SurFlat: Surface runoff in flat landscapes

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RESEARCH ARTICLE

WILEY

DTM resolution controls the accuracy of estimating surface runoff indicators in flat, lowland landscapes

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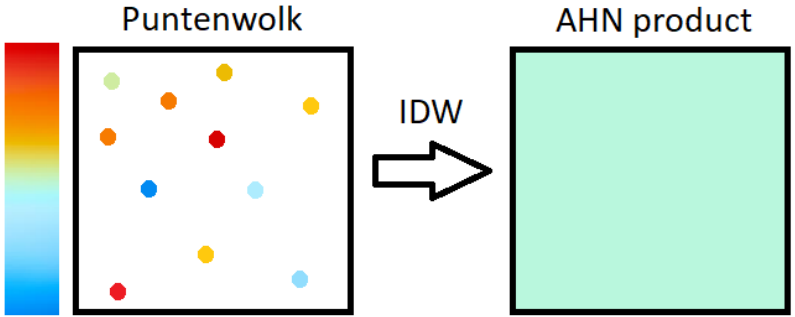
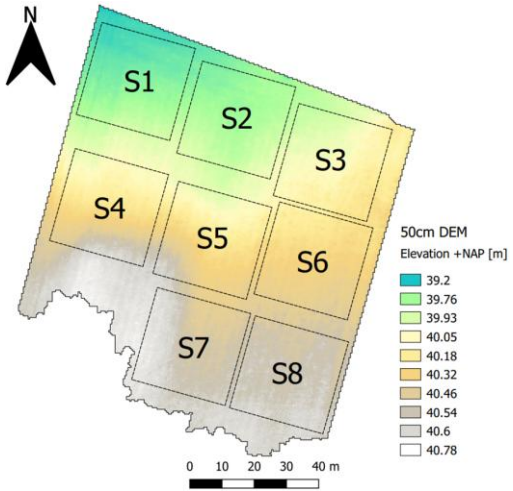
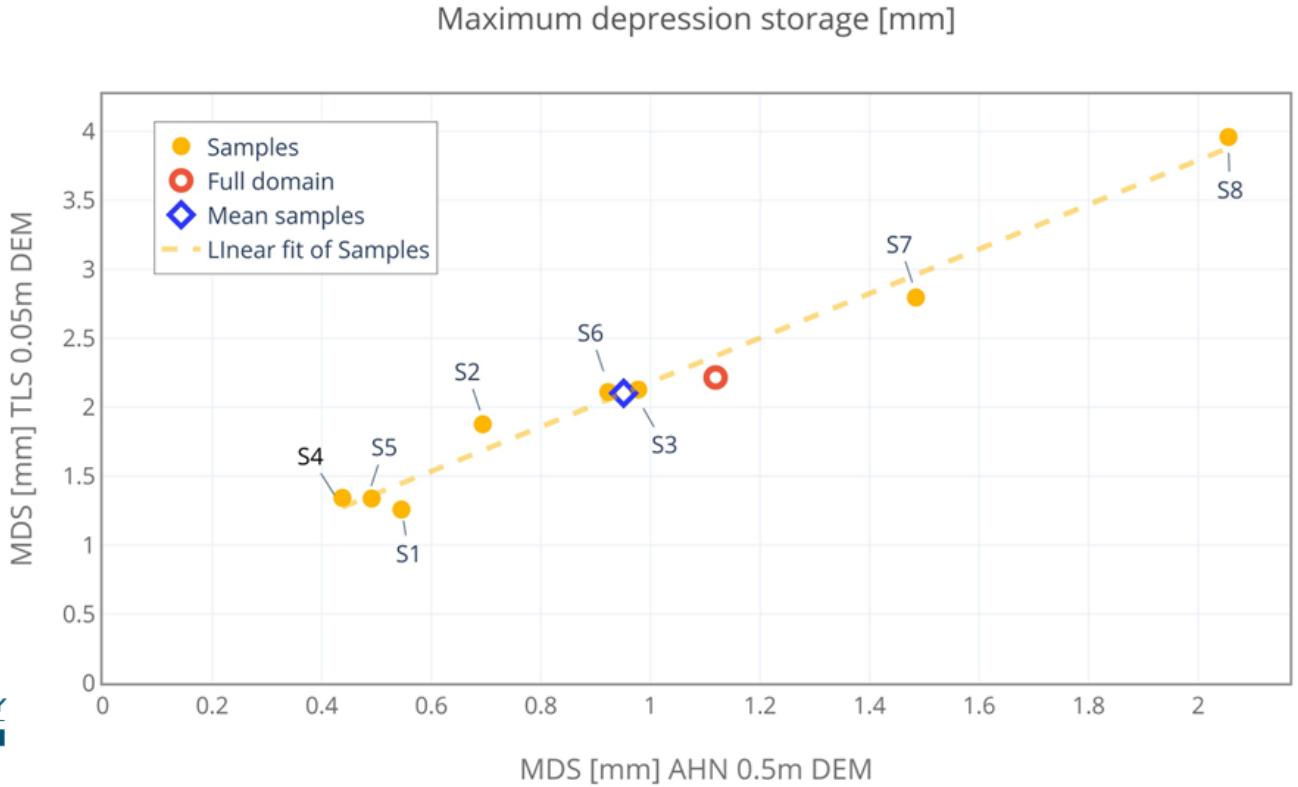
Maaiveldberging

Wat is de invloed van **microtopografie** op het inschatten van **maaiveldberging**, **roughness** en **connectiviteit**?



Maaiveldberging





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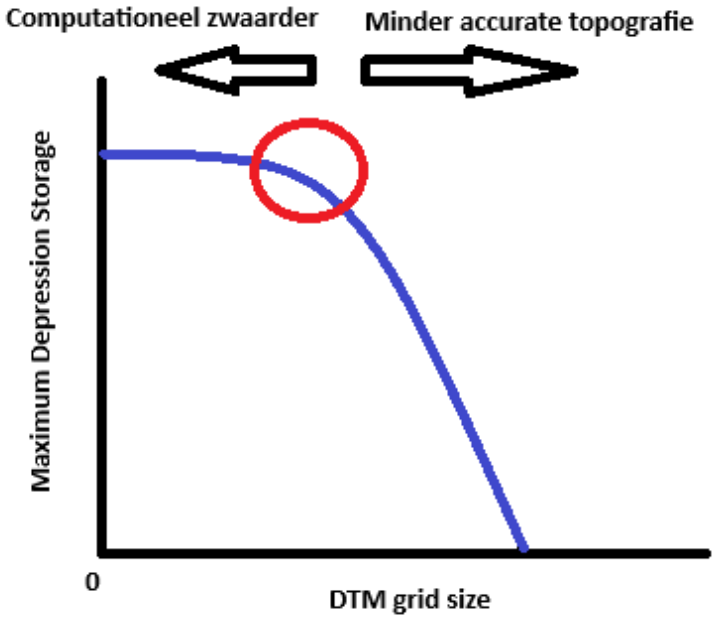
Topografie schaal



