The rising groundwater table

Data: 6 år

Analyser: 3 år

Terrestrial groundwater

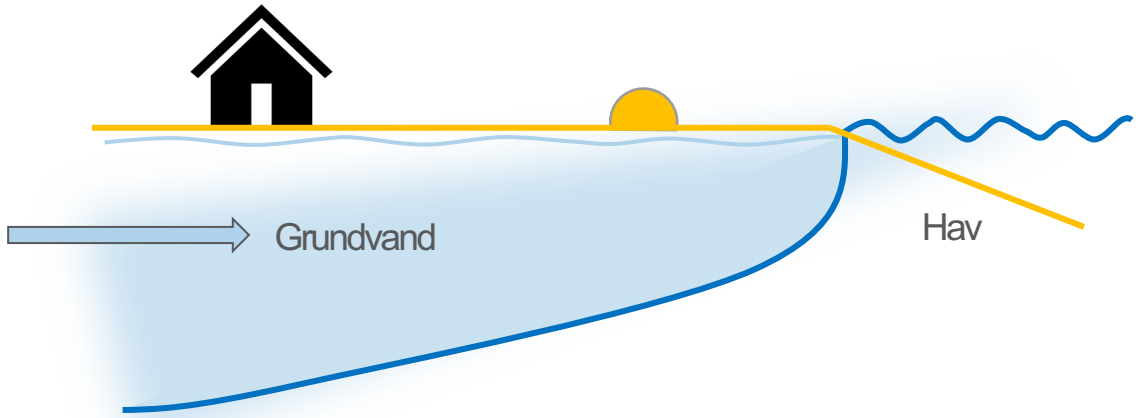
- Coastal areas

The rising groundwater table

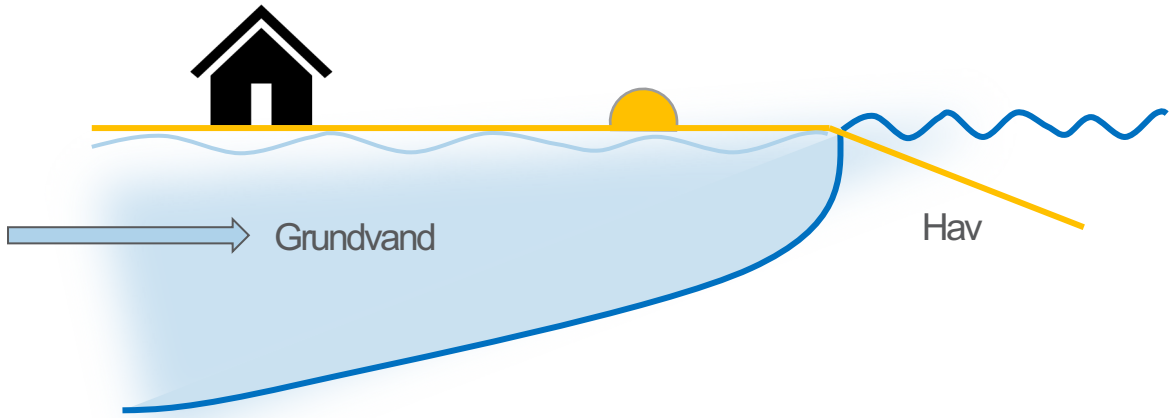
Do we have an invisible player**?**

The pressure from a rising sea level **:**
The rising sea level "pushes" the groundwater back under the dyke, towards land (due to the coarse-grained and porous geology) and forces a flood from below.

Gennemsnitlig dag



Stormflod



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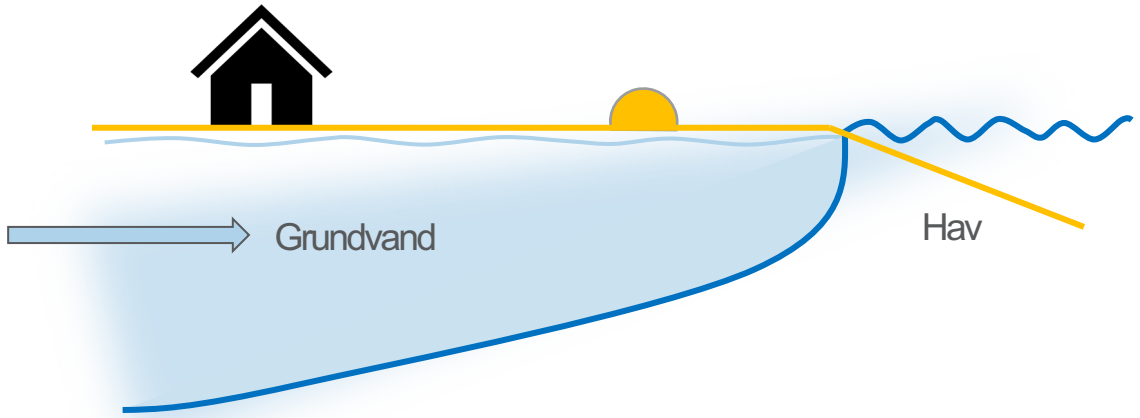
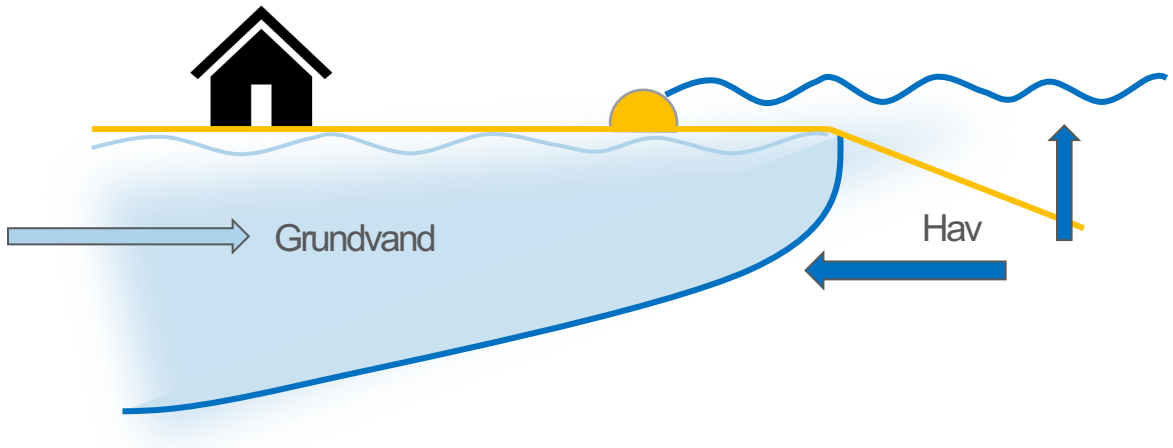


