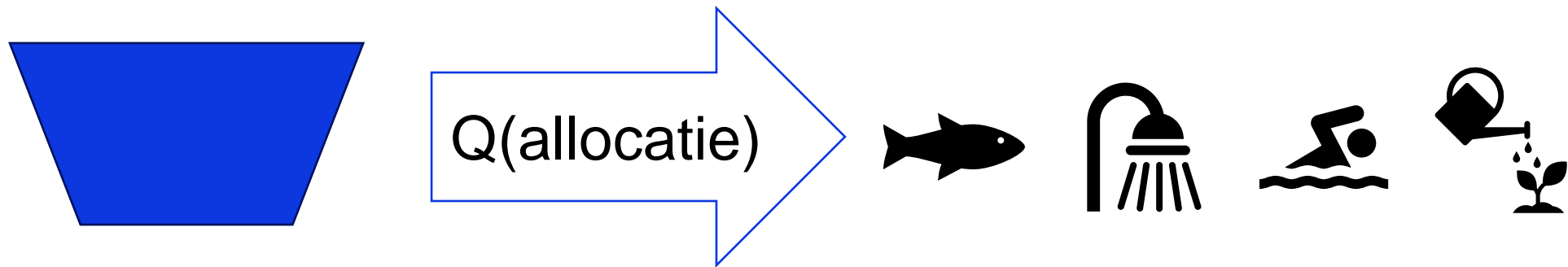
Bakjes, zijaanzicht

Gemalen kunnen automatisch worden aangestuurd

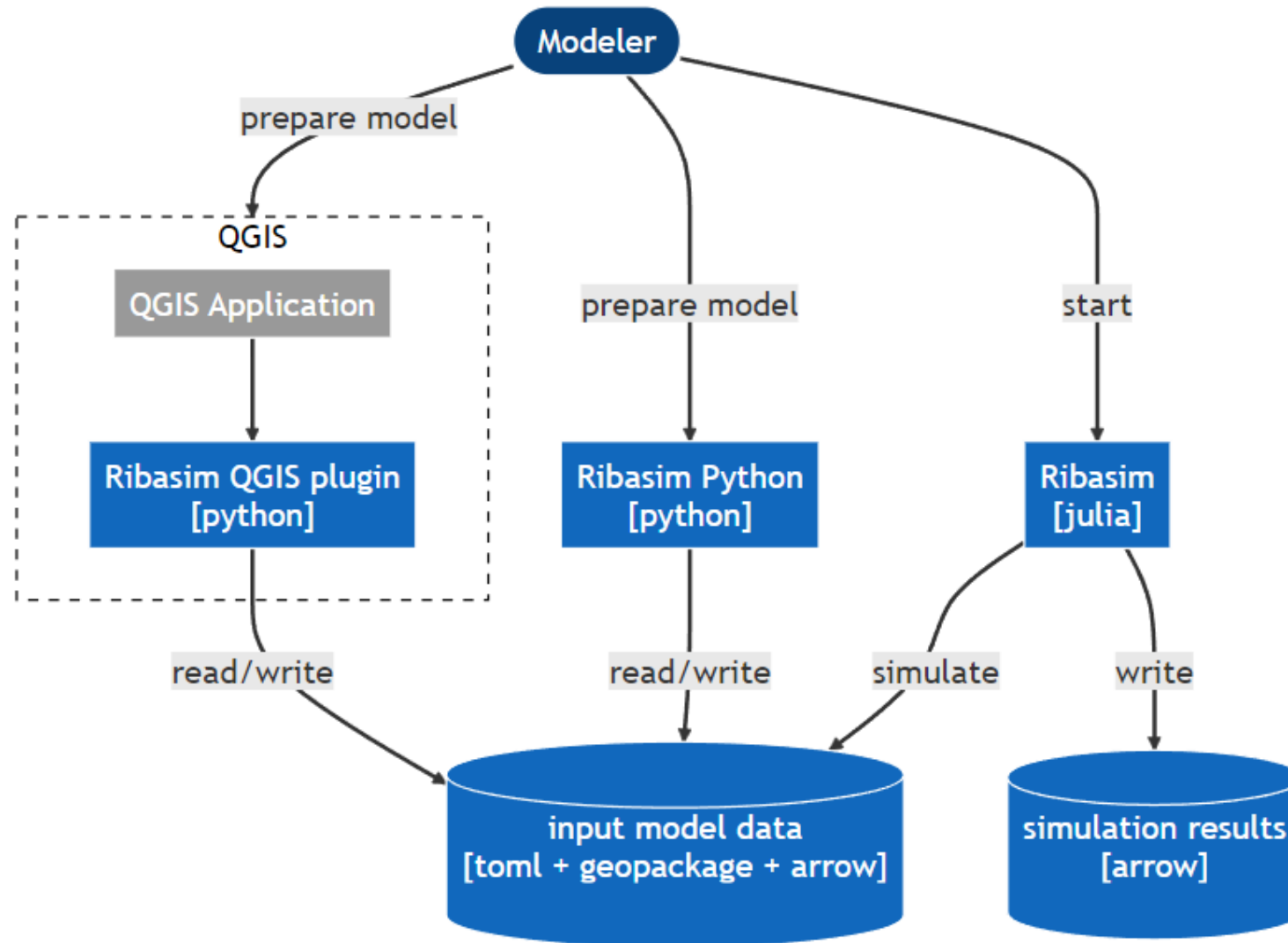


Bakjes, zijaanzicht

Watergebruikers volgen verdingingsreeks

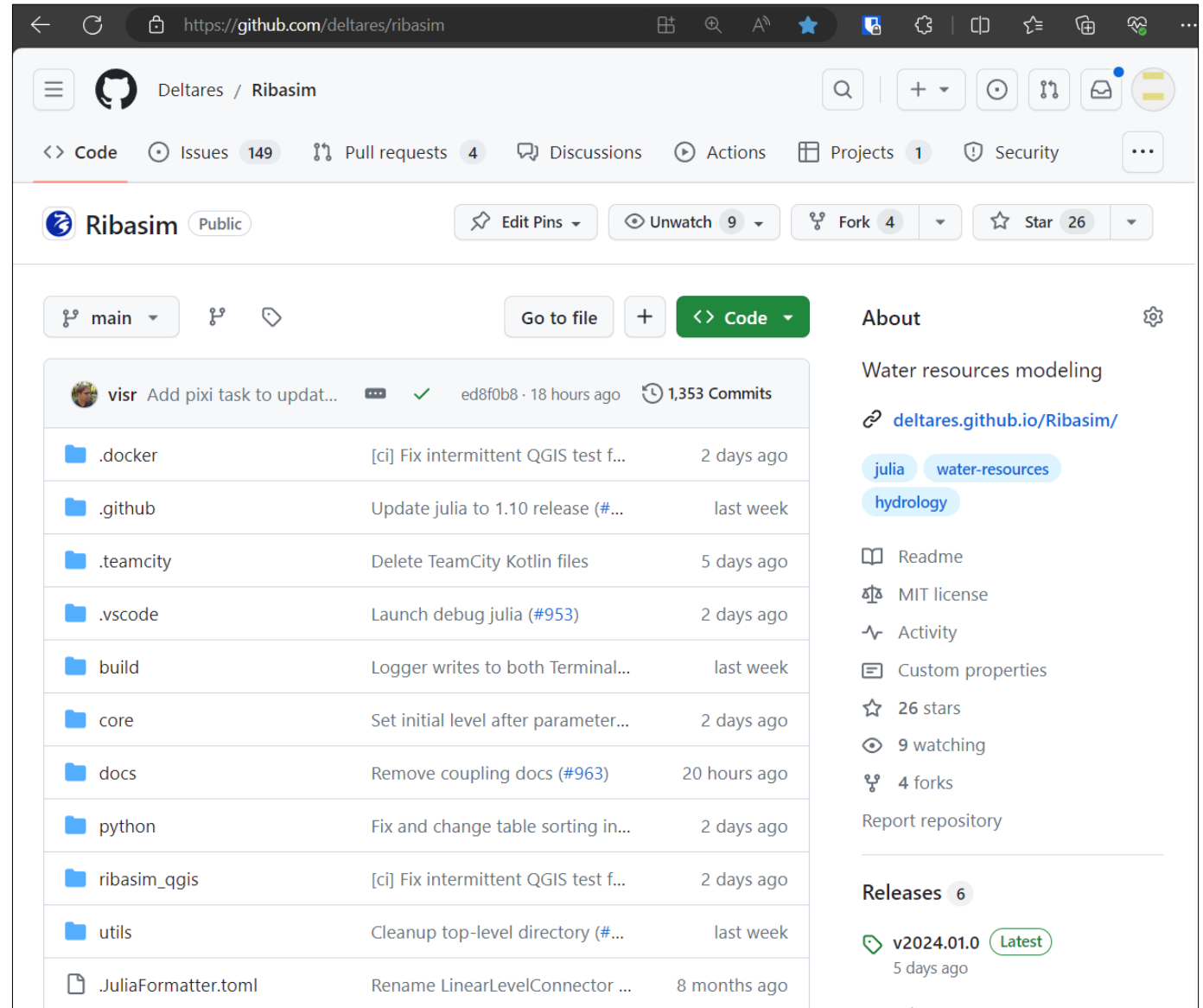


Ribasim systeem overzicht



Ontwikkelingsproces

Code openlijk beschikbaar op:
github.com/deltares/ribasim



https://github.com/deltares/ribasim

Deltares / Ribasim

<> Code Issues 149 Pull requests 4 Discussions Actions Projects 1 Security

Ribasim Public Edit Pins Unwatch 9 Fork 4 Star 26

main Go to file + Code

visr Add pixi task to updat... ed8f0b8 · 18 hours ago 1,353 Commits

.docker	[ci] Fix intermittent QGIS test f...	2 days ago
.github	Update julia to 1.10 release (#...	last week
.teamcity	Delete TeamCity Kotlin files	5 days ago
.vscode	Launch debug julia (#953)	2 days ago
build	Logger writes to both Terminal...	last week
core	Set initial level after parameter...	2 days ago
docs	Remove coupling docs (#963)	20 hours ago
python	Fix and change table sorting in...	2 days ago
ribasim_qgis	[ci] Fix intermittent QGIS test f...	2 days ago
utils	Cleanup top-level directory (#...	last week
.JuliaFormatter.toml	Rename LinearLevelConnector ...	8 months ago

About

Water resources modeling

deltares.github.io/Ribasim/

julia water-resources hydrology

Readme MIT license Activity Custom properties 26 stars 9 watching 4 forks Report repository

Releases 6

v2024.01.0 Latest 5 days ago

Ontwikkelingsproces

Code openlijk beschikbaar op:
github.com/deltares/ribasim

Voor elke aanpassing draait
automatisch de test-suite

Commits

main

All users All time

Commits on Jan 16, 2024

- Add pixi task to update registry (#962)** Verified ed8f0b8
- visr committed 18 hours ago · ✓ 25 / 25
- Remove coupling docs (#963)** Verified 94ef9ad