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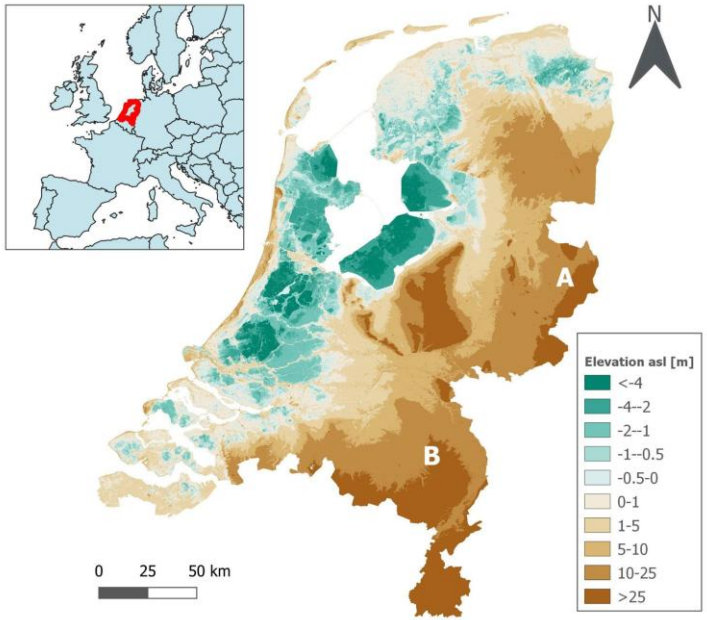

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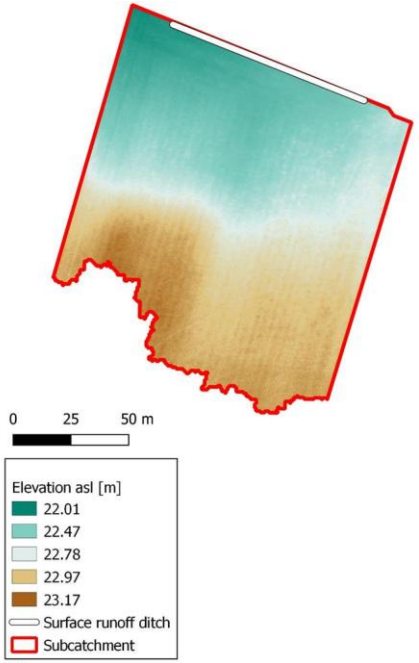
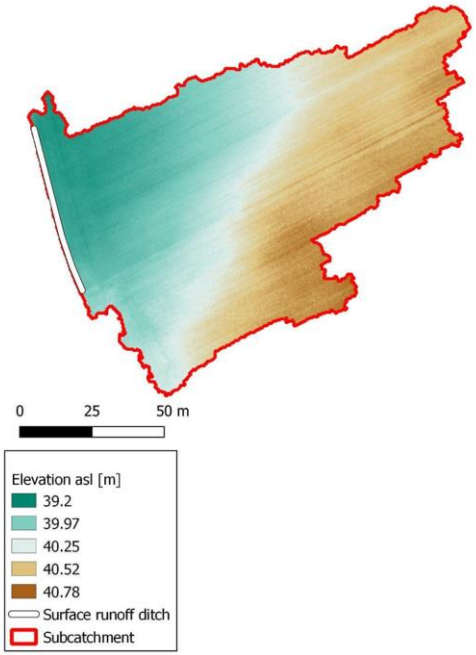


Brabant



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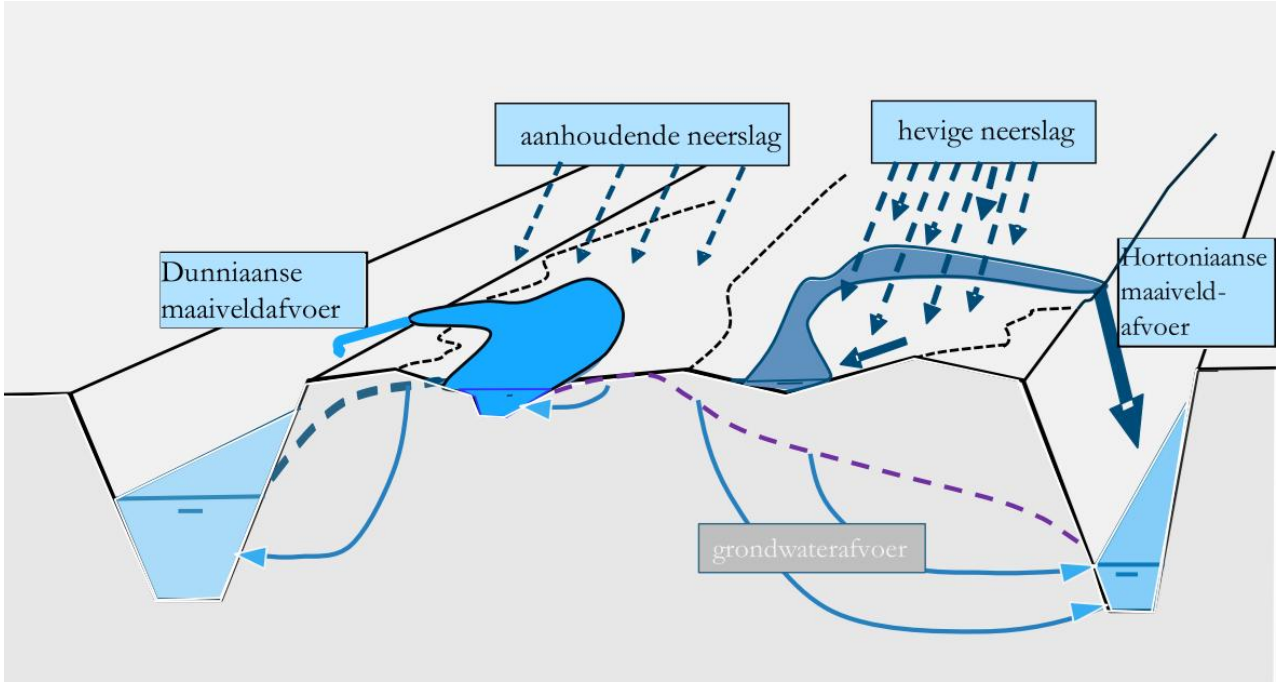

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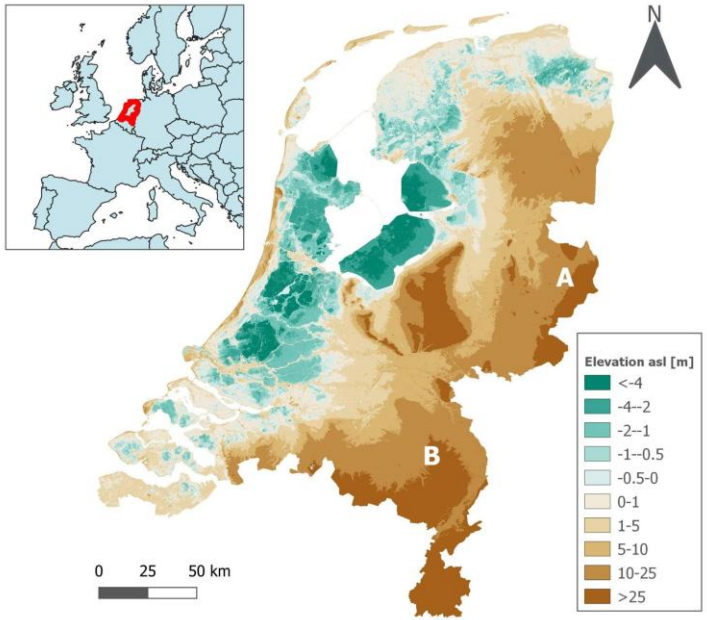