Stormflod



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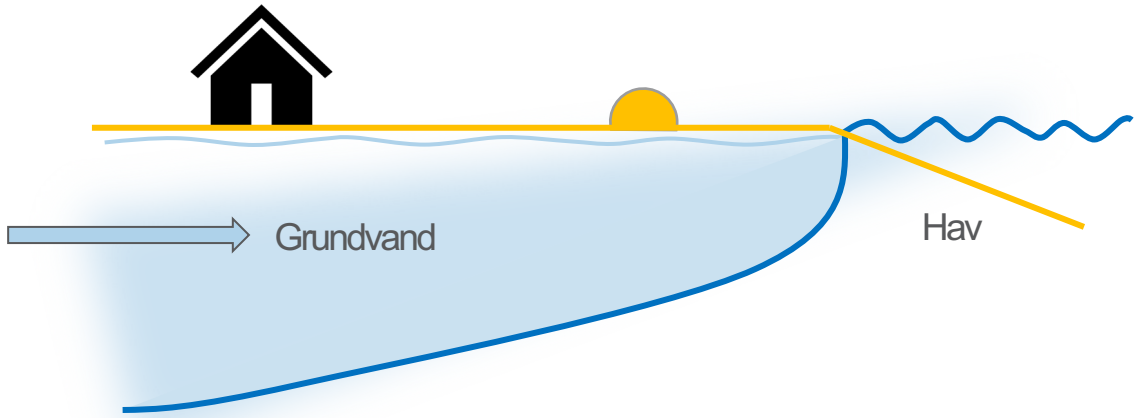

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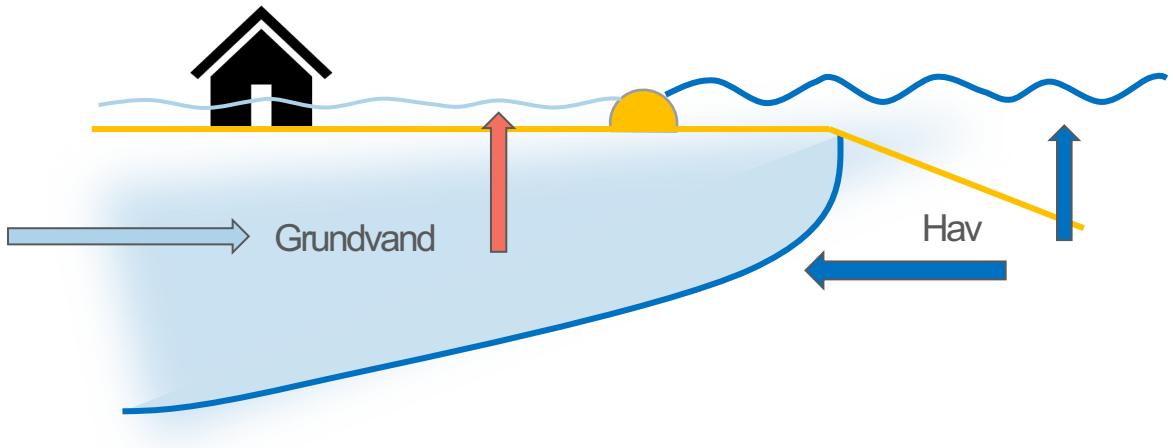


Case: Juelsminde

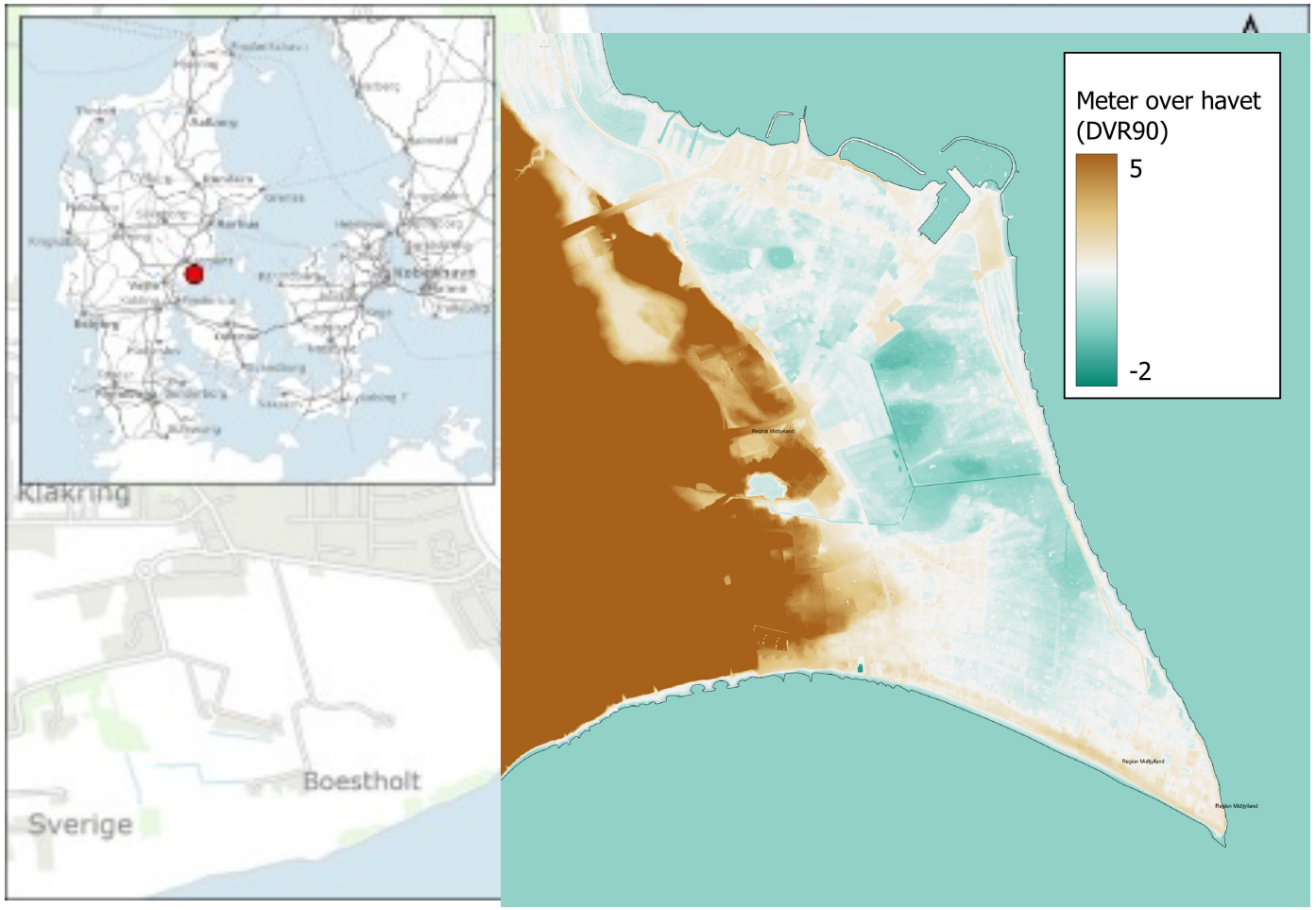
Foto: Hedensted Kommune

Forchhammer Mathiasen et al. *Short-Term Ocean Rise Effects on Shallow Groundwater in Coastal Areas: A Case Study in Juelsminde*.

Case: Juelsminde

Low-lying and flat topography

- In some areas below sea level



Forchhammer Mathiasen et al. *Short-Term Ocean Rise Effects on Shallow Groundwater in Coastal Areas: A Case Study in Juelsminde*.