- Hofer-Julian committed 20 hours ago · ✓ 18 / 18
- Docs additions for output, logging, and metadata (#961)** Verified 0102b02
- Huite committed yesterday · ✗ 17 / 18

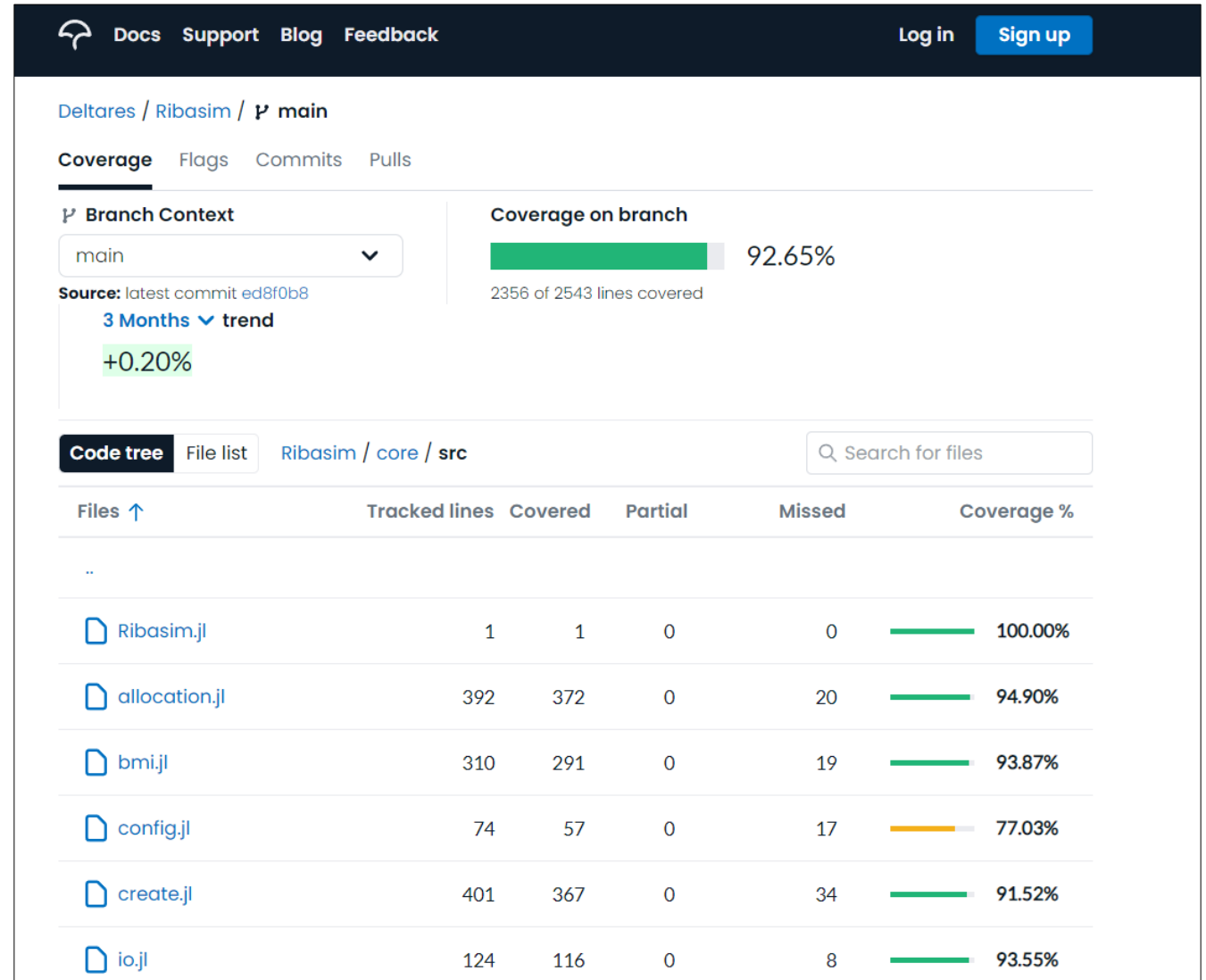
Commits on Jan 15, 2024

- Pixi: use latest QGIS release (#958)** Verified b09373c
- visr committed 2 days ago · ✗ 24 / 25
- Fix and change table sorting in Python (#903)** Verified ed802dc
- visr committed 2 days ago · ✓ 18 / 18
- Reflect current release process in docs (#948)** Verified ebd2f65
- Hofer-Julian committed 2 days ago · ✗ 14 / 18
- Set initial level after parameter creation (#955)** Verified d6fb637
- Huite committed 2 days ago · ✗ 17 / 18

Ontwikkelingsproces

Code openlijk beschikbaar op:
github.com/deltares/ribasim

Voor elke aanpassing draait
automatisch de test-suite
(inclusief dekkingsrapportage)



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Code openlijk beschikbaar op:
github.com/deltares/ribasim

Voor elke aanpassing draait
automatisch de test-suite
(inclusief dekkingsrapportage)

Openbare issue-tracking en
discussie

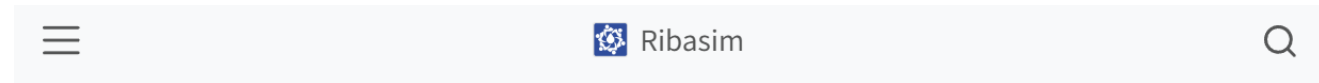
The screenshot shows the GitHub Discussions interface for the repository 'Deltares / Ribasim'. The top navigation bar includes 'Code', 'Issues 149', 'Pull requests 4', 'Discussions', 'Actions', and 'Projects 1'. Below the navigation, there are filters for 'Sort by: Latest activity', 'Label', and 'Filter: Open', along with a 'New discussion' button. A search bar contains the text 'is:open'. The main content area is divided into 'Categories' and 'Discussions'. The 'Categories' section includes 'View all discussions', 'Announcements', 'General', 'Ideas', 'Polls', 'Q&A', and 'Show and tell'. The 'Discussions' section lists several discussions, each with a title, author, date, and status (e.g., 'Answered').

