WP1.1

MEASURING AND MONITORING

METEN EN MONITOREN

Philip Conroy

Ramon Hanssen (promotor)

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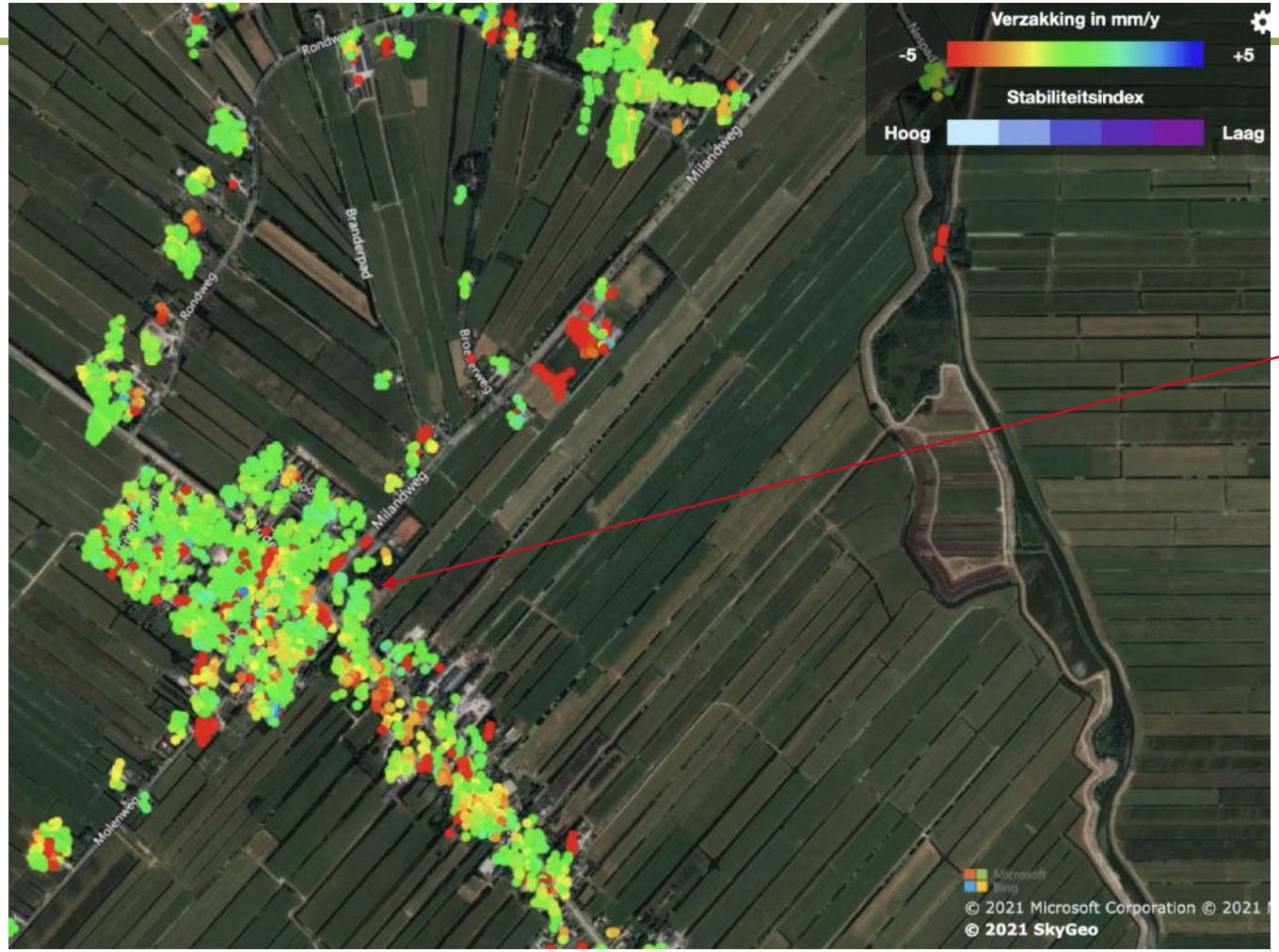
INSAR: MEASURUNG GROUND MOVEMENT FROM SPACE
INSAR: METEN VAN BODEMBEWEGINGEN VANUIT DE RUIMTE



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Houses and other structures provide strong, stable reflections