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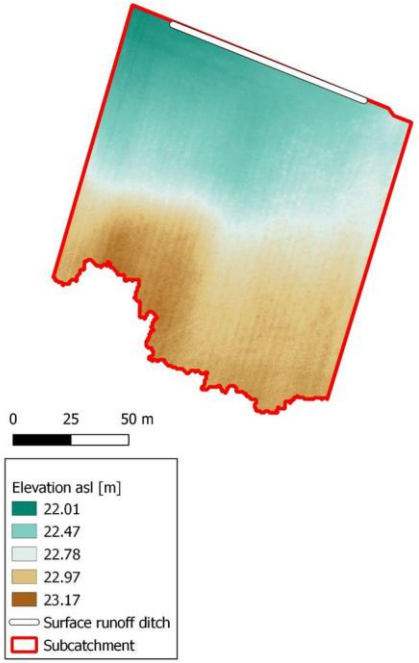

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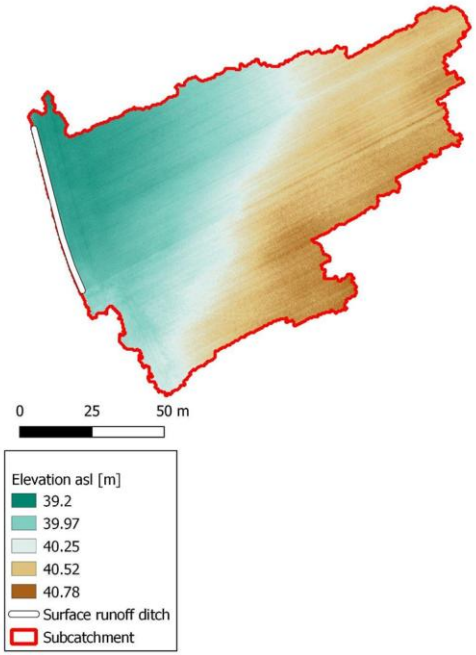

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Veldmetingen Maaiveldafvoer Twente

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Meetperceel Twente

Meetperceel Brabant

Veldmetingen Maaiveldafvoer Brabant

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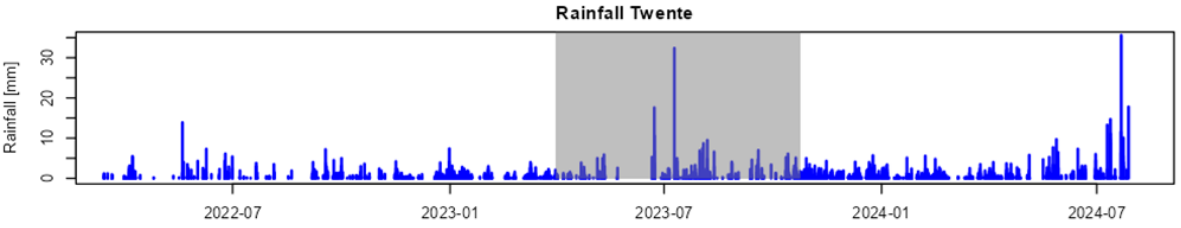
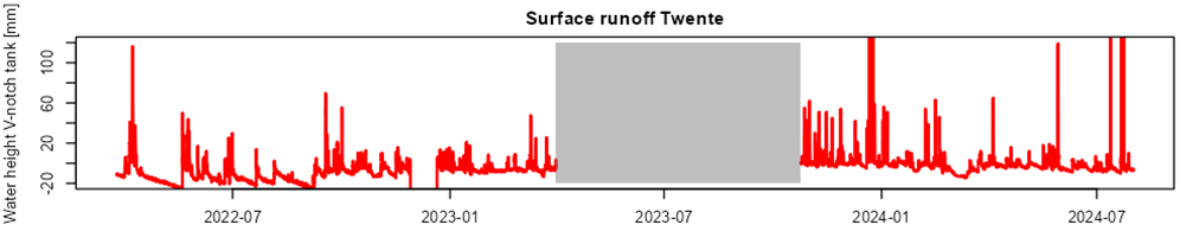
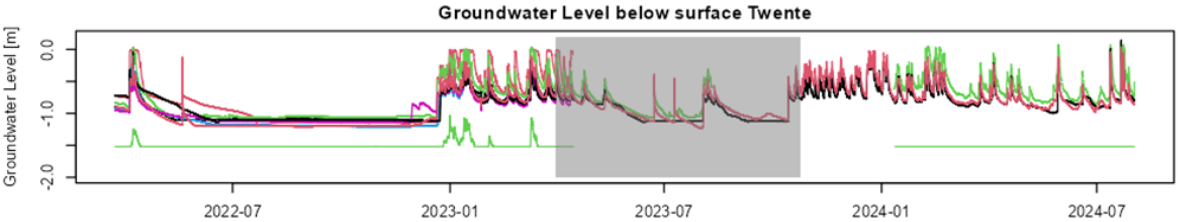
Veldmetingen Maaiveldafvoer Twente

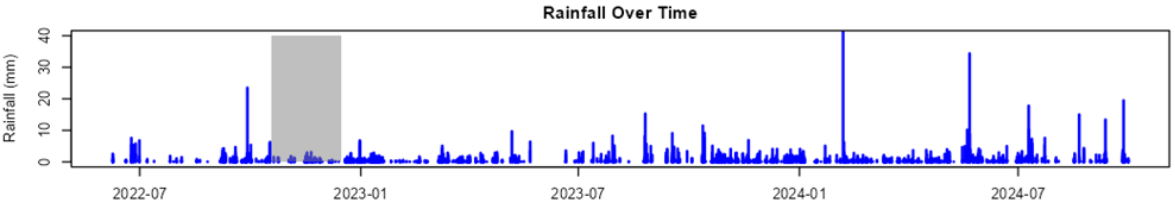


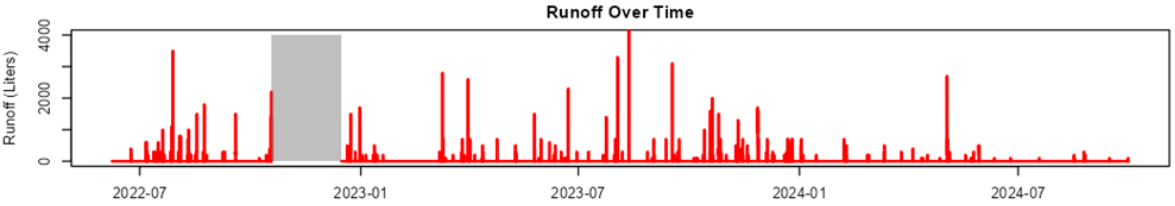


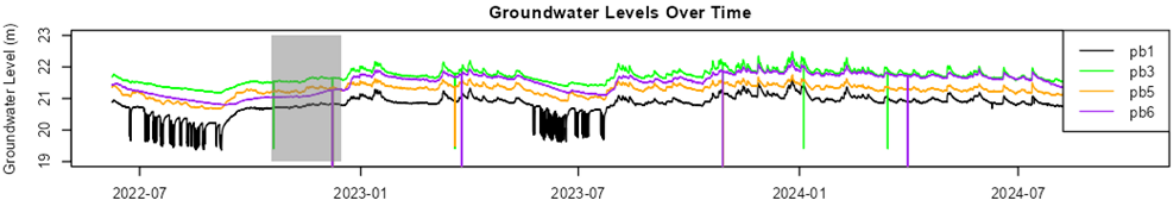


	Twente	*Brabant*
Recorded events	51	68
Months of monitoring excluding SRO sensor outages	21	25
Cumulative rain [mm]	1876	2259
Cumulative SRO [mm]	17.7	9.9
Mean event SRO depth [mm]	0.35	0.15
Mean event SRO/Rain [%]	2.5	1.3
Summer events	18	30
Winter events	33	38
Irrigation events (excluded from recorded events)	-	29
Cumulative irrigation SRO [mm]	-	2.2
Mean irrigation event SRO depth [mm]	-	0.08
Flooding events (excluded from recorded events)	7	-