Discussion Title	Author	Date	Status
Visualize basin time variables	jc-hunink	Dec 12, 2023	Answered
time-dependent PidControl	harm-nomden-sweco	Nov 7, 2023	General
issue met control node?	JvanHouwelingen	Aug 8, 2023	Answered
Tijdreeksen opvragen met iMOD plugin geeft error	SiebeBosch	Aug 17, 2023	Answered
Stuw niet gebruiken als benedenstroomse waterstand te hoog is	tessa-andringa-sweco	Aug 15, 2023	Answered

Ontwikkelingsproces

Documentatie online beschikbaar:

<https://deltares.github.io/Ribasim/>



Equations

Equations

Ribasim currently simulates the following “natural” water balance terms:

1. Precipitation
2. Evaporation
3. Infiltration
4. Drainage
5. Urban runoff
6. Upstream and downstream flow

Additionally, Ribasim simulates the following “allocated” water balance terms:

1. General user
2. Flushing

Depending on the type of boundary conditions, Ribasim requires relation between storage volume and wetted area A , and between the storage volume and the water level h . These are (currently) represented by piecewise linear relationships.

1 Formal model description

In this section we give a formal description of the problem that is solved by Ribasim. The problem is of the form

$$\frac{d\mathbf{u}}{dt} = f(\mathbf{u}, p(t), t), \quad t \in [t_0, t_{\text{end}}], \quad (1)$$

On this page

- 1 [Formal model description](#)
 - 1.1 [The Jacobian](#)
 - 2 [Natural water balance terms](#)
 - 3 [User allocation](#)
 - 4 [PID controller](#)
 - 5 [Numerical solution](#)
 - 6 [Performance](#)

Ontwikkelingsproces

Documentatie online beschikbaar:

<https://deltares.github.io/Ribasim/>

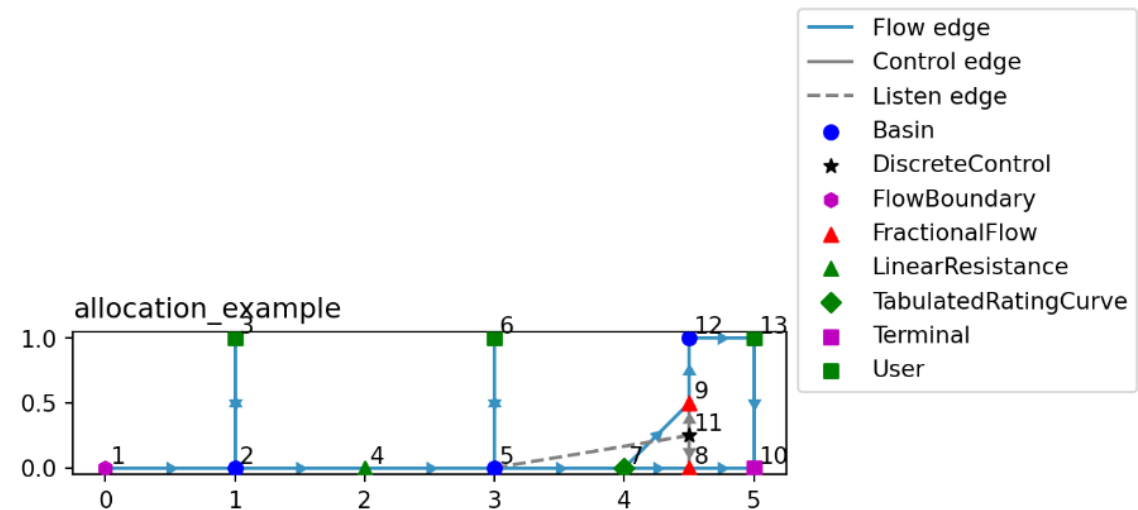
Inclusief simpele voorbeeld- & test-modellen

Test models

Ribasim developers use the following models in its testbench and in order to test new features.

► Code

Generate a model that is used as an example of allocation in the docs.



Ontwikkelingsproces

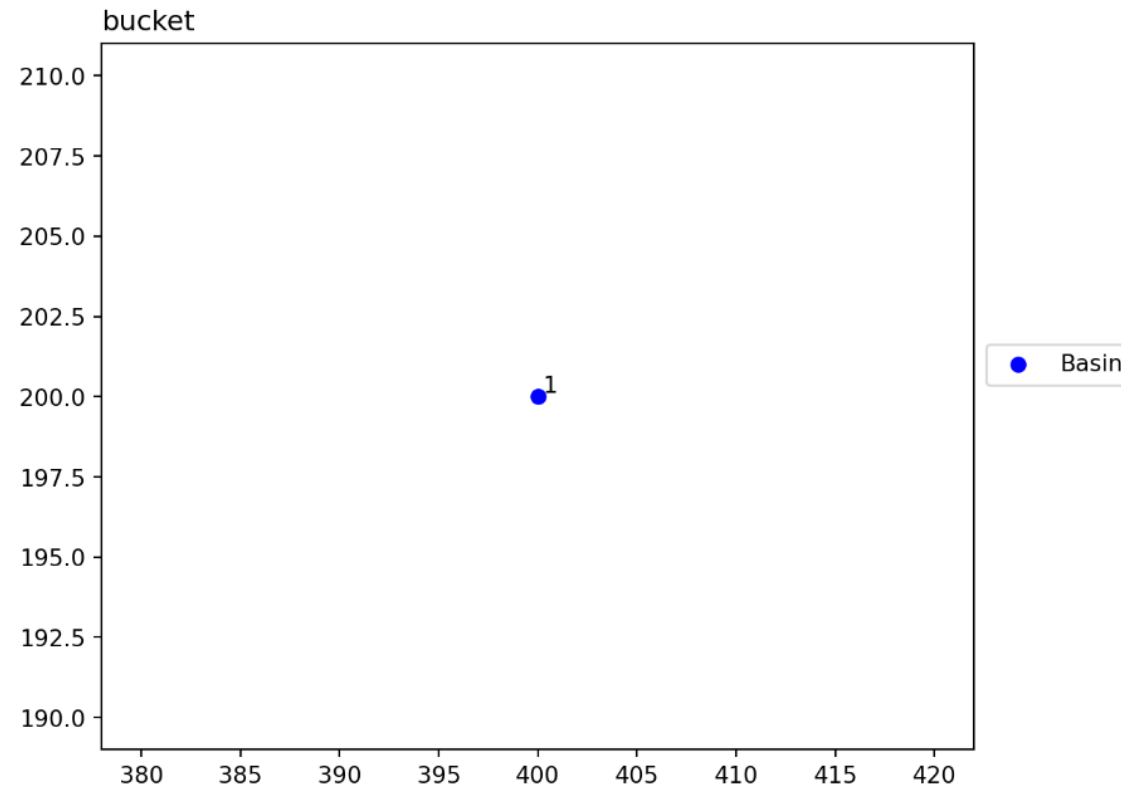
Documentatie online beschikbaar:

<https://deltares.github.io/Ribasim/>

Inclusief simpele voorbeeld & test-modellen

(soms heel simpel...!)

Bucket model with just a single basin.



Software ontwikkeling: samenwerking TKI

De software wordt getoetst op basis van pilot cases:

- Vrij afwaterend
- Peilgestuurd
- Landelijk netwerk (nadruk op verdelingsaspecten)
- Koppeling met MODFLOW

Dat levert inzicht en ideeën over:

- Ontbrekende concepten
- Gebruiksgemak
- Hoe te schematiseren?