- *Can currently be monitored*

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INSAR: MEASURUNG GROUND MOVEMENT FROM SPACE
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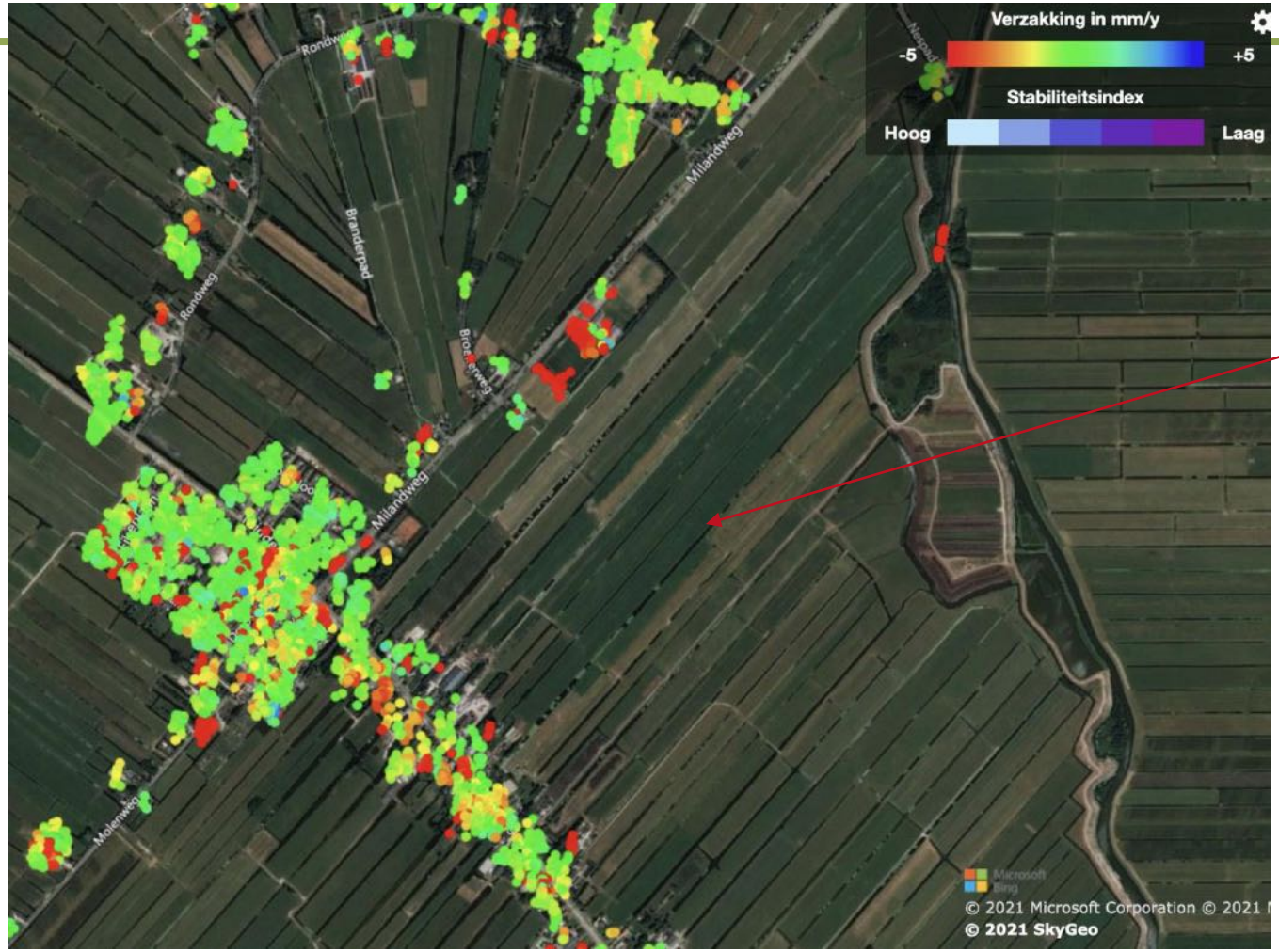

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Agricultural areas give only unstable, noisy reflections

