Combing geophysical methods to investigate the salt/ freshwater interface at the vicinity of water extraction facilities
Hermans et al. (2012)
Methods

**Geophysics:**
- Frequency domain electromagnetics
- Electrical resistivity tomography
- Continuous resistivity profiling

→ electrical conductivity/resistivity ~ water quality

- Fast mapping fresh-/salt water interface
- Relatively large spatial coverage
FDEM

CMD-Mini explorer

Visconti & de Paz (2016)
FDEM

DUALEM-421S
FDEM IN HIGHLY CONDUCTIVE ENVIRONMENT

Pseudodepth ≈ 0.9-1.8m

Paepen et al. (in progress)
FDEM IN HIGHLY CONDUCTIVE ENVIRONMENT

Paepen et al. (in progress)

McNeil (1980)

\[
\frac{H_S}{H_P}_V \approx \frac{H_S}{H_P}_H \approx \frac{iB^2}{2} = \frac{i\omega \mu_0 \sigma S^2}{4}
\]

FIGURE AIV. Plot of indicated conductivity for EM31 versus true (homogeneous half-space) conductivity for both vertical ($\sigma_V$) and horizontal ($\sigma_H$) dipoles.
FDEM IN HIGHLY CONDUCTIVE ENVIRONMENT

Hanssens et al. (2019)

\[ QP = \frac{ECa \cdot \mu_0 \cdot \omega \cdot r^2}{4} \cdot 10^3 \]
FDEM IN HIGHLY CONDUCTIVE ENVIRONMENT

Pseudodepth $\approx 0.9-1.8m$

Conductivity (mS/m)

Paepen et al. (in progress)
ERT ON LAND
Results

Paeppen et al. (in progress)
Conductivity (mS/m)

Resistivity (Ωm)

Paepen et al. (in progress)
Resistivity logging

Resistivity of the well surrounding sediments $P_m$, measured with the long normal device (AM X1m):

- $P_m > 20 \, \Omega \cdot m$
- $25 \, \Omega \cdot m < P_m < 20 \, \Omega \cdot m$
- $P_m < 25 \, \Omega \cdot m$
- Impermeable substratum
- Level in m TAW

Lebbe (1981)

Resistivity ($\Omega \cdot m$)

Paeppen et al.
(in progress)
Resistivity (Ω m)

Paepen et al. (in progress)
Pseudodepth \( \approx 6\) m

Paepen et al. (in progress)
Conclusions

ERT/ CRP/FDEM:
- Qualitative interpretation
- Spatial variation

“De Westhoek”
- Freshwater discharge
- Saltwater lens
- Shift zone SGD
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RG Project
Quantitative and qualitative assessment of the fresh groundwater discharge in the Belgian coastal area.