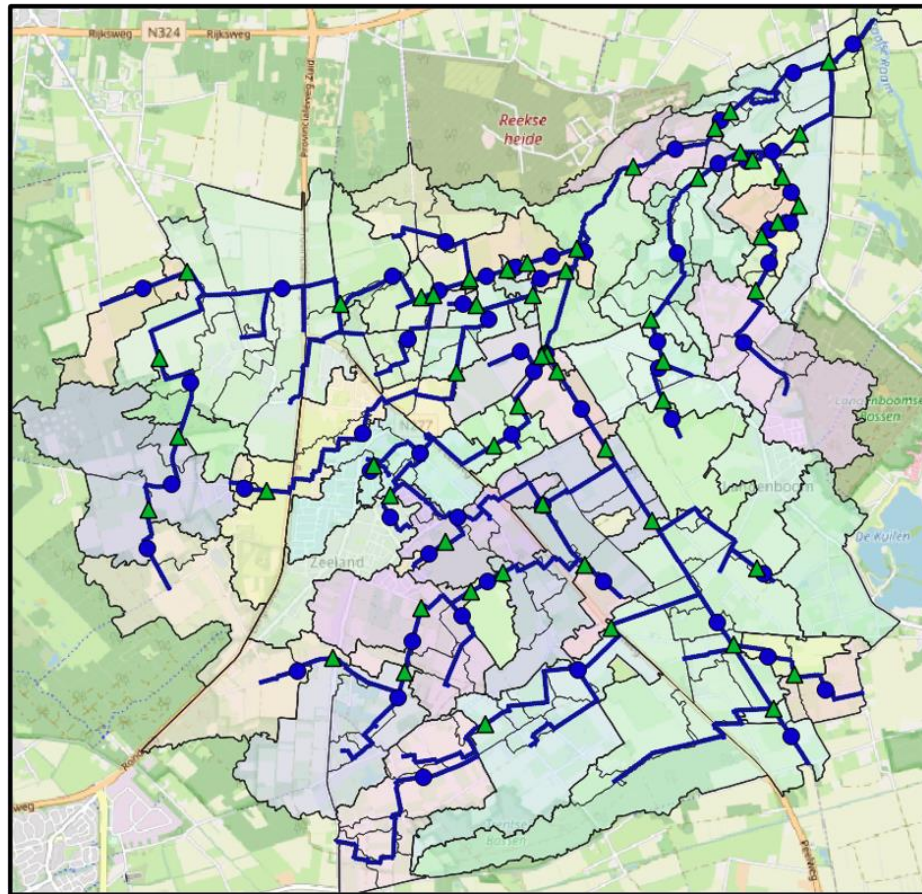
Loopt door t/m Q1 2024

Deltares

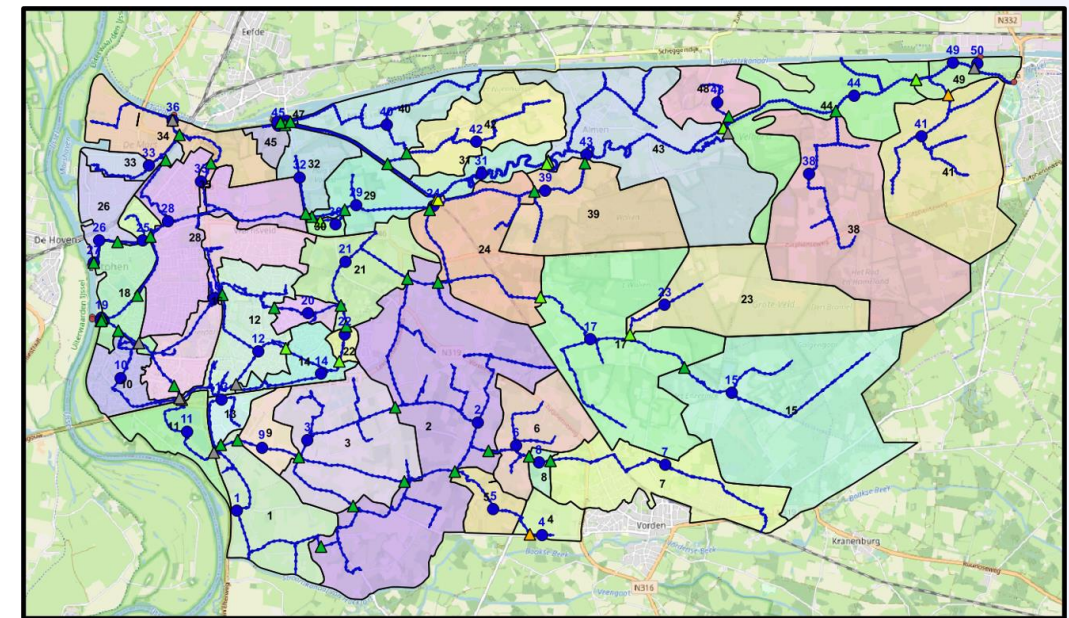


Samenwerking TKI

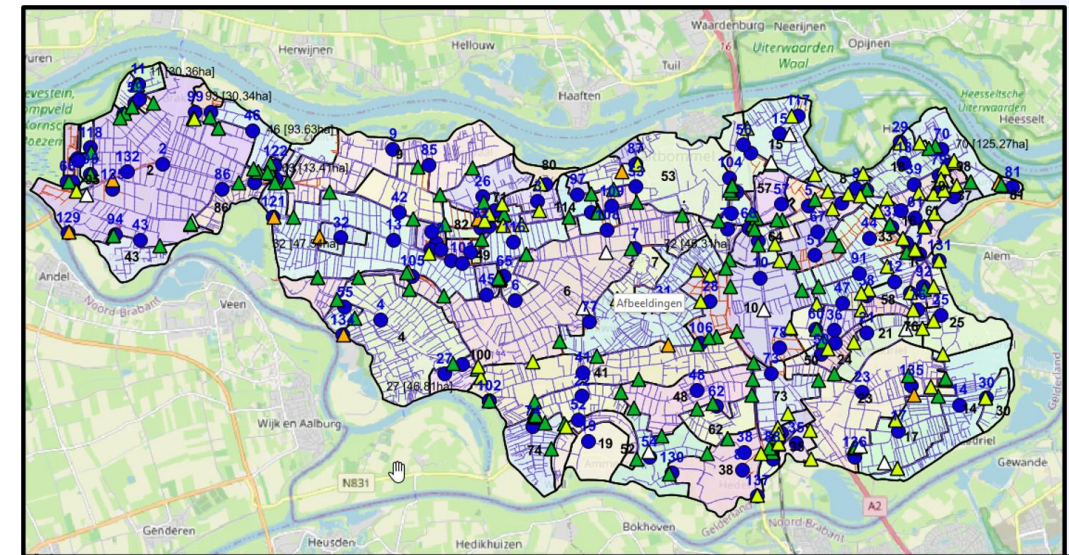
Hoe te lumpen?