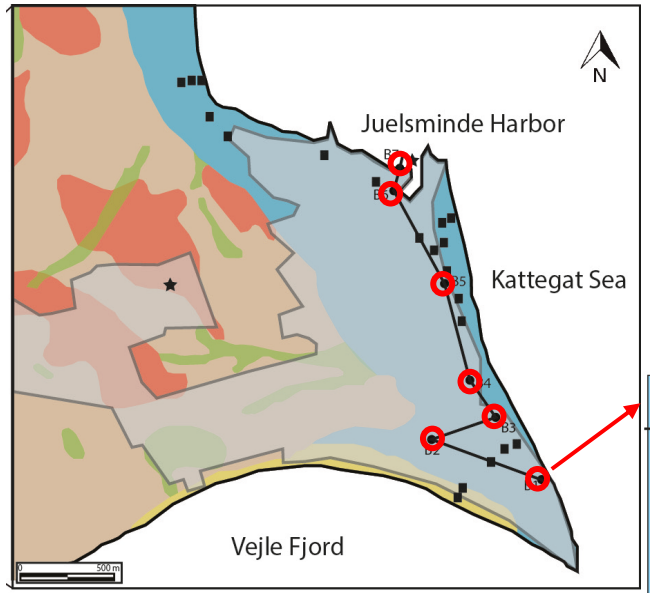
Case: Juelsminde

Low-lying and flat topography

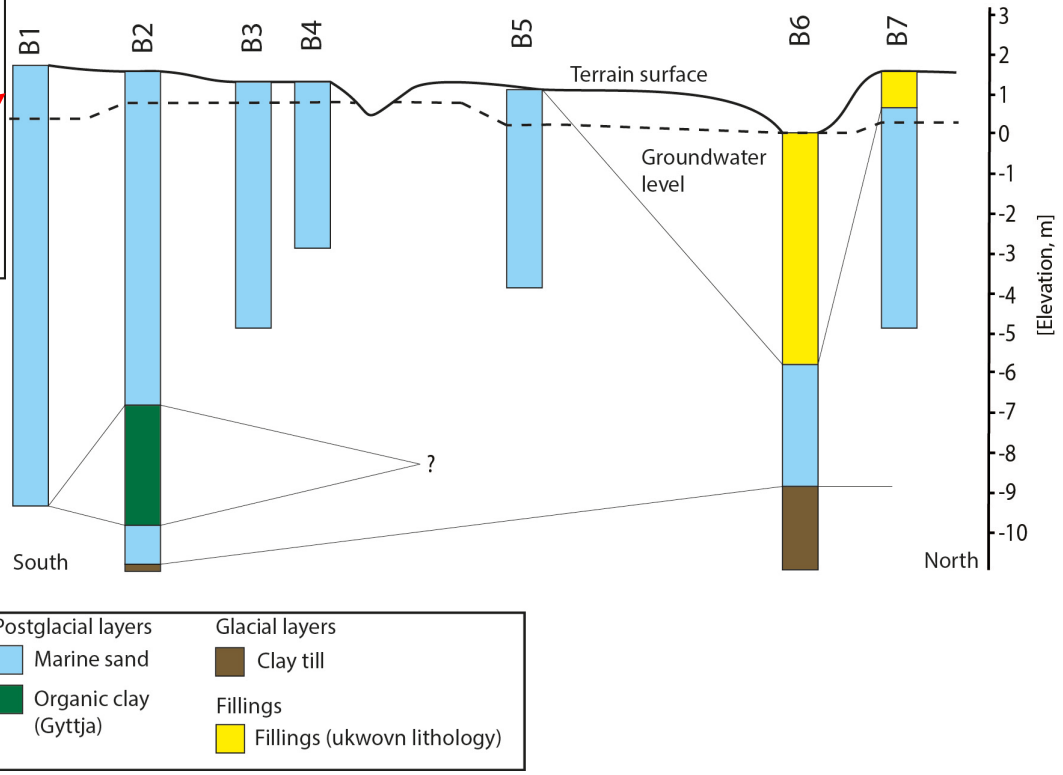
- In some areas below sea level

Coarse-grained and sandy geology

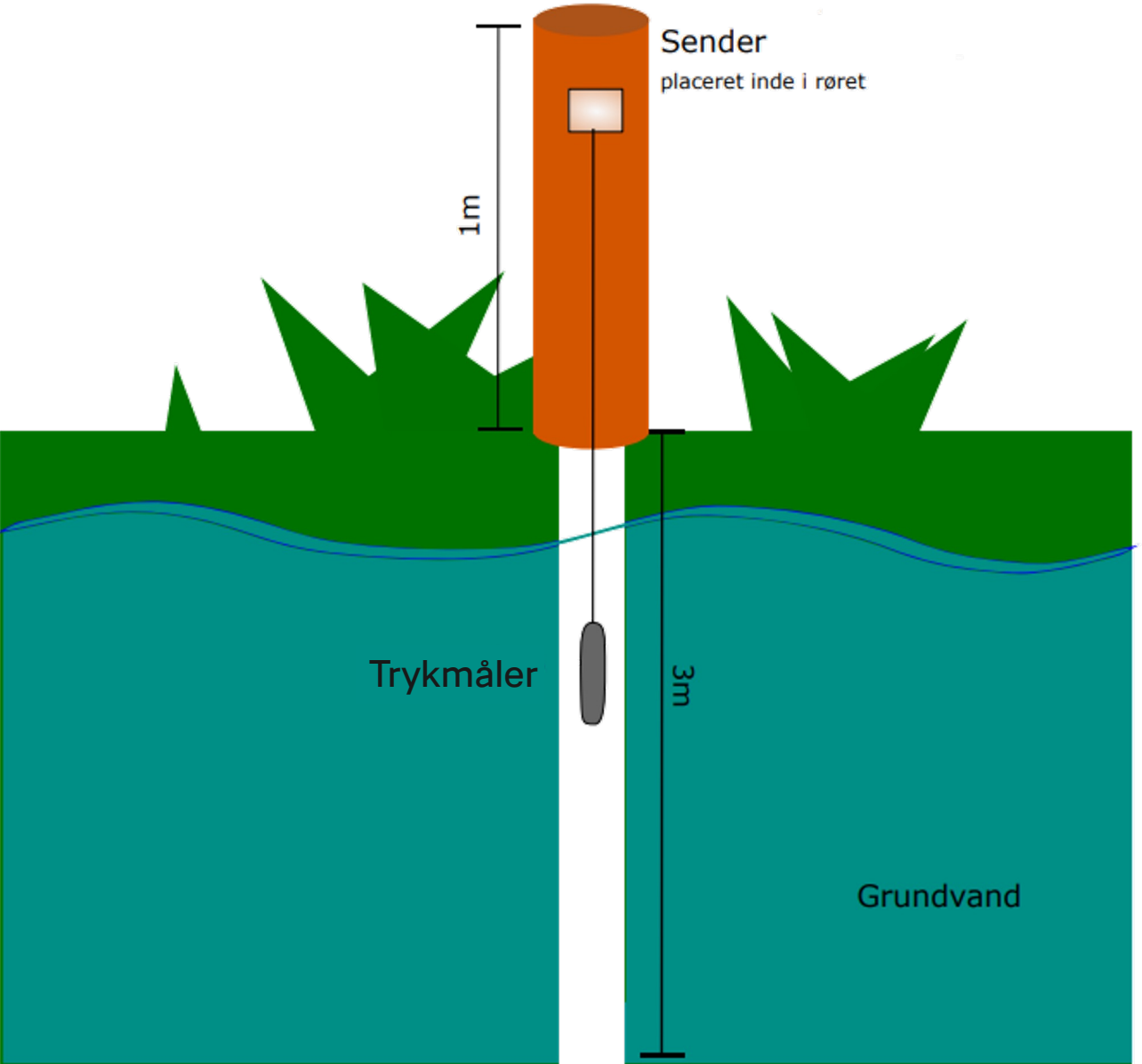
Risk of flooding from the sea, streams and rainfall