Veldmetingen Maaiveldafvoer Brabant







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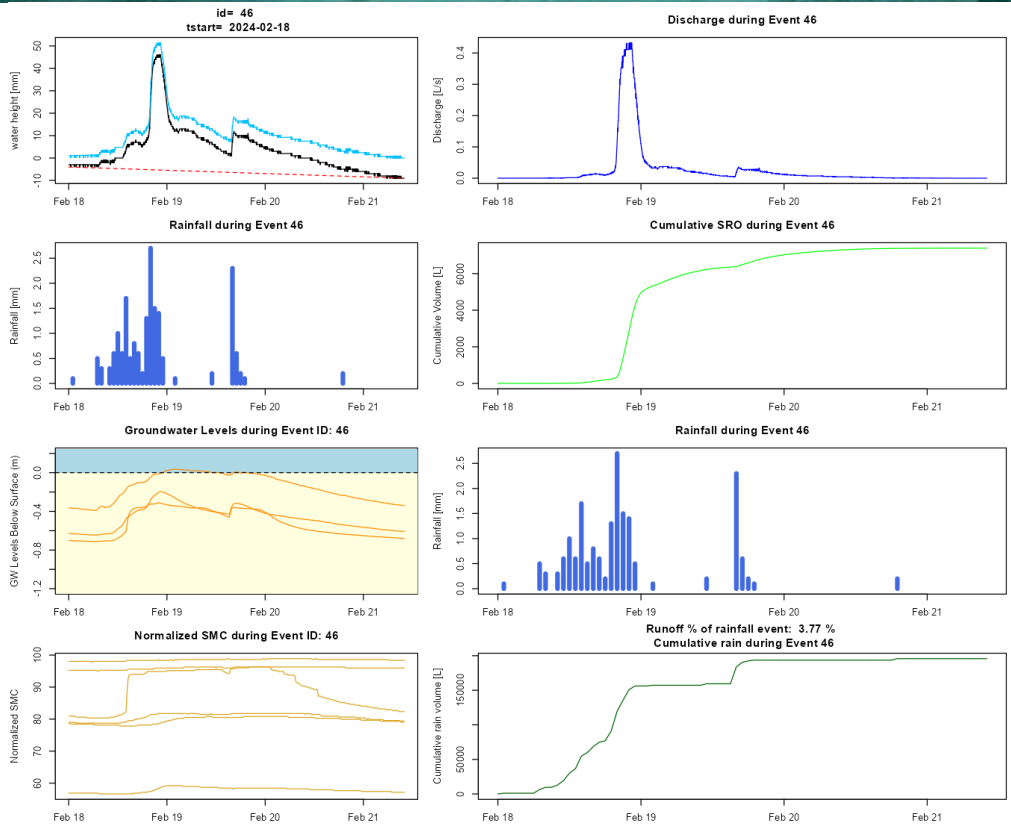
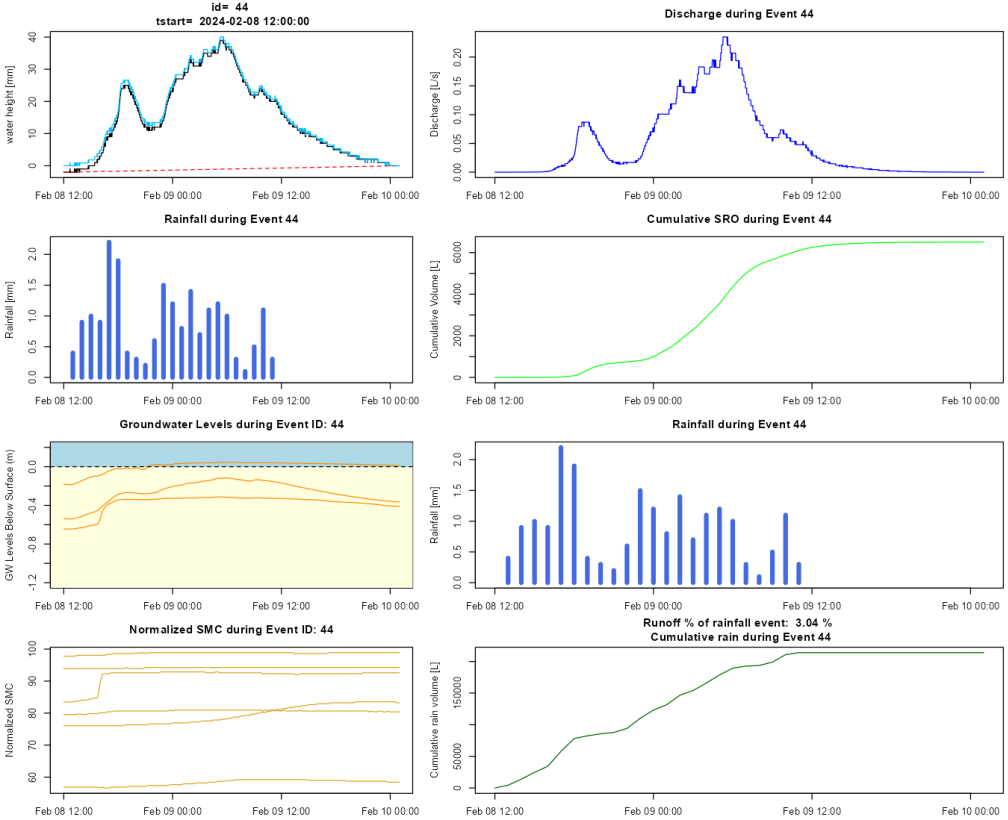