- *Cannot currently be monitored*

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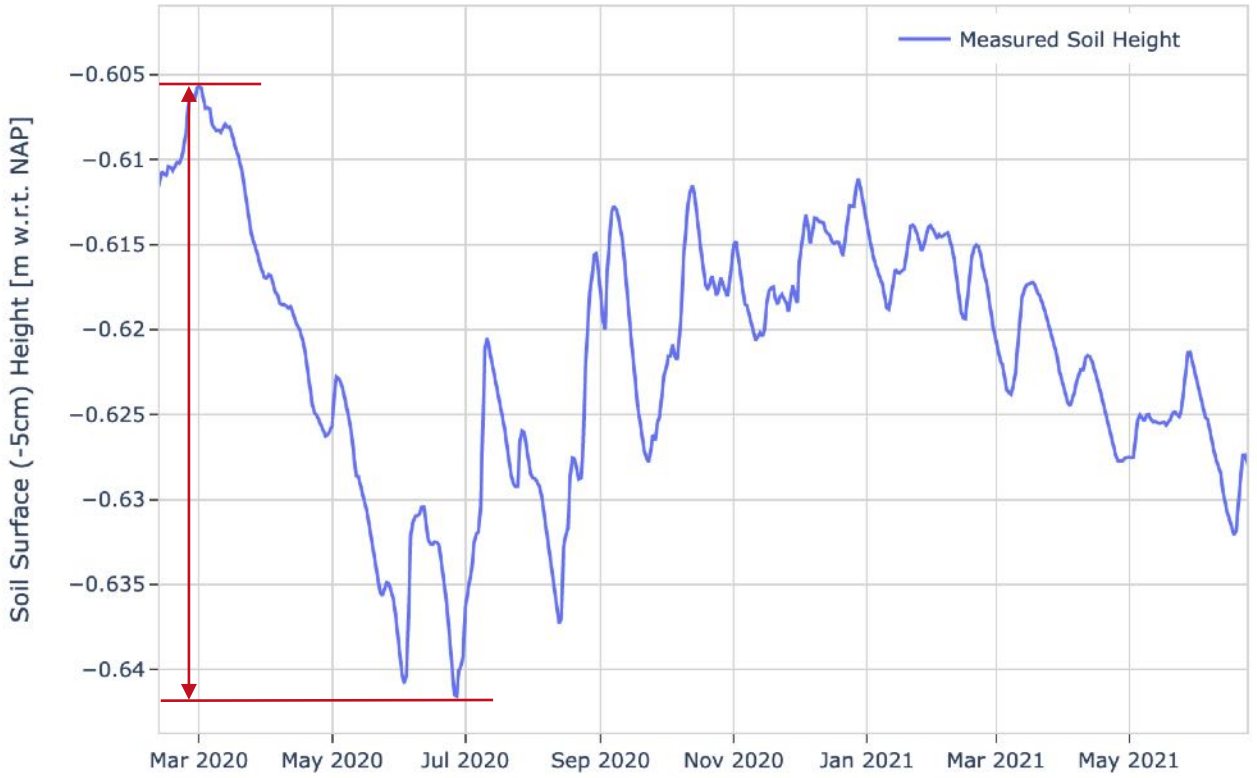
CHALLENGES
UITDAGINGEN



~ 4 cm

Shallow, rapid soil motion is
an order of magnitude larger than deep, long-term subsidence