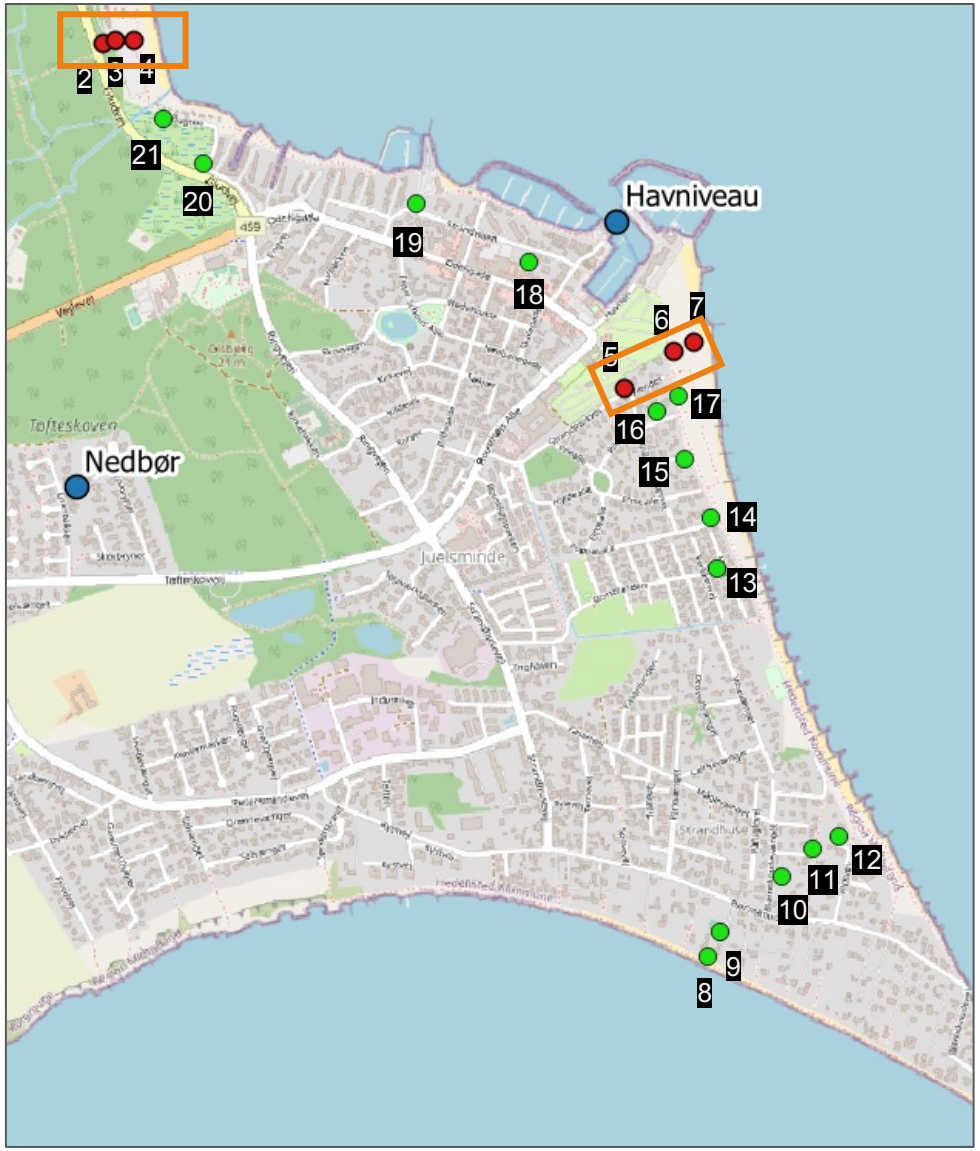
Forchhammer Mathiasen et al. *Short-Term Ocean Rise Effects on Shallow Groundwater in Coastal Areas: A Case Study in Juelsminde*.



Data collection (price?)



Data collection



Logger type	Logger no.	Distance to coast [m]
Rotek loggers	1	139
	2	139
	3	101
	4	52,5
	5	210
	6	91
	7	45,5
IoT loggers	8	25
	9	85
	10	237
	11	166
	12	95
	13	93
	14	93
	15	111
	16	153
	17	90
	18	106
	19	75
	20	122
	21	67