Hooge Raam



Zutphen



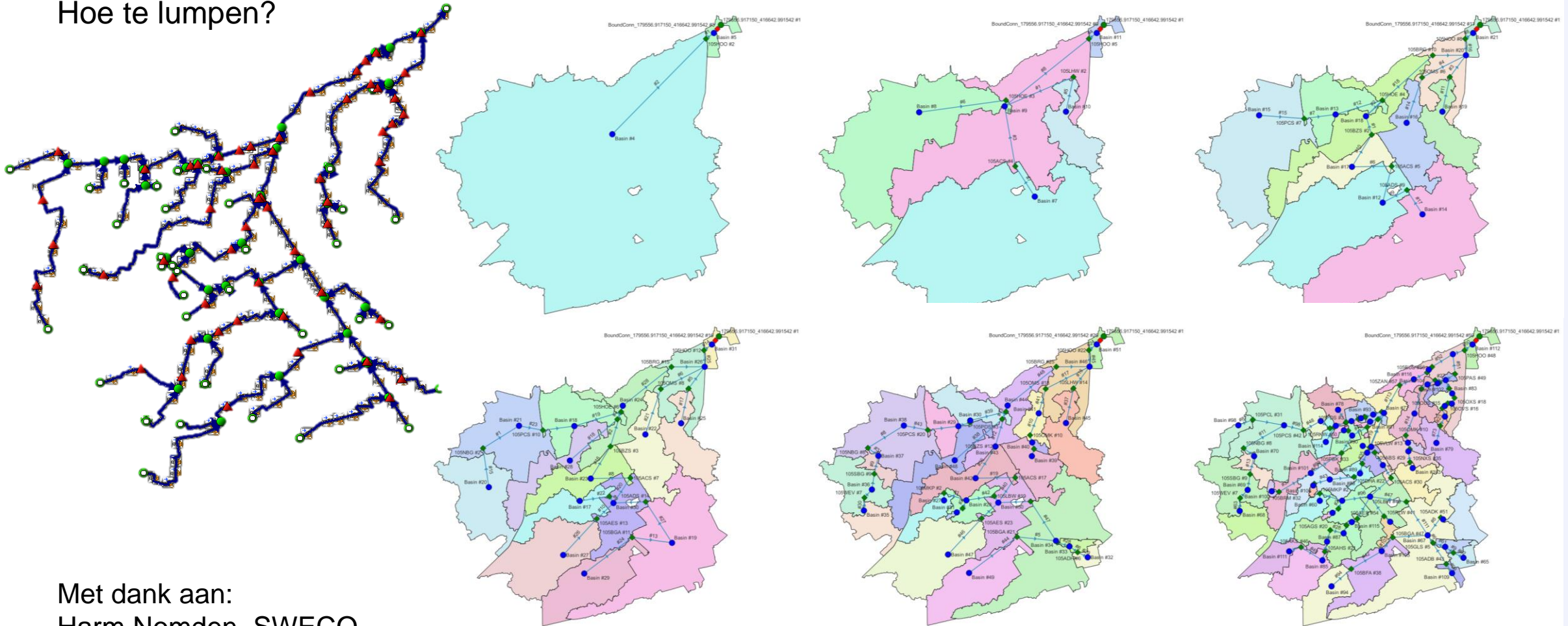
Bommelerwaard

Met dank aan:
SWECO

Deltares

Samenwerking TKI

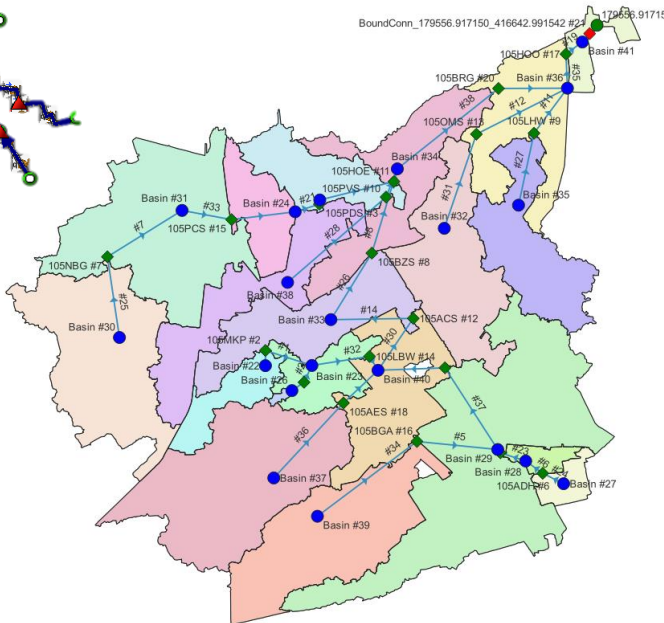
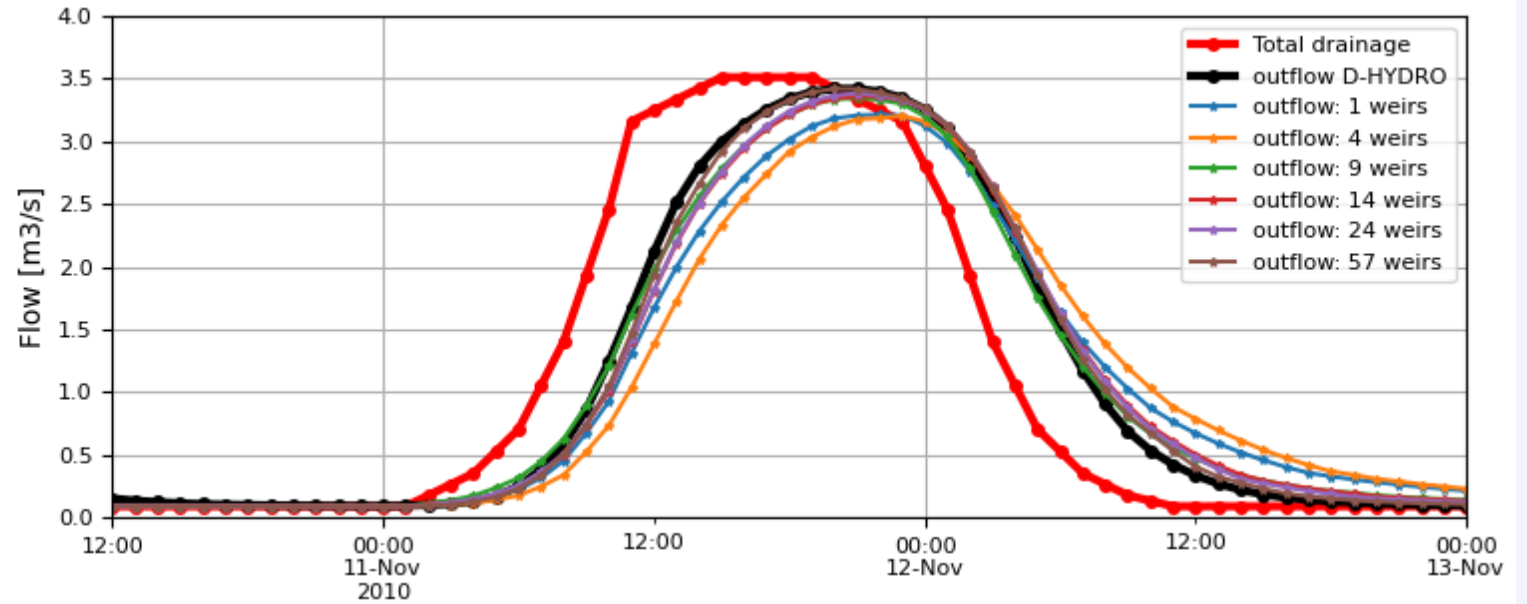
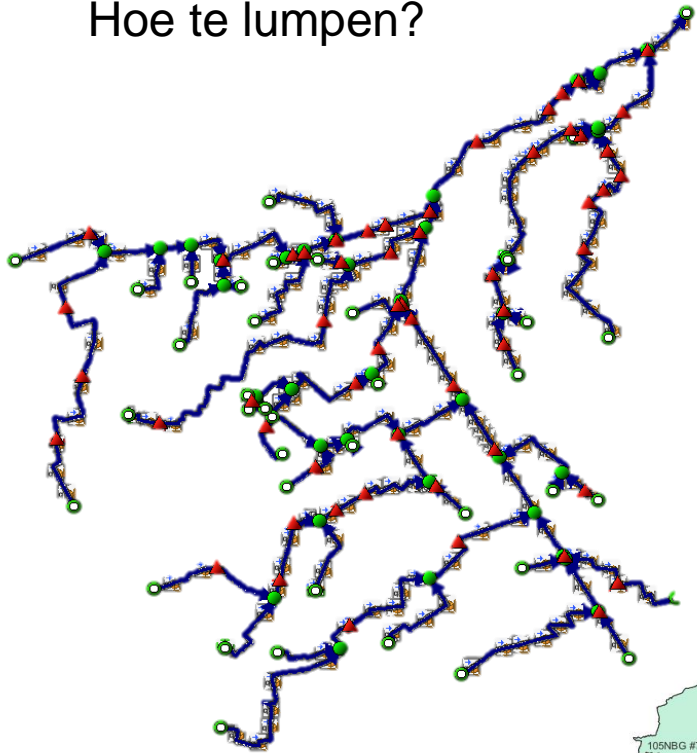
Hoe te lumpen?



Met dank aan:
Harm Nomden, SWECO

Samenwerking TKI

Hoe te lumpen?