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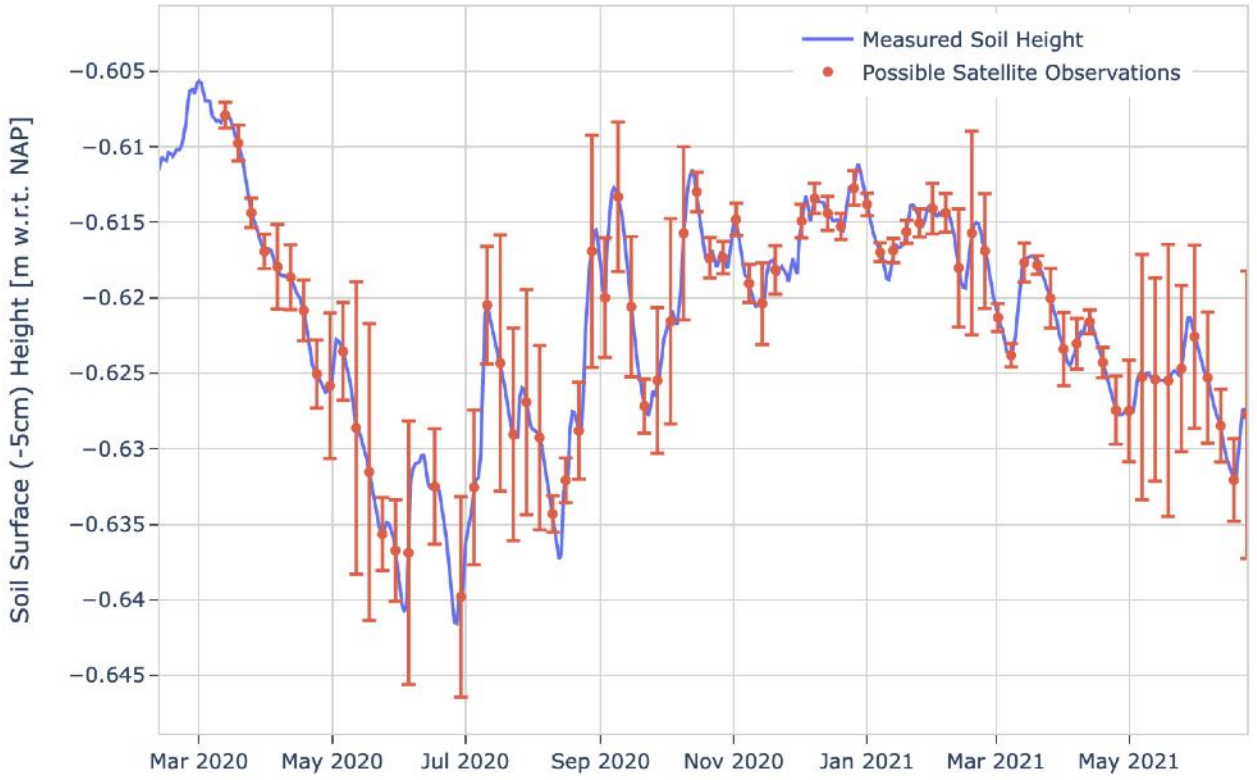
UITDAGINGEN