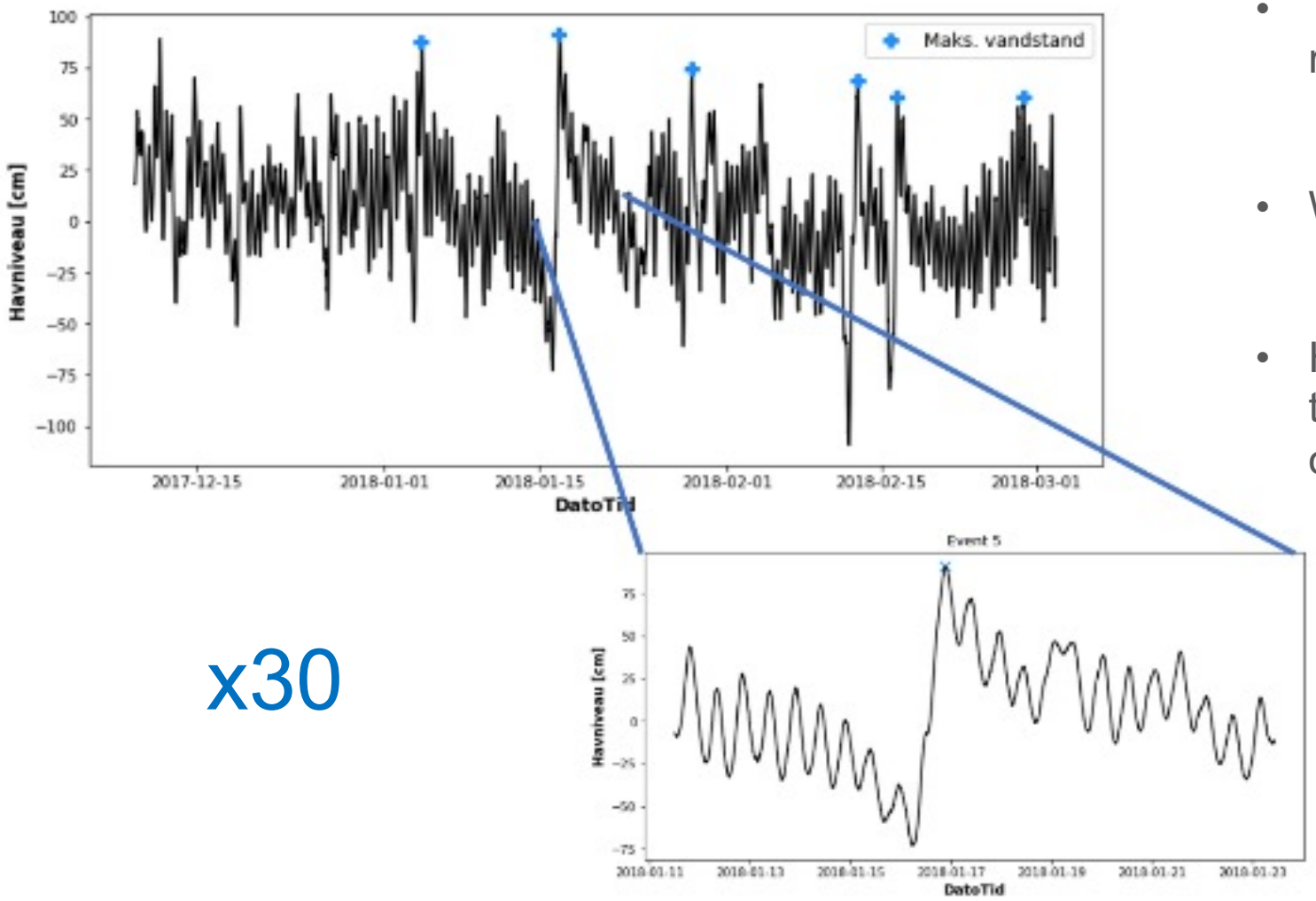
6 loggers from 2017

Investigate the impact of sea level changes on the groundwater level inland

14 loggers add from 2021

investigate the contribution of precipitation and spatial variation of the water table

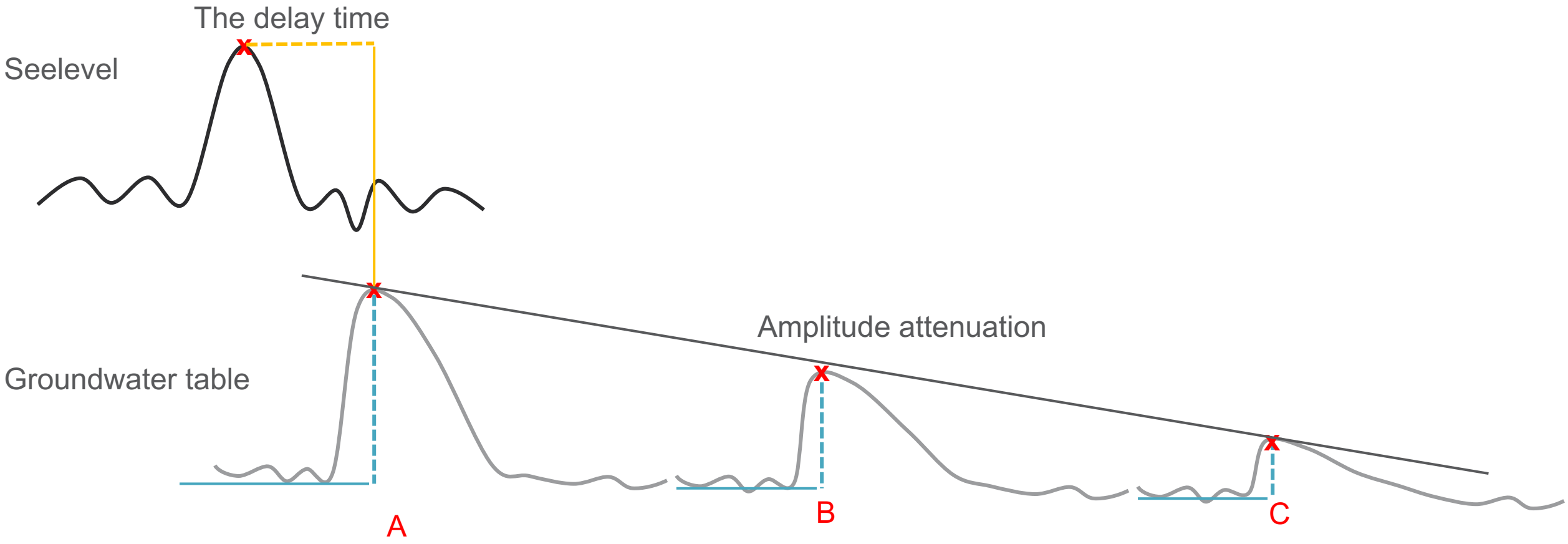
Method



x30

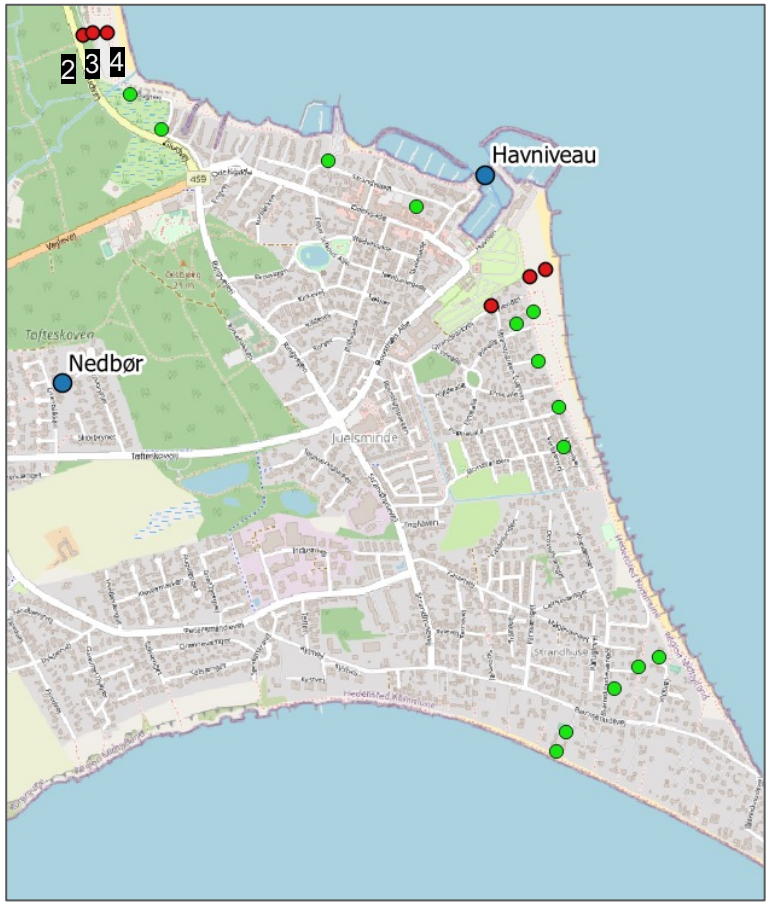
- To what extent can a sea level rise be recorded in the groundwater boreholes?
- When can the increase be recorded
- How does the rise in water level depend on the distance to the coast and the magnitude of the sea level rise