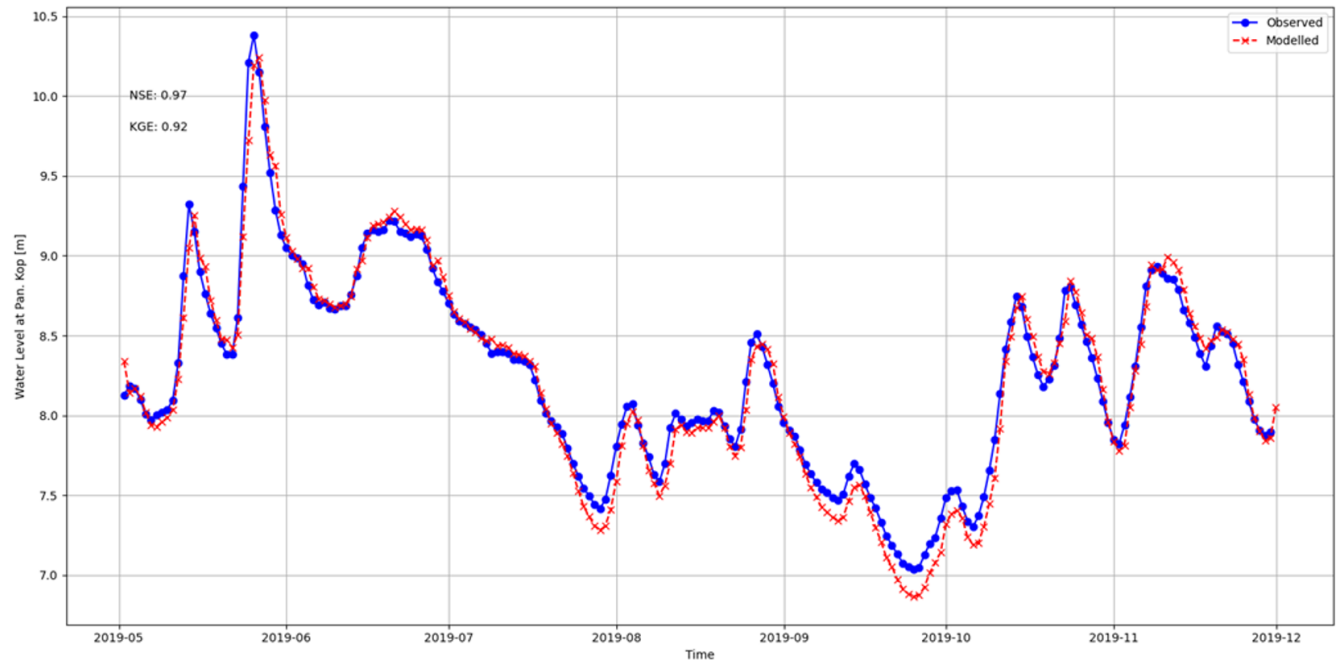
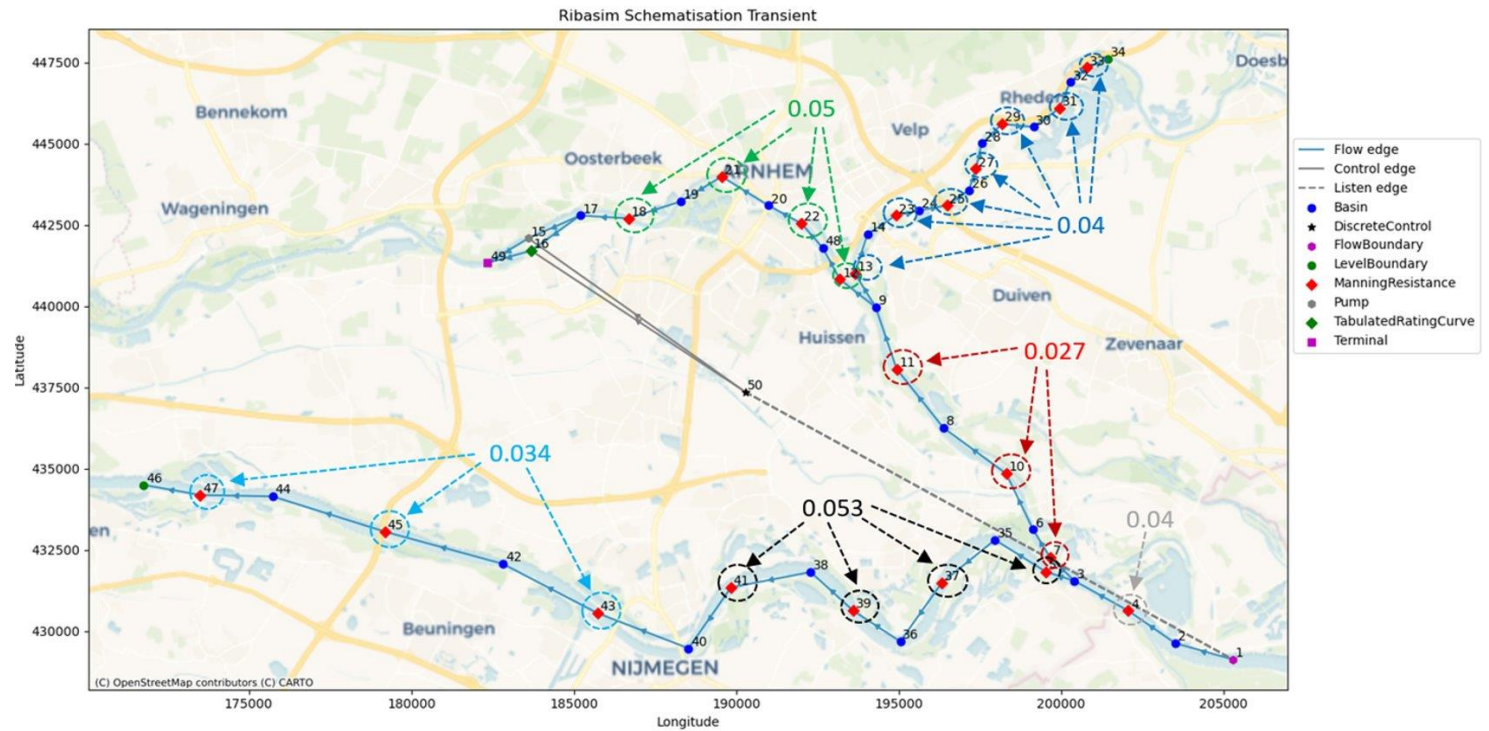


Simulation length	D-HYDRO	RIBASIM	
Piekaafvoer 3 dagen	29 minuten	10 basins	9 seconden
		58 basins	12 seconden

Met dank aan:
Harm Nomden, SWECO

Samenwerking TKI

Zijn ook de rivieren te simuleren, inclusief sturing?



Status

Fysische concepten lijken te voldoen:

Q-h relaties, Manning weerstanden, profielen, etc.

Waar werken we de komende tijd aan?

- Koppeling met MODFLOW 6 modellen, inclusief voorbereiding
- Waterverdeling op basis van prioritering
- Pasief stoftransport: zout, tracers
- Gebruiksgemak (validatie, visualisatie)
- Verdere bevindingen pilots verwerken
- Zomer 2024: “1.0 release”

Ondertussen: volle kracht vooruit met landelijke Ribasim schematisatie voor LHM!

Deltares / Ribasim

<> Code Issues 149 Pull requests 4 Discussions Actions Projects 1

Filters is:issue is:open Labels 32 Milestones 4 New issue

149 Open 288 Closed

Author	Label	Projects	Milestones	Assignee	Sort
<input type="checkbox"/>	<input checked="" type="radio"/>				
	enhancement				2
#960	opened 2 days ago	by d2hydro			
<input type="checkbox"/>	<input checked="" type="radio"/>	allocation	validation		
#959	opened 2 days ago	by SouthEndMusic	1 task		
<input type="checkbox"/>	<input checked="" type="radio"/>	tech-debt			
#956	opened 2 days ago	by deltamarnix			
<input type="checkbox"/>	<input checked="" type="radio"/>	allocation			
	good first issue				
#954	opened 2 days ago	by SouthEndMusic			

Landelijke Ribasim schematisatie LHM in ontwikkeling

Beschikbaar op:
github.com/Deltares/Ribasim-NL

Eind 2024 oplevering

In nauwe samenwerking met
waterbeheerders

Uitvoering in samenwerking met
consortium adviesbureaus:

- SWECO
- HKV
- D2HYDRO
- HydroConsult
- ...