Error bars = 1σ

Only one observation per 6 days is possible

Large & seasonal effect of noise

Noise and rapid changes can force phase unwrapping errors

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ESTIMATING LINEAR VELOCITIES
HET SCHATTEN VAN LINEARE SNELHEDEN

End users often want linear subsidence rates

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ESTIMATING LINEAR VELOCITIES
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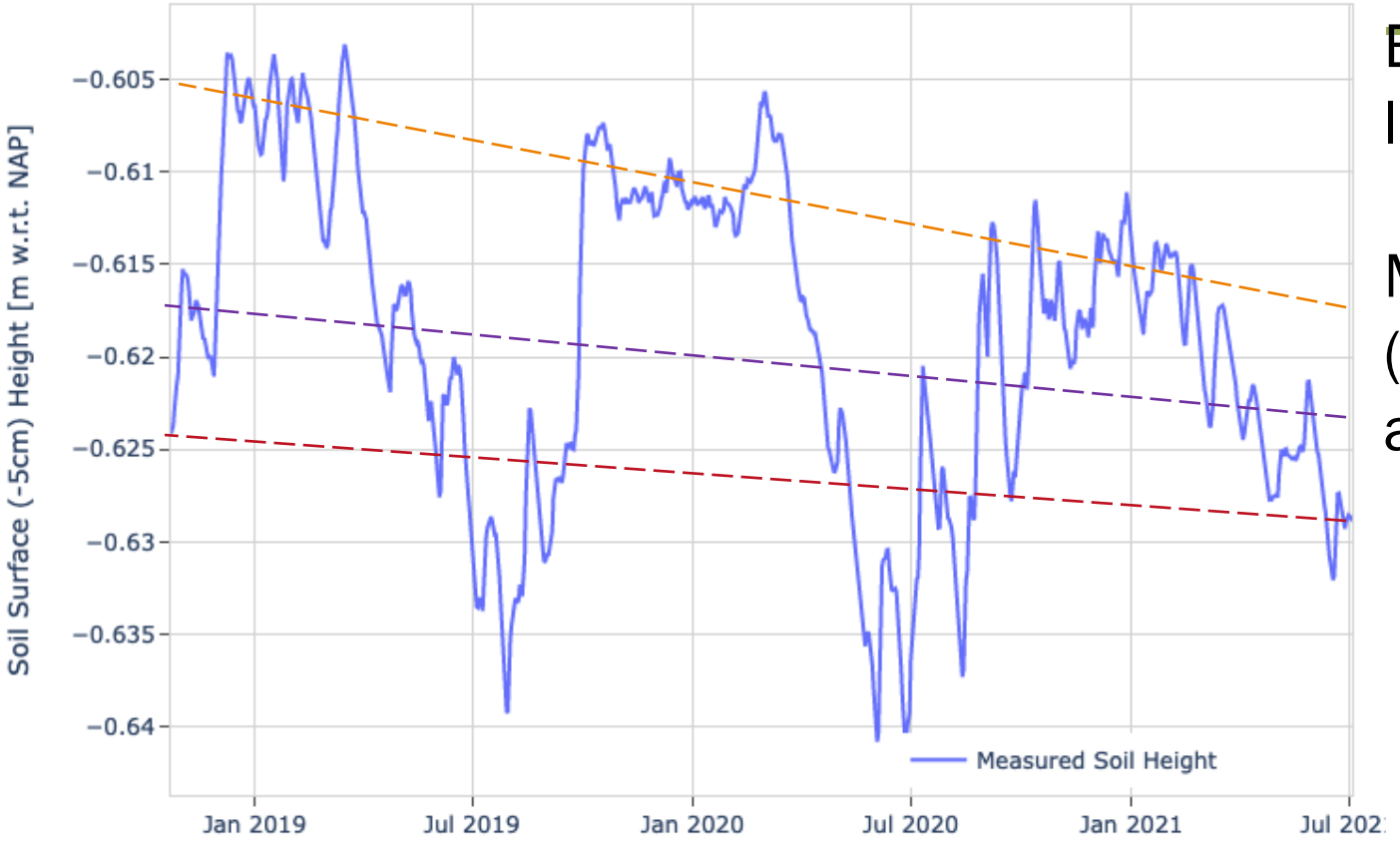

End users often want linear subsidence rates

Many (mis)interpretations are possible!