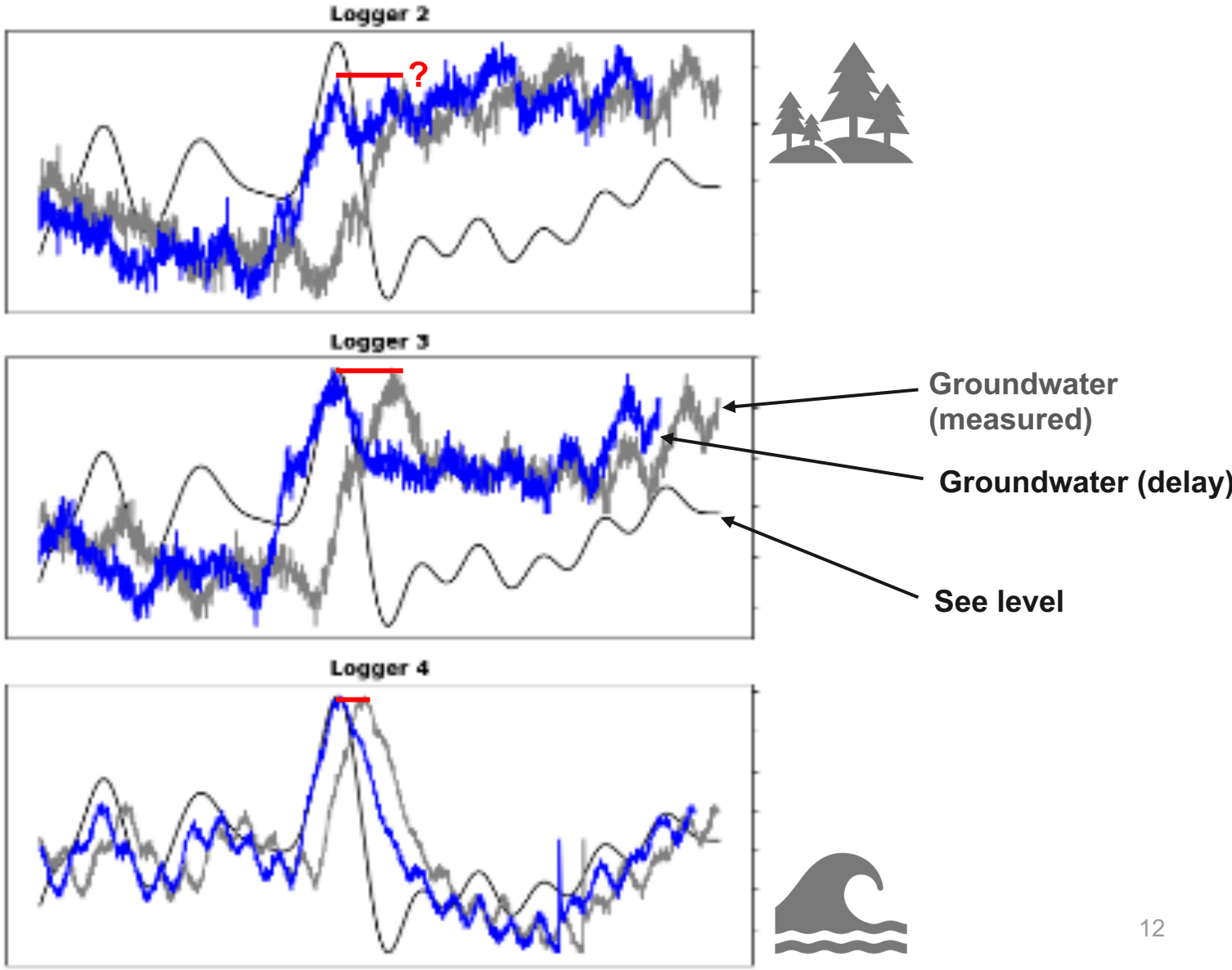
Method


The delay time
Seelevel
Groundwater table
Amplitude attenuation
A
B
C

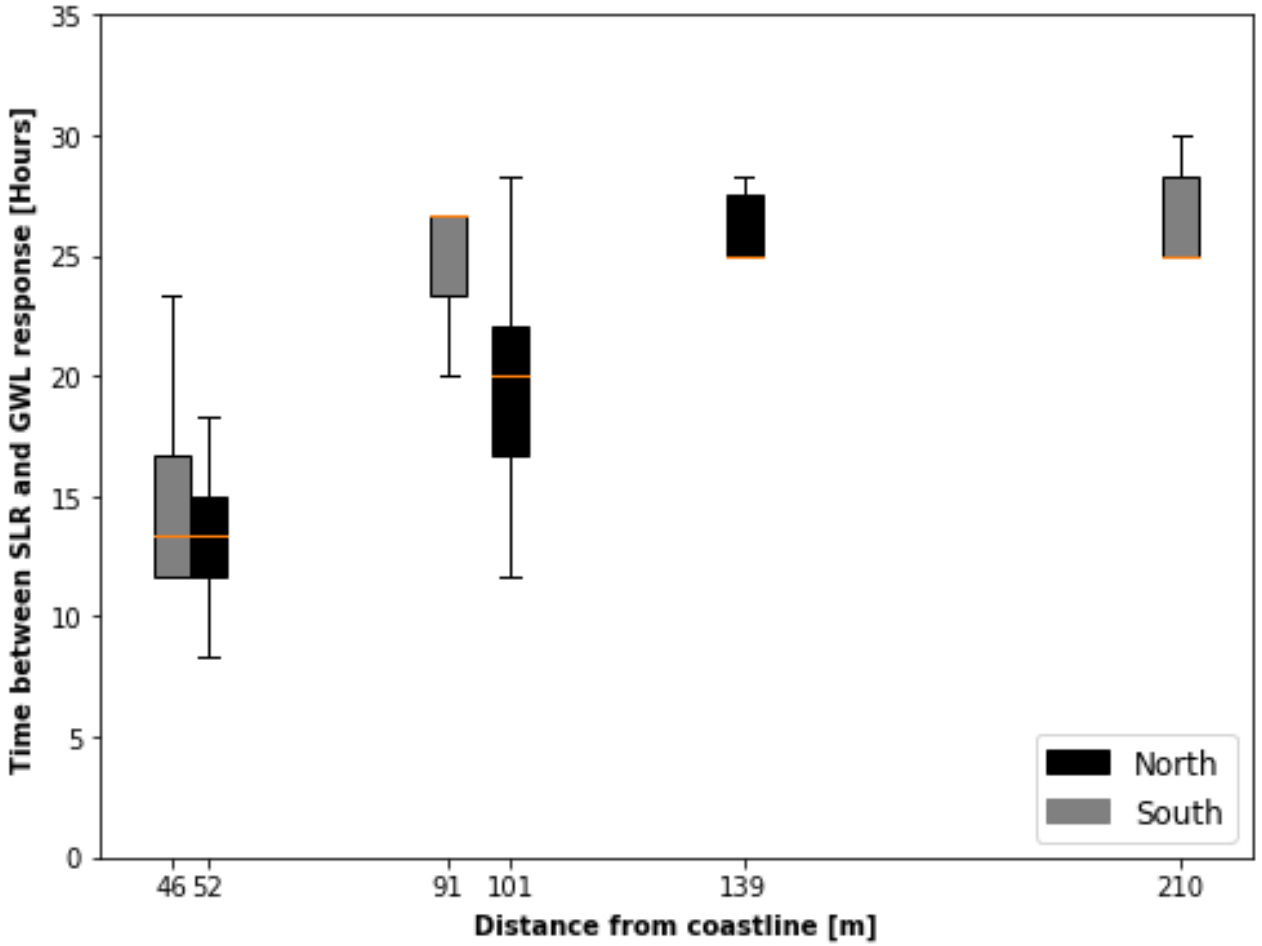
Method