Veldmetingen Maaiveldafvoer Twente



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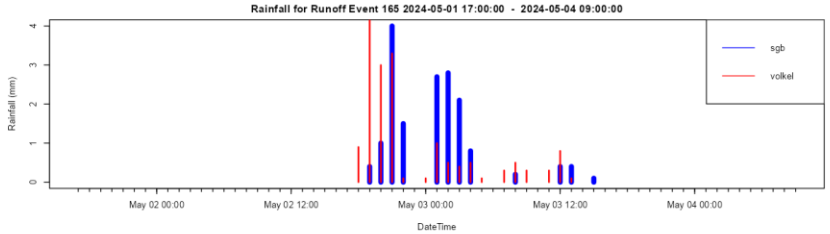
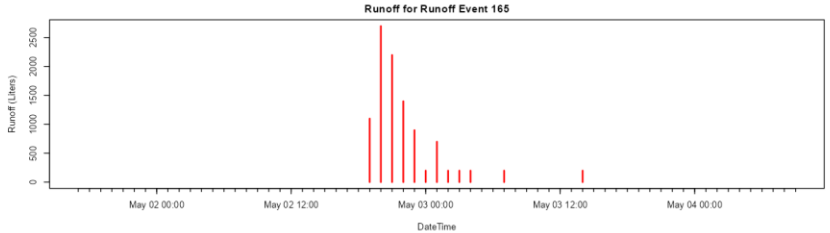
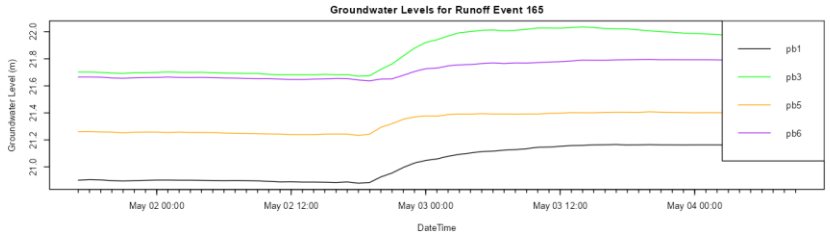
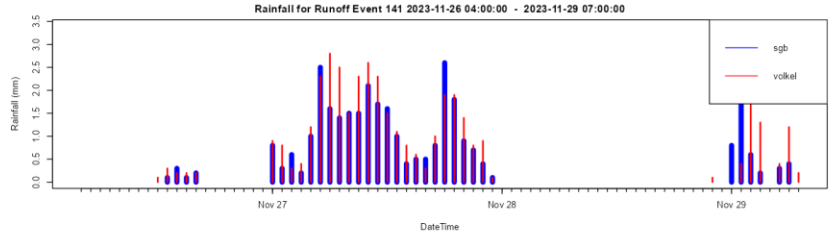
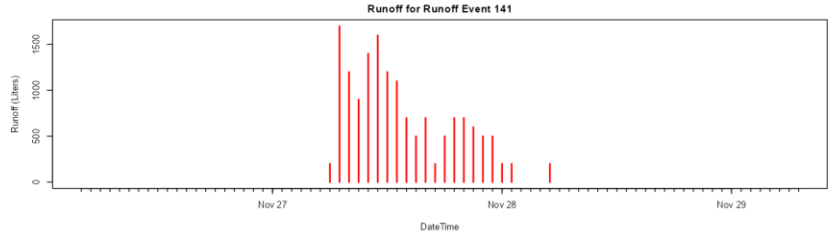
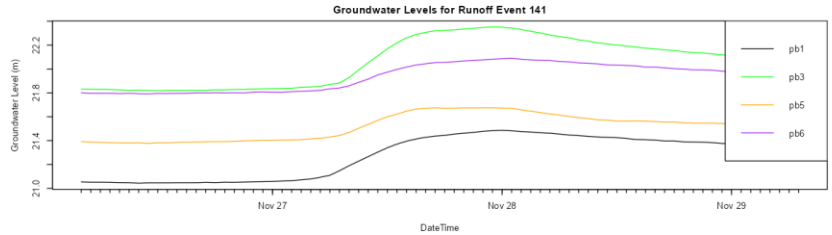








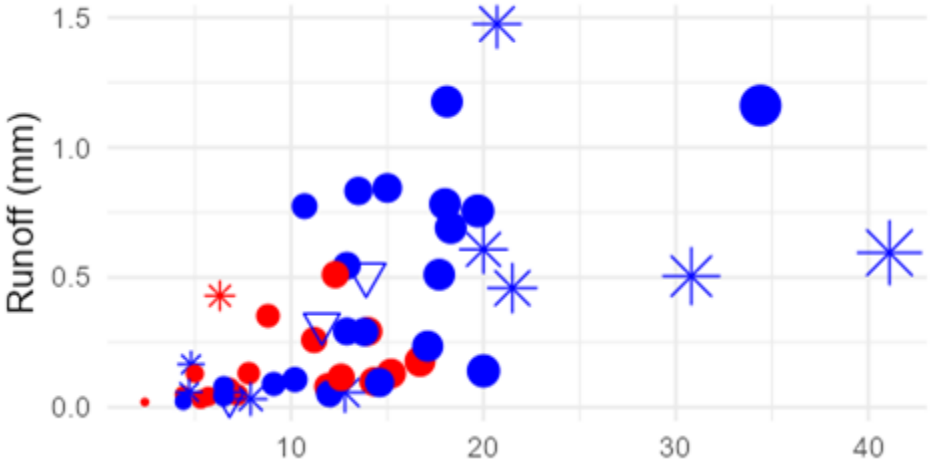




Veldmetingen Maaiveldafvoer

Neerslag (mm)

Twente



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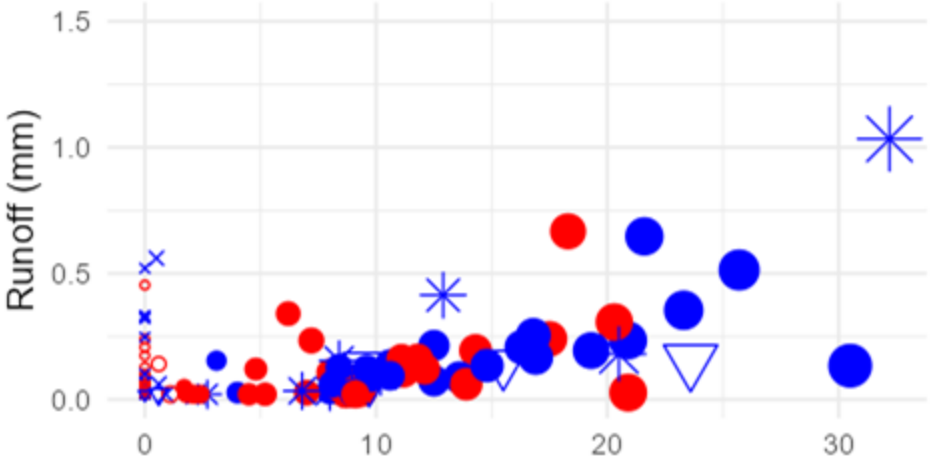
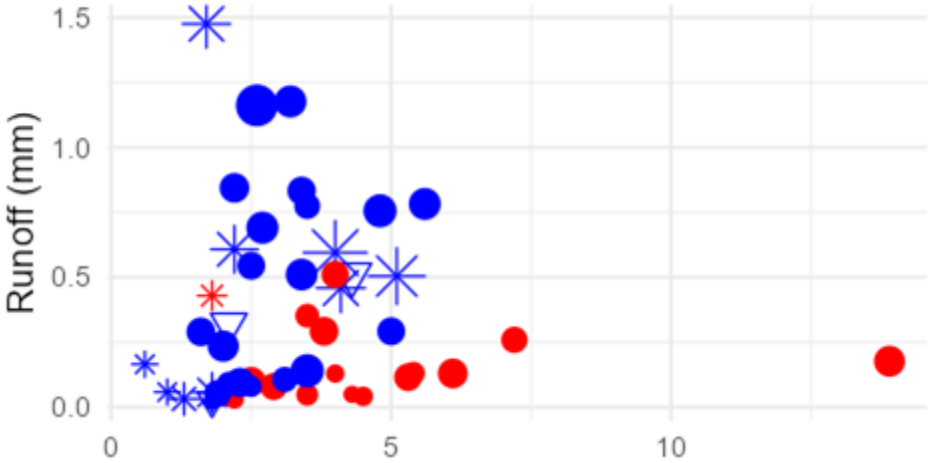


Veldmetingen Maaiveldafvoer

Max. neerslagintensiteit (mm/h)