Deltares

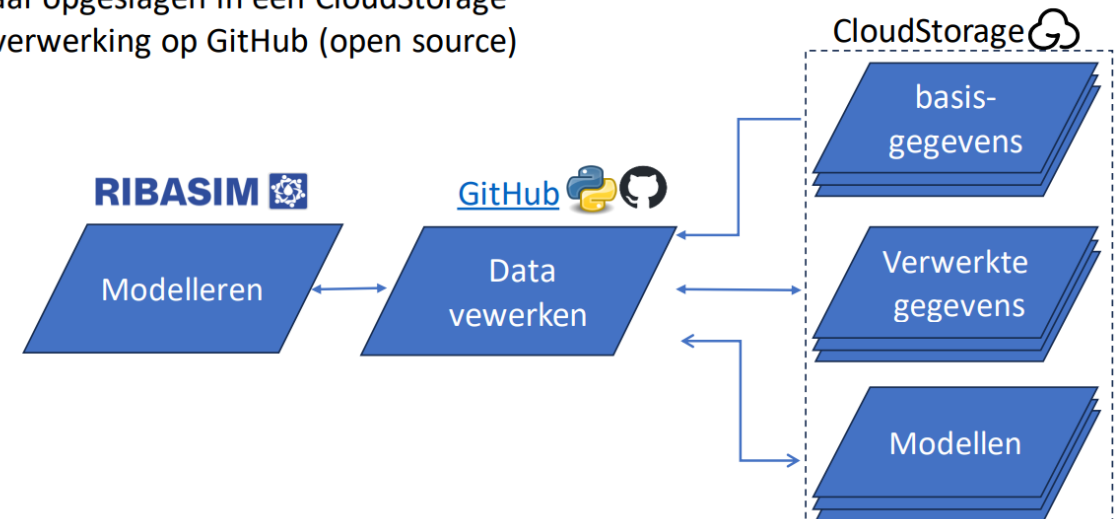
Ribasim-NL: reproduceerbaar en datagedreven

Reproduceerbare modellen:

- Geautomatiseerd opbouwen van schematisatie
- Alle gegevens centraal opgeslagen in een CloudStorage
- Alle code voor dataverwerking op GitHub (open source)

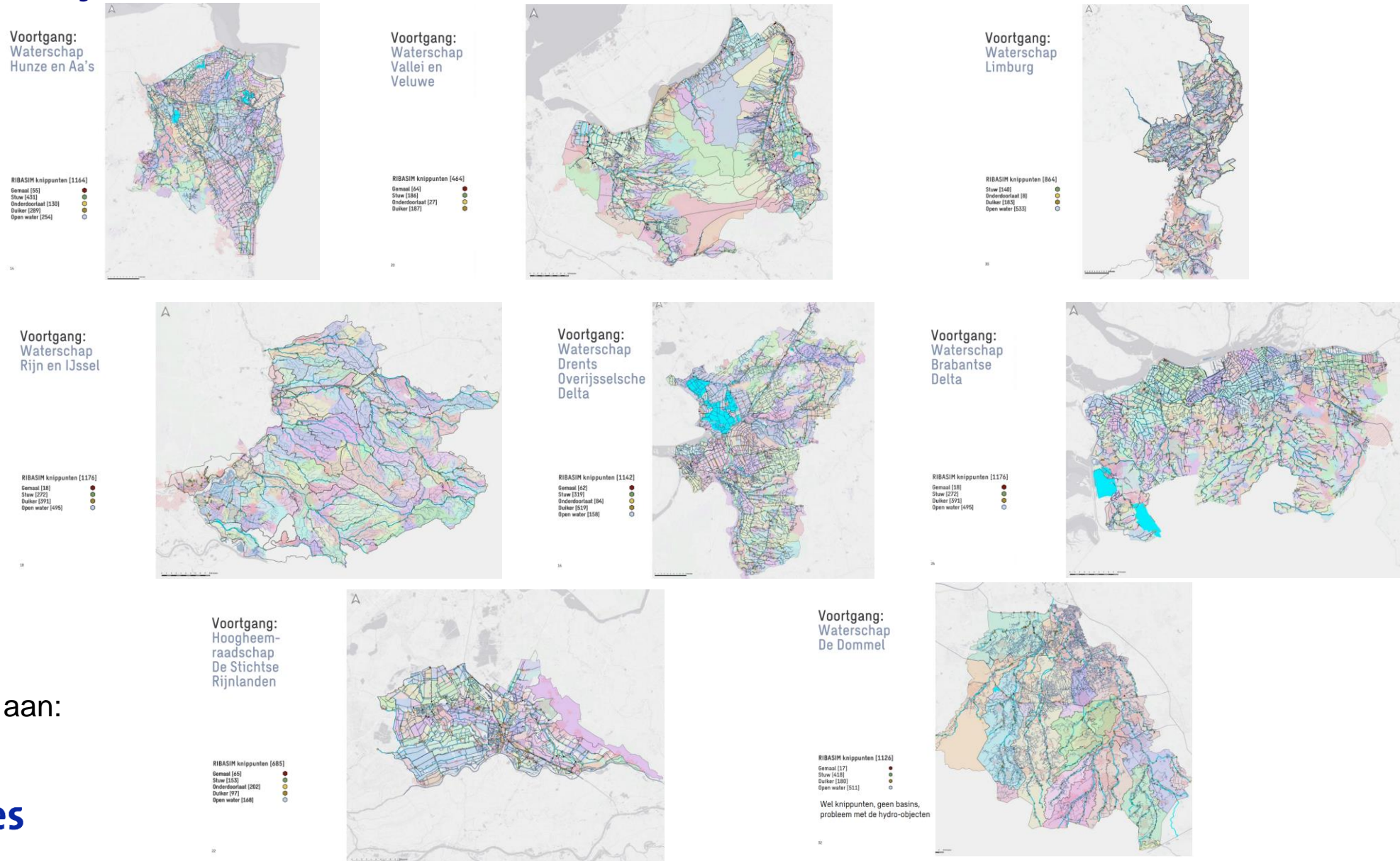
Basisgegevens:

- Waterschappen
- Rijkswaterstaat
- Externe bronnen:
 - GWK
 - KRW
 - OSM
 - WIWB
 -