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TNO innovation for life

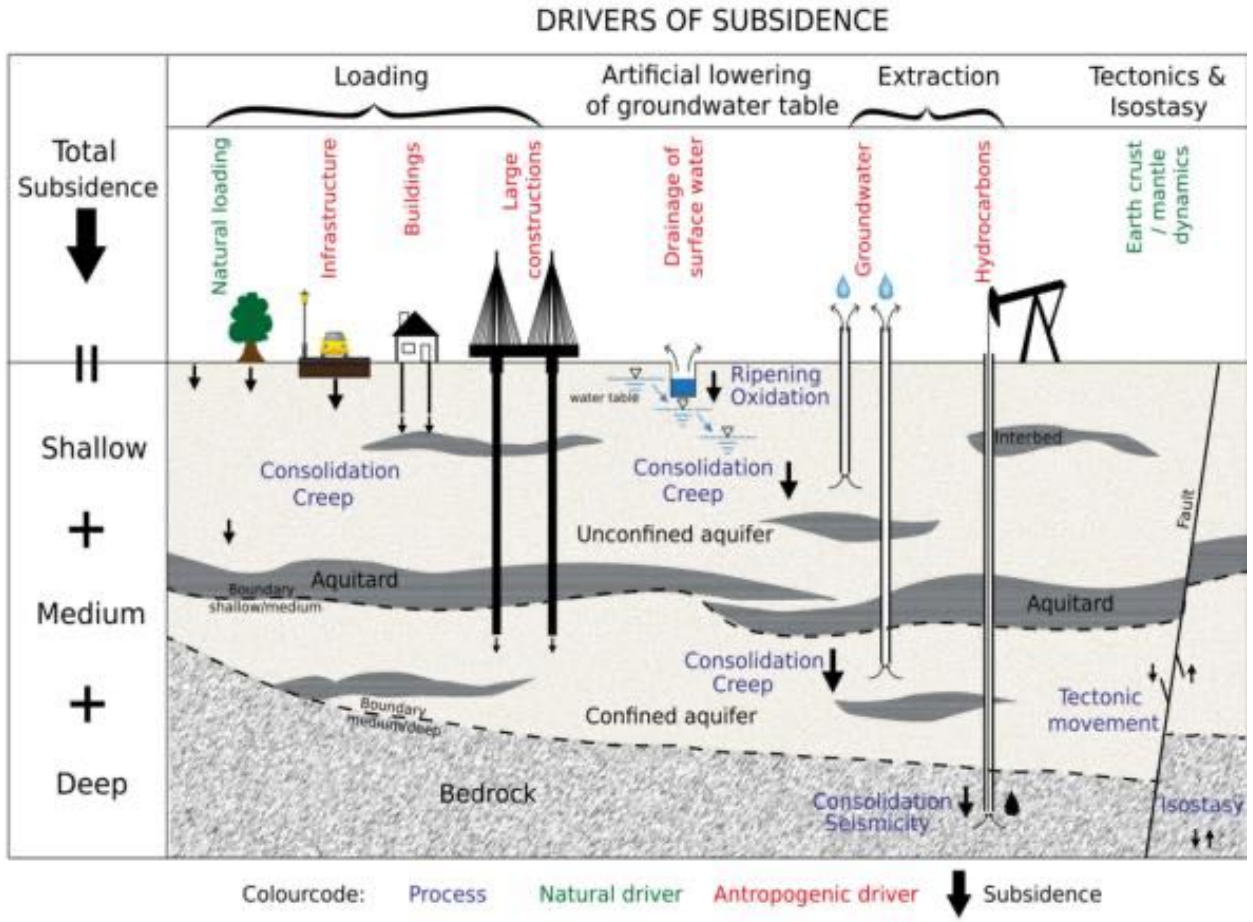
DISENTANGLING AND PARAMETERIZING THE TOTAL SIGNAL OF SUBSIDENCE

AN INVERSION APPROACH APPLIED TO VARIOUS CASE STUDIES IN THE NETHERLANDS | M.A.M. VERBERNE

THE PROJECT

- Search intresting case studies
(i.e. signals from several depths, elaborate dataset)

- Disentangle the signal by Data Assimilation
(and machine learning)



Promotor:
Hans de Bresser (UU)

Supervisor:
Peter Fokker (TNO)

STATUS

ACHIEVEMENTS AND GOALS

Achievements

- Developed a data assimilation approach to disentangle deep and shallow signal, tested on synthetic data
- Recognised dependency subsidence measurements on soil moisture content

Goals

- Recognition of shallow parameters of peat oxidation and compaction of peat and clay in subsidence signal
- Succesfull disentangelement of subsidence processes in areas with combined signals
    - Proves correctness subsidence models
    - Helps in future estimates and mitigation

WP1.3 Background Subsidence, relative SLR and GIA in the Netherlands

Kim de Wit

Soft soil & Anthropogenic ≈ WP2 [mm-cm/yr]

$$Total\ Subsidence = Compaction + Oxidation + Resource\ extraction + GIA + Hydro\ isostasy + Sediment\ isostasy + Tectonics$$

Natural "background" subsidence = WP1.3 [(0.1)mm/yr]

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- Wouter van der Wal (TU Delft)
- Paolo Stocchi (NIOZ)

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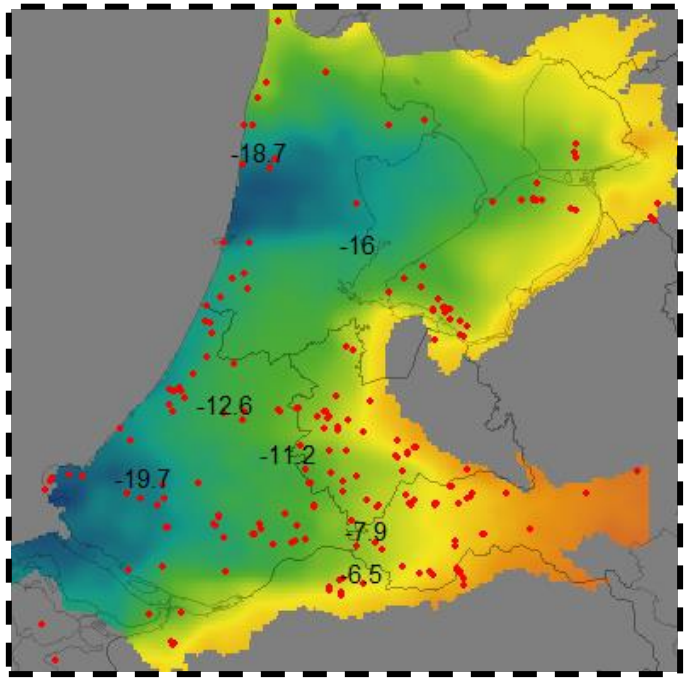
WP1.3 BACKGROUND SUBSIDENCE, RELATIVE SLR AND GIA IN THE NETHERLANDS