Twente



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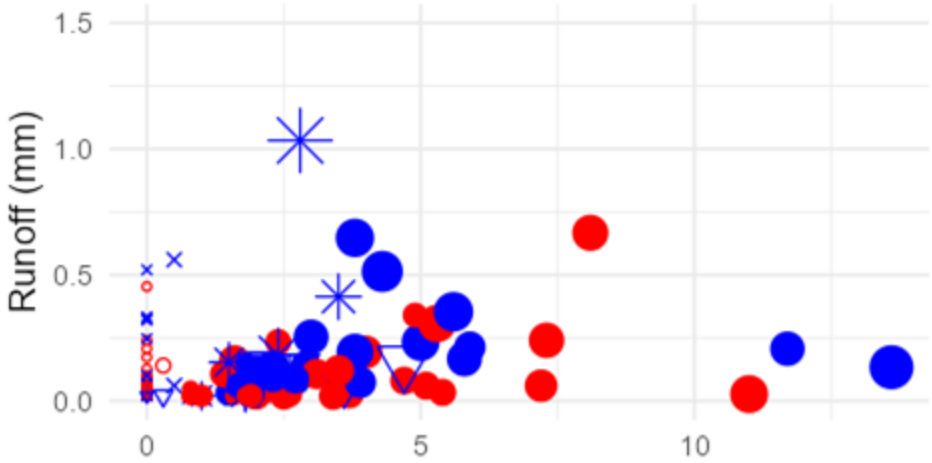
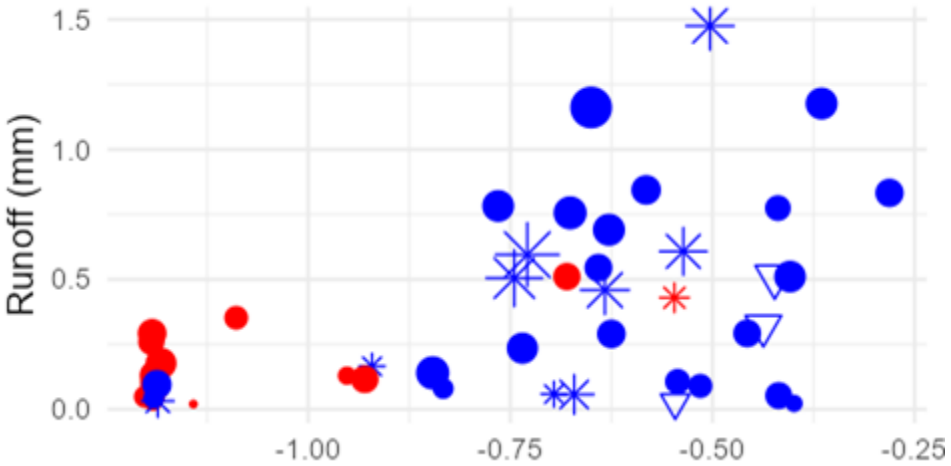


Veldmetingen Maaiveldafvoer

Initiële grondwaterstand (m onder maaiveld)

Twente



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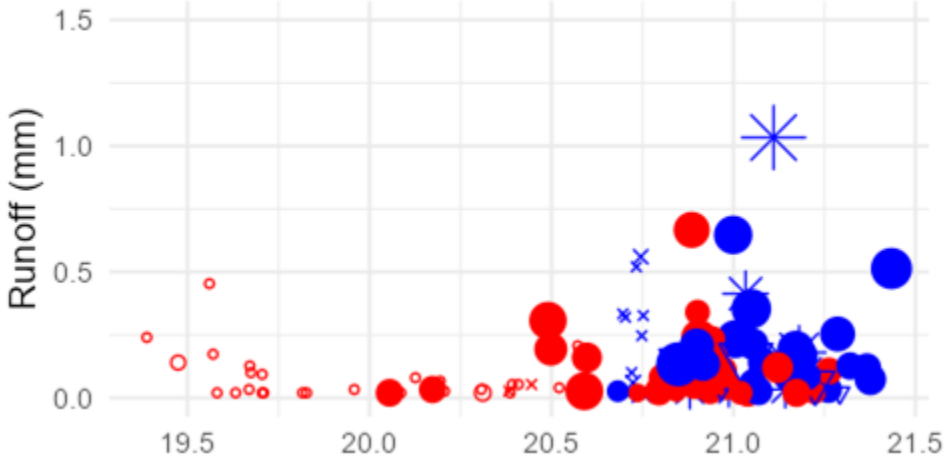
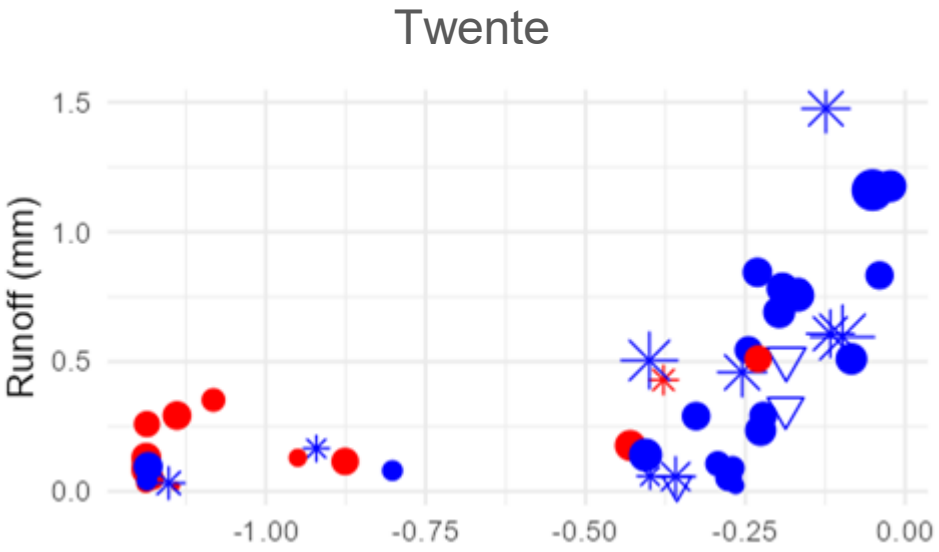
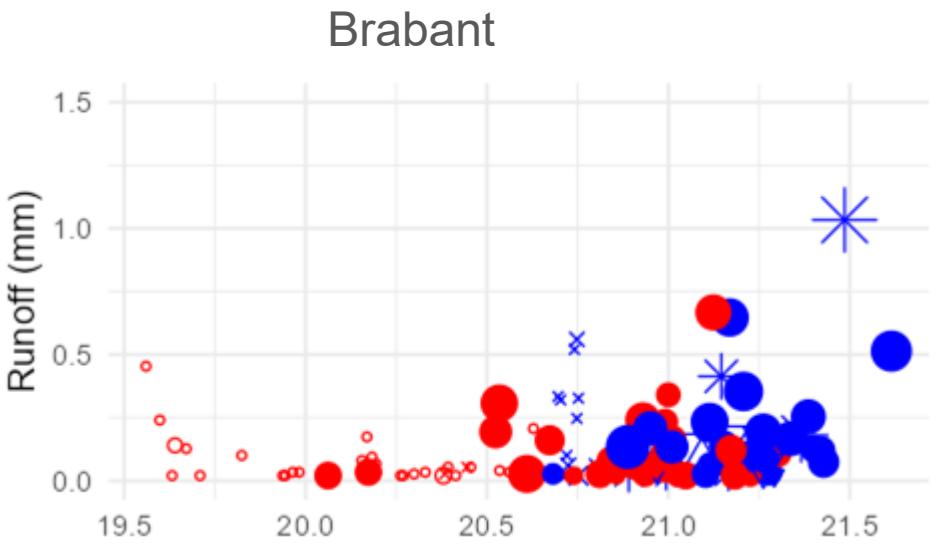