Met dank aan:
D2HYDRO

Landelijke Ribasim schematisatie LHM

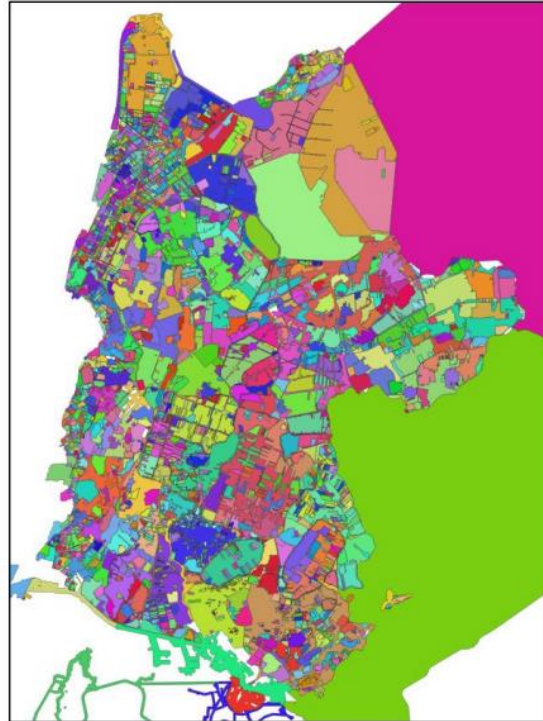


Met dank aan:
SWECO

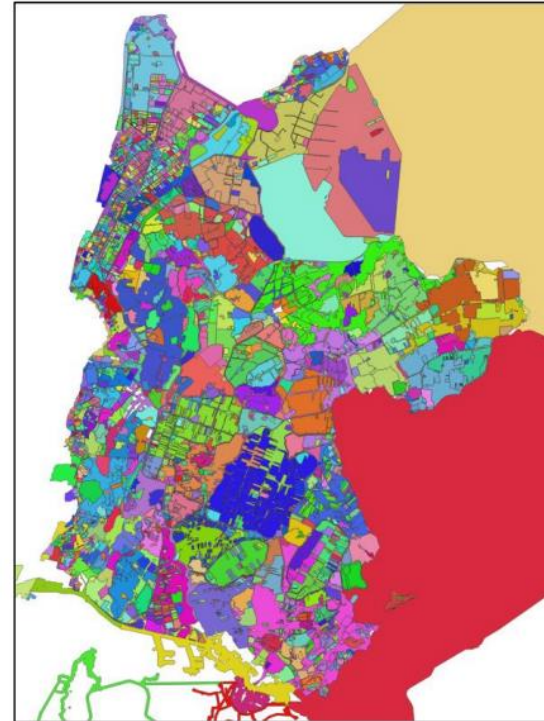
Deltares

Landelijke Ribasim schematisatie LHM

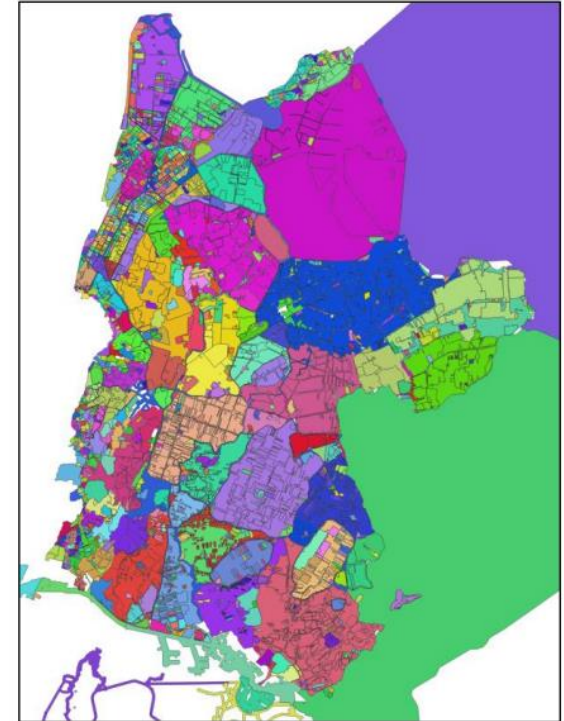
Van peilgebied naar
netwerk



0.25m
8 landgebruik klassen



0.50m
5 landgebruik klassen

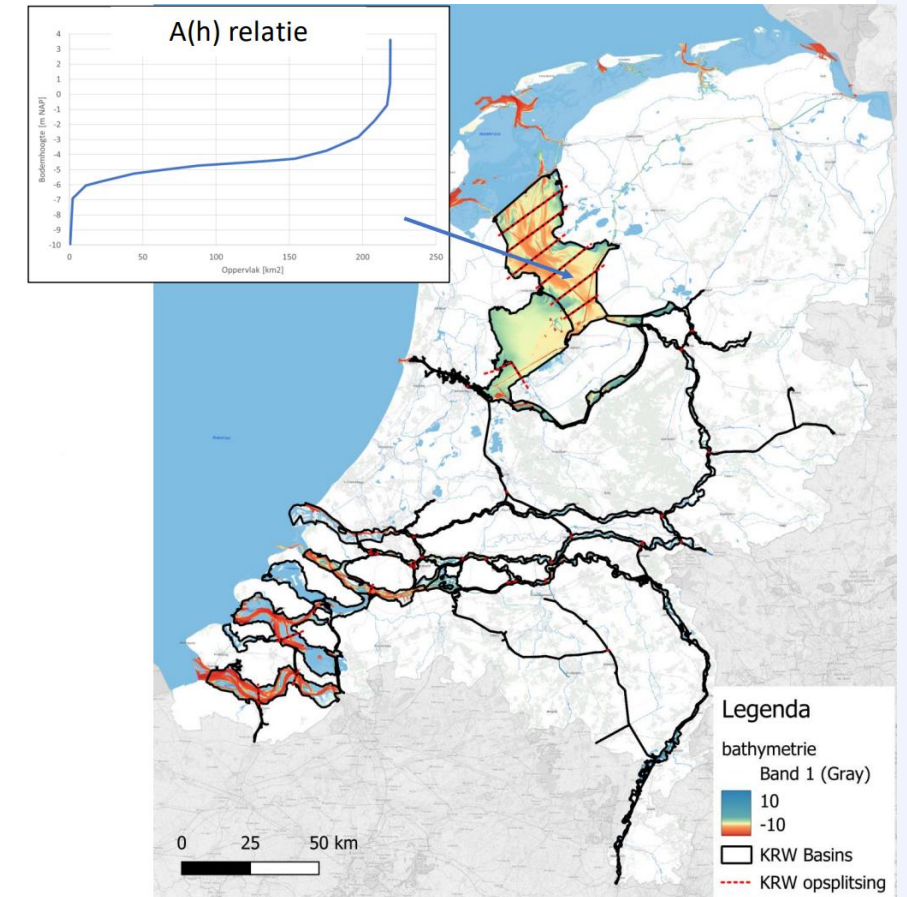
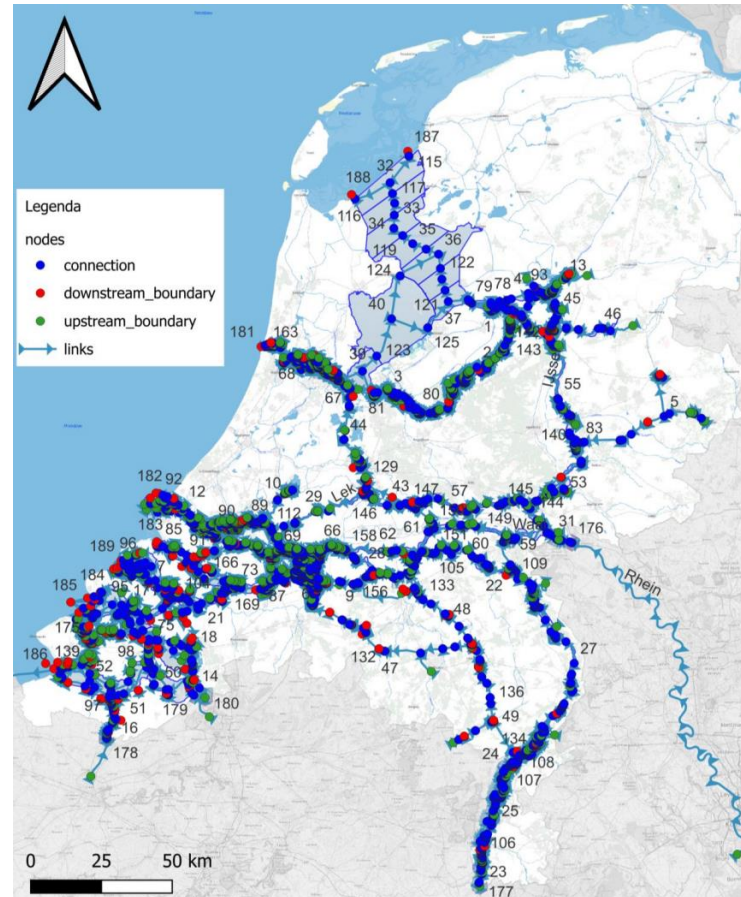


1.00m
5 landgebruik klassen

Landelijke Ribasim schematisatie LHM

Ook het hoofdwatersysteem:

- Op basis van actuele basisdata
- Herkenbaar
- Reproduceerbaar



Conclusie

“Alleen ga je sneller, samen komen je verder”

- Zomer 2024: Ribasim “1.0 release”
- Gezamenlijk (Deltares & Marktpartijen) werken aan software & tooling → directe doorstart LHM schematisatie
- Toepassing zal resulteren in voortschrijdende inzichten en verdere verbeteringen



Conclusie

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- Toepassing zal resulteren in verdere inzichten en verbeteringen

Dank voor de aandacht!

<https://github.com/deltares/ribasim>

Deltares