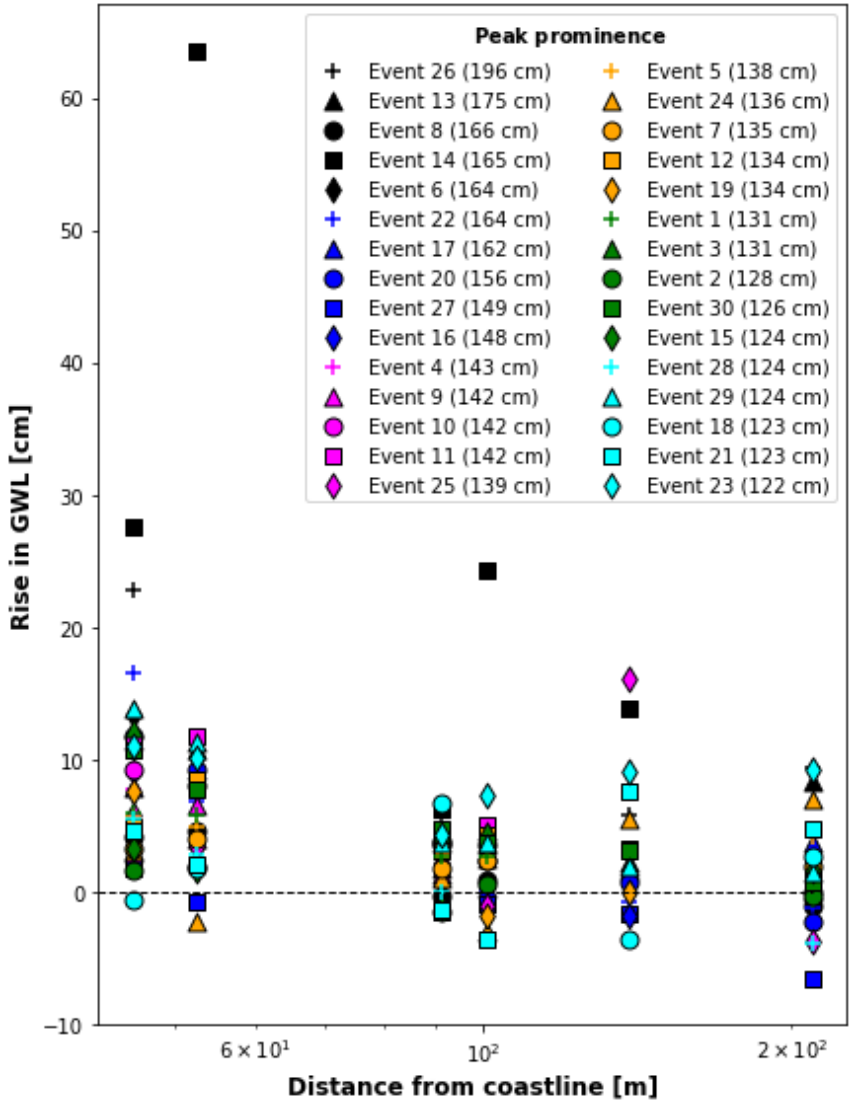
Northern profile





Results





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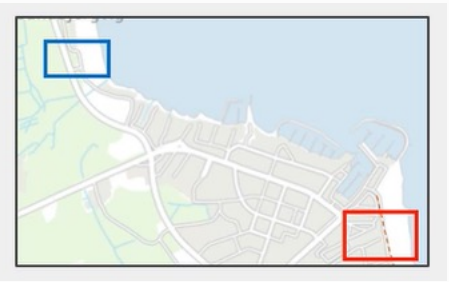
Example