Veldmetingen Maaiveldafvoer

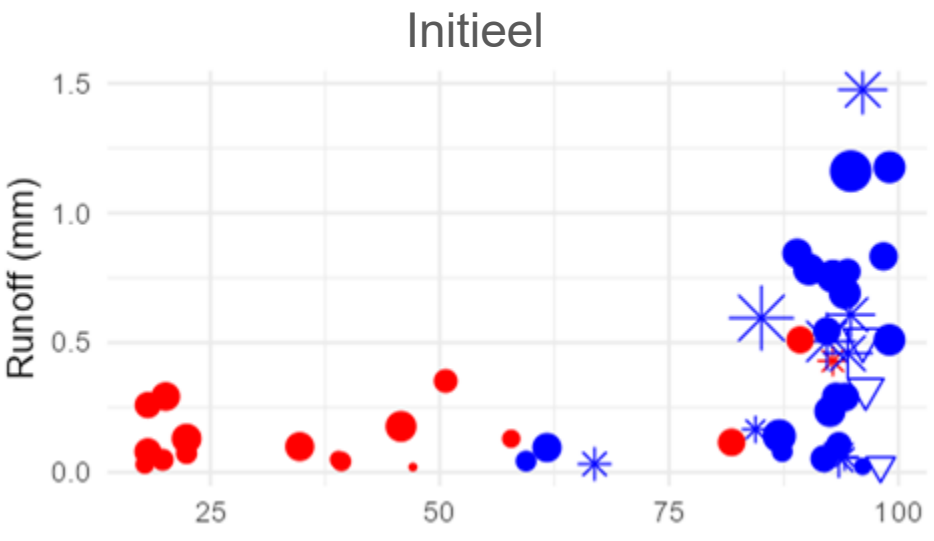
Max. grondwaterstand gedurende event (m onder maaiveld)

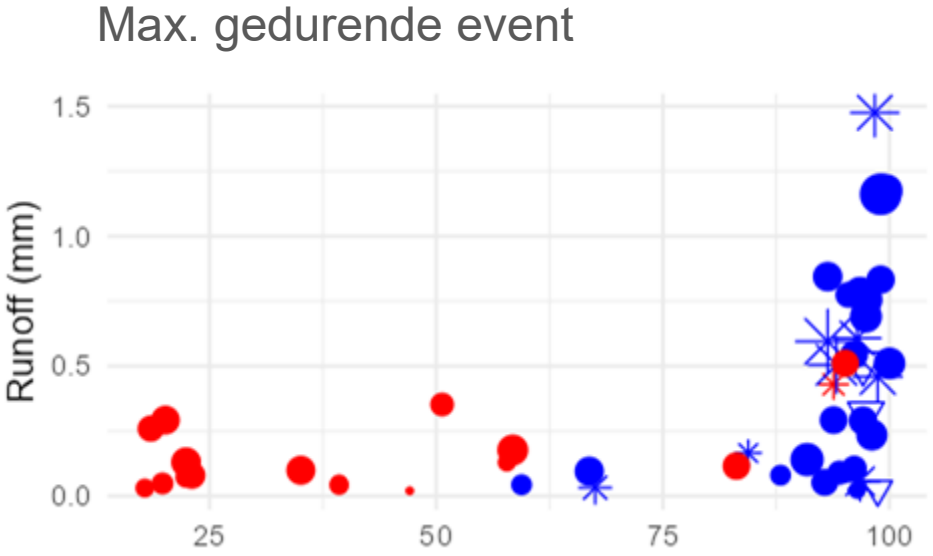




Veldmetingen Maaiveldafvoer

Bodemvocht verzadigingsgraad (%) Twente

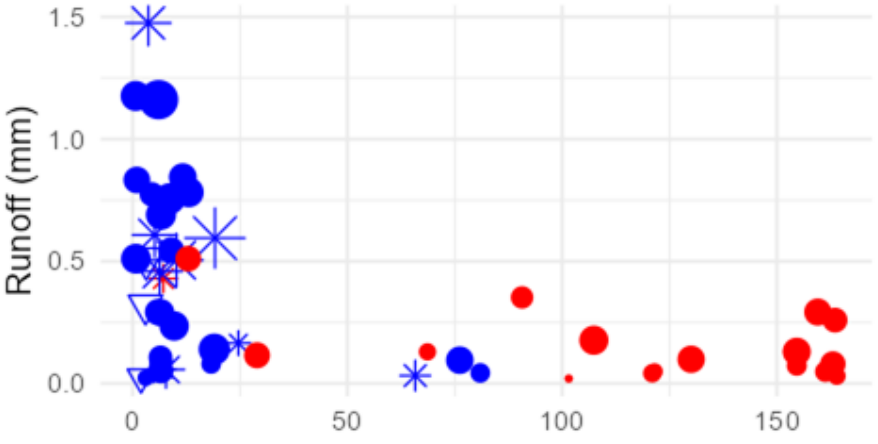




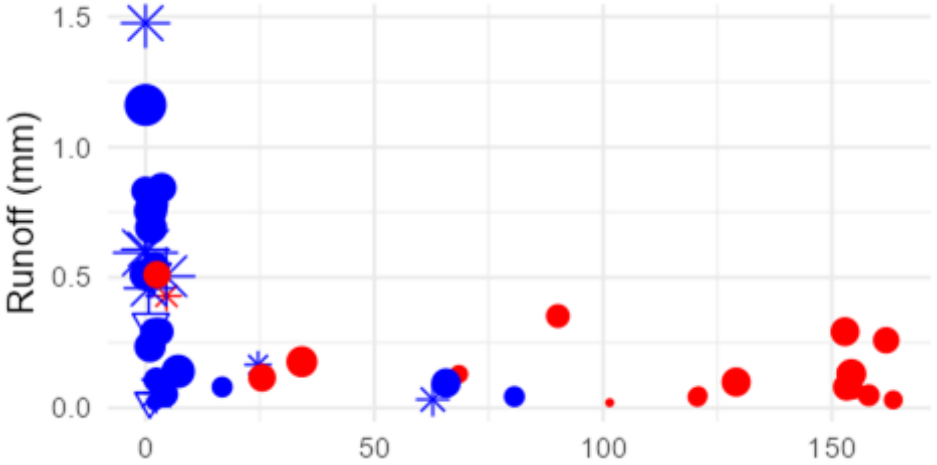
Veldmetingen Maaiveldafvoer

Beschikbare bodemberging (mm) Twente

Initieel



Max. gedurende event



Voorwaarden maaiveldafvoer > 0.5 mm

TWENTE

Neerslag
- Totaal > 10 mm
- Intensiteit > 2.2 mm/uur

Grondwaterstand
- < 25 cm onder het maaiveld

Bodemberging
- Initieel < 13 mm
- Natste moment event < 3.5 mm

BRABANT

Neerslag
- Totaal > 20 mm
- Intensiteit > 3 mm/uur

Grondwaterstand
- *Niet sturend*

Bodemberging
- *Niet gemeten*

Conclusies en implicaties

Maaiveldafvoer komt voor en is goed meetbaar op zandgronden Twente en Brabant

- Dus meer maaiveldafvoer op slechter doorlatende gronden?
- Moet BOFEK een slecht doorlatende toplaag opnemen?

Maaiveldafvoer volumes op meetpercelen zijn in dezelfde orde van grootte als maaiveldberging

- Het vergroten van maaiveldberging kan maaiveldafvoer dus aanzienlijk verminderen?

Duidelijke relatie maaiveldafvoer en beschikbare bodemberging op perceel Twente

- Zijn landschappen met een beperkte beschikbare bodemberging beter te modelleren dan landschappen met een dik zandpakket?
- Hoeveel soortgelijke gebieden met beperkte bodemberging zijn er in Nederland?