<u>Aim:</u> Disentangling background subsidence in the NL (specifically GIA)

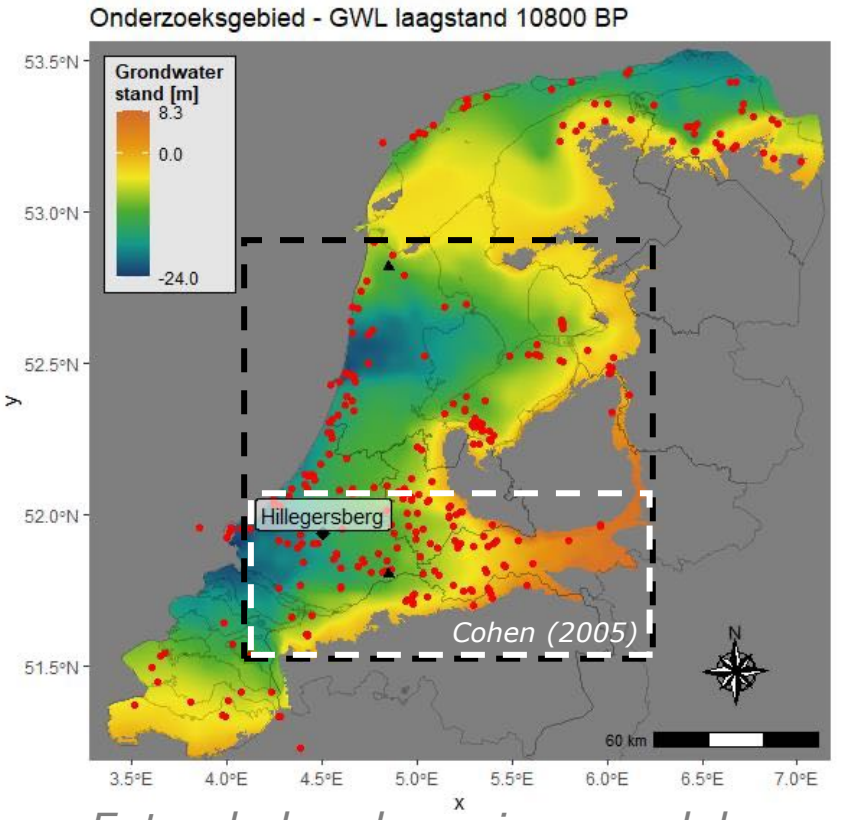
- Improved spatial reconstruction of glacial isostatic adjustment (GIA)
- Spatial reconstruction of Holocene relative sea level rise

<u>Activities</u>:

- Extend 3D Holocene groundwater level (GWL) interpolation to entire Dutch coastline (in progress)



Model area Koster et al. (2017)