Ca. 130 cm increase

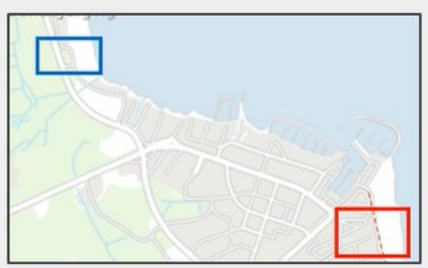
Example

Ca. 130 cm increase

~14 hour

~ 13 hour

Example

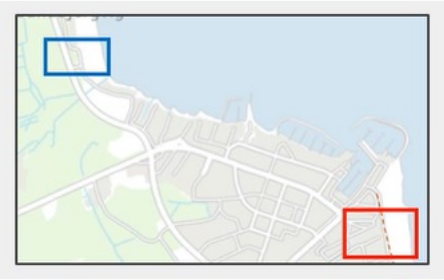


Ca. 130 cm increase

~20 hour

~ 25 hour

Example



Ca. 130 cm increase

~25 hour

+25 hour

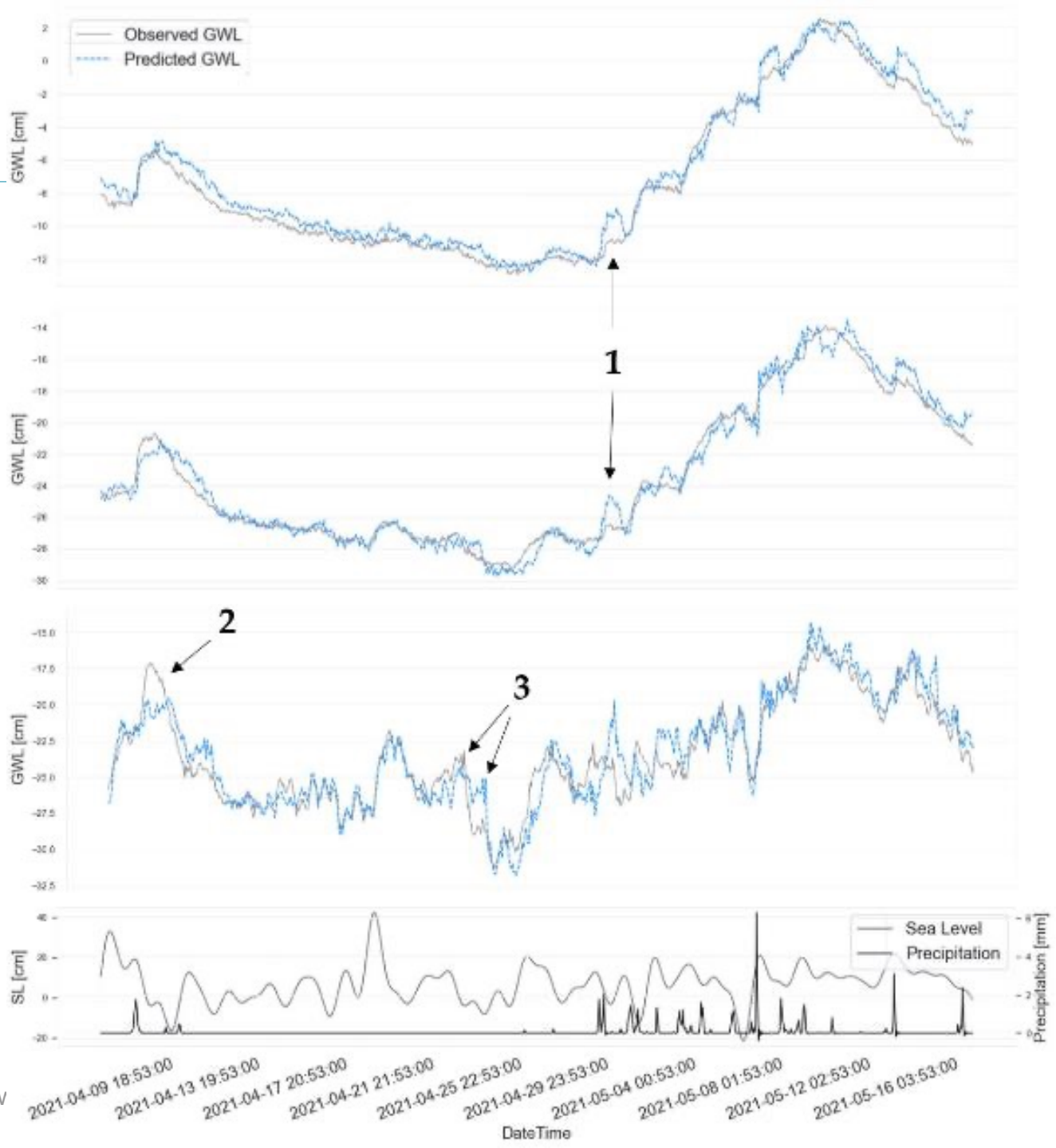
Model predictions

1-3 days in advance

Overall weaknesses

1. One is overestimation of the importance of precipitation.
2. It can have challenges with the more extreme rises in the water level.
3. It shows delay of own signal

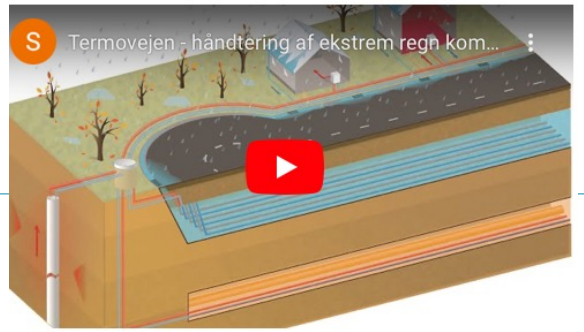
Use: Alert (an App), targeted drainage/pumpin and see the water as a ressource not a problem

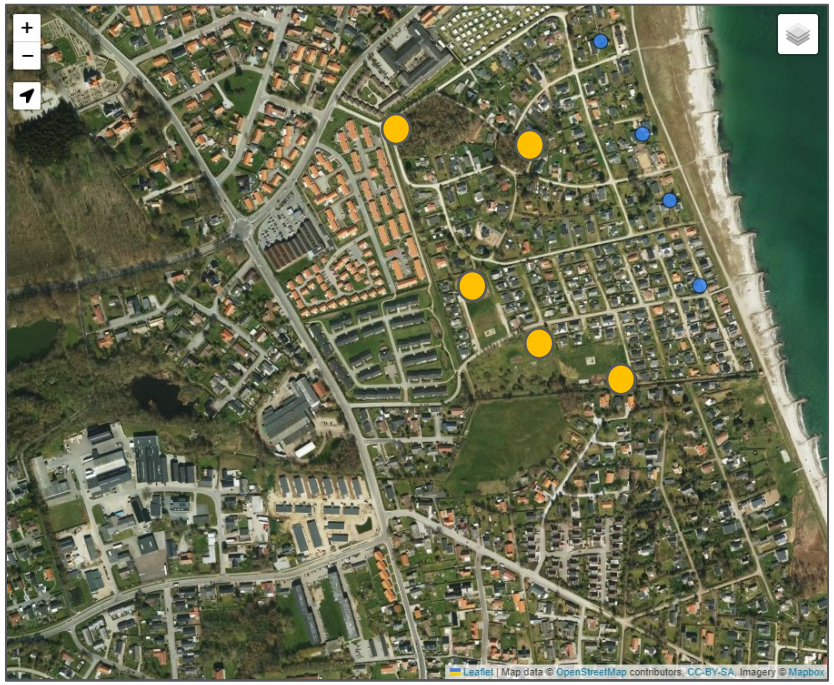


Categorization of boreholes/areas, whats next

Risikokort d. 24. Februar '22

Outlook





Open Access Article

Short-Term Ocean Rise Effects on Shallow Groundwater in Coastal Areas: A Case Study in Juelsminde, Denmark

by Ronja Forchhammer Mathiasen *, Emilie Padkær Haugan, Theis Raaschou Andersen, Henriette Højmark Hansen, Anna Bondo Medhus and Søren Erbs Poulsen

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Når havet kommer nedefra, Juelsminde

I fremtiden forventes stigende havniveau og flere kraftige storme. I Juelsminde, en lavtliggende kystby, sikrer man sig med diger imod direkte oversvømmelser fra havet. En sandet undergrund tillader dog passage under diget så havet kan få grundvandet til at stige og oversvømme byen nedefra. Artiklen præsenterer en undersøgelse af sammenhængen imellem havniveau og grundvandsstand.

Henriette Højmark Hansen, Ronja Cedergreen Forchhammer, Anna Bondo Medhus, Theis Raaschou Andersen & Søren Erbs Poulsen

I Hedensted Kommune mellem Horsens og Vejle Fjord ligger Juelsminde. En by med godt 4000 indbyggere. Som så mange andre danske byer, er Juelsminde placeret ved kysten. Syd for havnen, kun hundrede meter fra kysten ligger et sommerhusområde. Både byen og sommerhusområdet ligger få meter over havets overflade på hævet sandet havbund fra Litorinahavet /1/. Kysten er en erosionskyst, hvor havet konstant ændrer kystrækningen

råde mod de fleste havniveaustigninger (figur 1). Alligevel er der planer om at forhøje diget til minimum 2,5 m for at sikre beskyttelse imod 100-års hændelser /4/. Selvom diget kan beskytte mod direkte oversvømmelse kan områdets beboere dog stadig ikke vide sig sikre i forhold til indirekte oversvømmelse fra havet.

Grundvandsstigninger ved højt havniveau

I perioder uden kraftig nedbør, men med forhøjet havvandstand, er der observeret

RESIST

HEDENSTED KOMMUNE

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