Maaiveldberging wordt bepaald door microtopografie

- Mogelijkheid om vertaalformules te ontwikkelen

SURFLAT: Surface runoff in flat landscapes

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Veld Brabant

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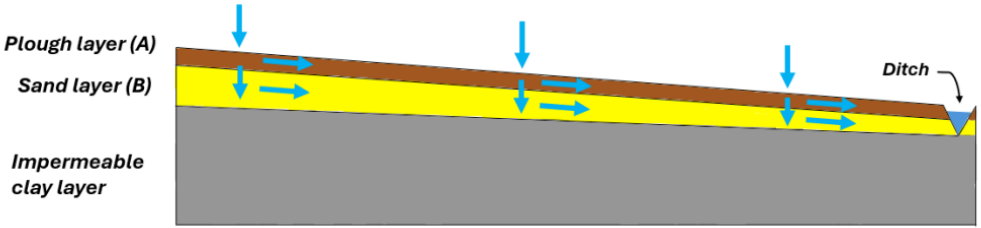

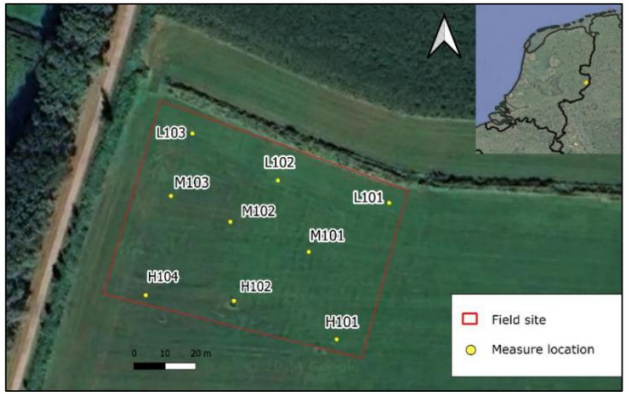

Figure 1.1: Field site with measurement locations.

	Lower bound Confidence Interval (m/d)	***Median (m/d)***	*Upper bound Confidence Interval (m/d)*
Layer A - Vertical	0.50	**1.55**	2.43
Layer A - Horizontal	0.10	**0.58**	1.56
Layer B - Vertical	0.69	**0.97**	12.24
Layer B - Horizontal	0.68	**2.35**	5.68

Table 3.2: Overview of bootstrapped medians with confidence intervals in meters per day.

	Lower bound Confidence Interval (m/d)	***Mean (m/d)***	*Upper bound Confidence Interval (m/d)*
Layer A - Vertical	1.79	**8.00**	18.85
Layer A - Horizontal	0.49	**6.22**	16.81
Layer B - Vertical	3.00	**9.25**	16.22
Layer B - Horizontal	2.25	**12.76**	29.78

Table 3.3: Overview of bootstrapped means with confidence intervals in meters per day.

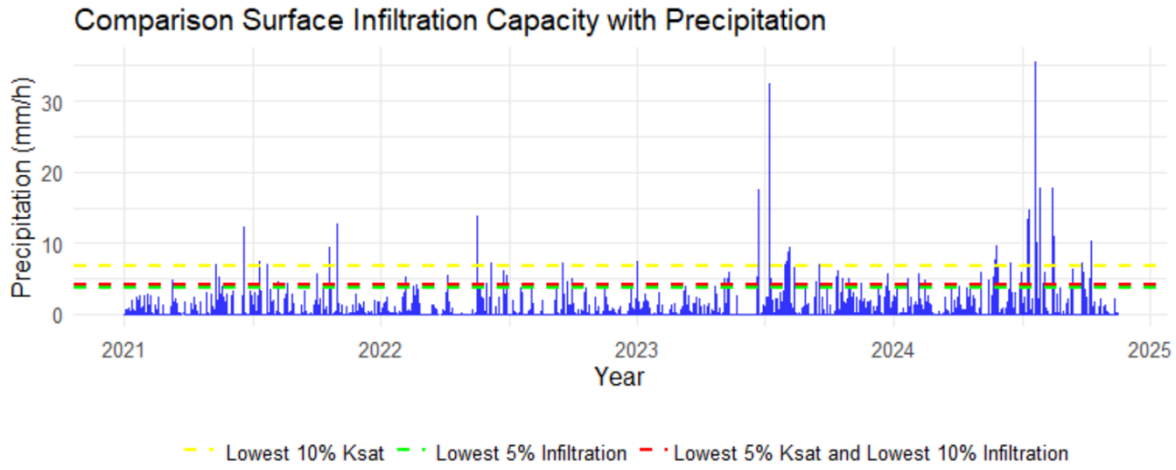

Figure 3.14: Hourly precipitation data of weather station Twenthe plotted with several levels of vertical Ksat and infiltration of layer A in millimeter per hour.

	Value (mm/h)	*Hours of exceeding precipitation*
Lowest 5% Ksat	4.08	102
Lowest 10% Ksat	6.79	37
Median Ksat	64.41	0
Lowest 5% Infiltration	3.80	113
Lowest 10% Infiltration	4.05	102
Median Infiltration	76.00	0

Table 3.7: Hours of precipitation of KNMI weather station Twenthe from 01-01-2021 until 14-11-2024 which exceeds different levels of infiltration capacity of the topsoil.

Figure 4: Study site satellite image and study site plots.

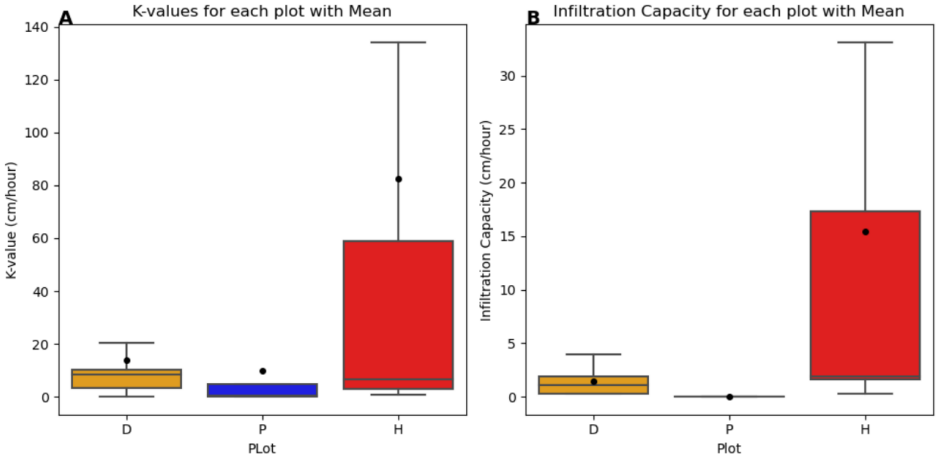

Figure 7: K-value (A) and Infiltration capacity (B) shown for each plot. Mean is shown with black dot.

Vervolgonderzoek

- Publicatie dataset
- Focus modelstudies vs. metingen
- Focus parameterisatie
  - Maaiveldberging
  - Doorlatendheid toplaag
- Focus regio
  - Regionale afvoerpieken vs. metingen
  - Metingen generaliseerbaar? Wanneer wordt aan voorwaarden maaiveldafvoer voldaan, maar treedt het niet op?
  - Welke rol spelen verschillende afstanden tot de sloot voor verschillende velden?

Tips voor maaiveldafvoer metingen

- Zorg voor een webcam
- Bij voorkeur meetpercelen op korte afstand van woonplaats
- Houd rekening met intensief onderhoud, storingen, diefstal en dieren.
- Een simpele handeling van de landbewerker kan je hele meetopstelling teniet doen