Extended and previous model areas

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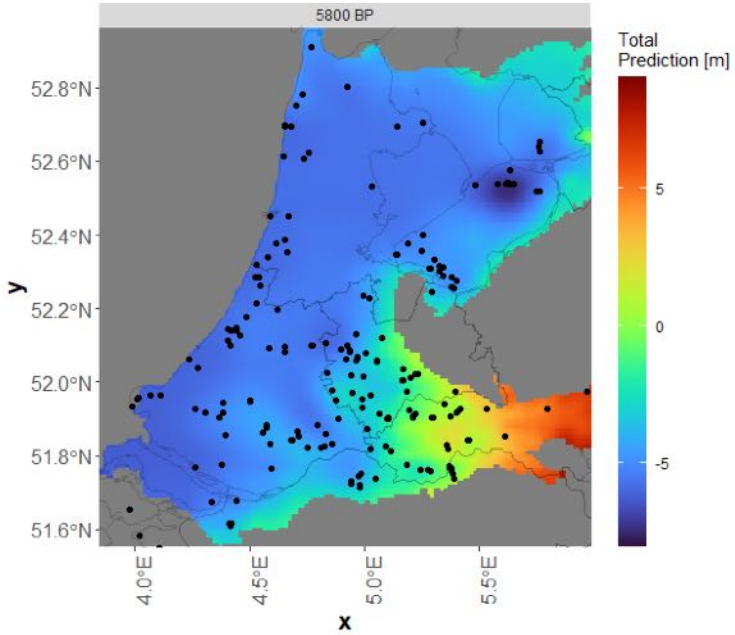
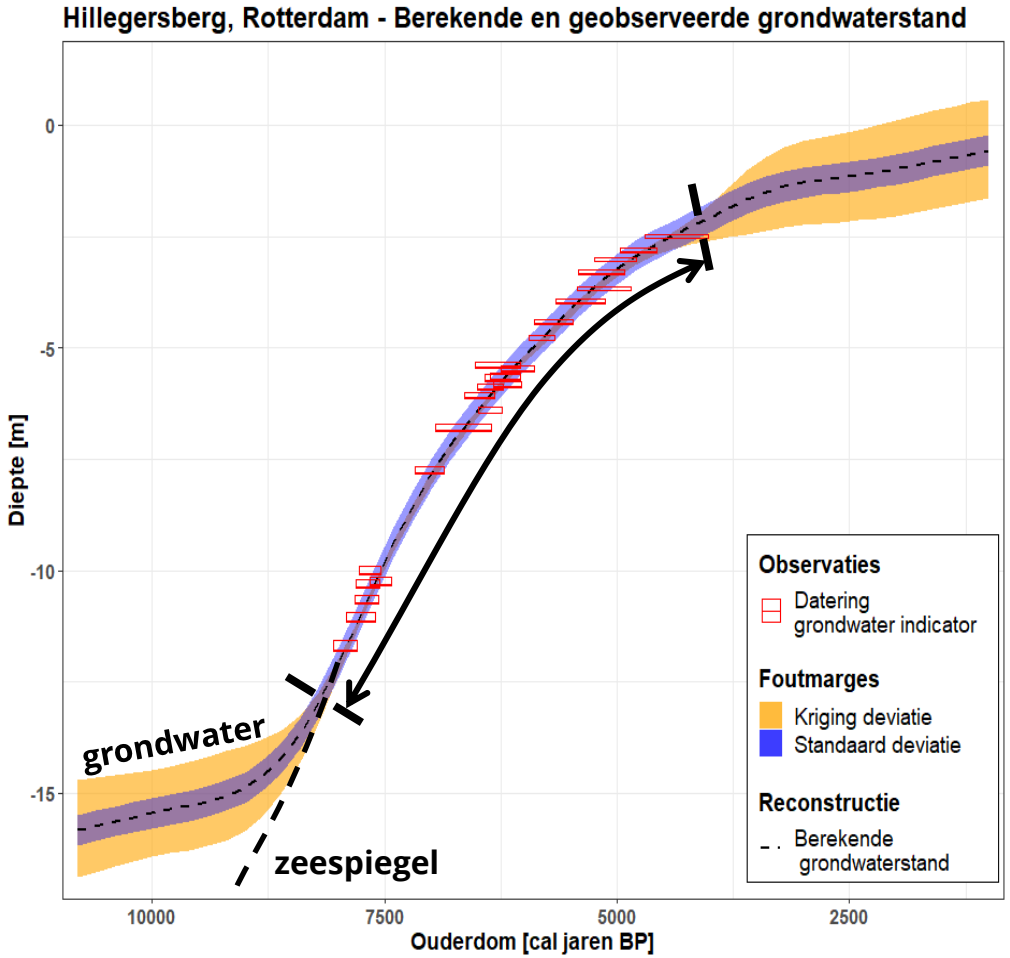
WP1.3 PROGRESS AND PLANNING

Activities:

- Extract differential subsidence from 3D GWL interpolation (in progress)
- Couple 3D GWL interpolation with GIA models (planned)
- First paper about 3D GWL interpolation ~start of 2022



Example of GWL prediction at 5800 BP



Observations from Van de Plassche (1982)

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CONSORTIUM

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PLATFORM SLAPPE BODEM
sterke samenwerking

Ministerie van Infrastructuur en Waterstaat

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PROVINCIE UTRECHT

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HOOGHEEMRAADSCHAP DE STICHTSE RIJNLANDEN

Drents Overijsselse Delta

Tauw