




GEUS

Fremtidens grundvandsovervågning og –varsling

Anders R. Johnsen

Geological Survey of Denmark and Greenland
Danish Ministry of Climate, Energy and Building

	Fund (% indtag)	>0,1 µg/L (% indtag)
1,2,4-triazol	32*	1,4*
Desphenyl chloridazon	29*	17*
Methyl-desphenyl chloridazon	17*	4,7*
2,6-Dichlorbenzamid (BAM)	20,3	7,8
DEIA (Desethyl-desisopropyl-atrazin)	14,9	3,5
Desisopropyl-atrazin	11,1	1,7
Didealkyl-hydroxy-atrazin	7,7	1,3
Desethyl-atrazin	7,3	1,4
Bentazon	6,8	2
Glyphosat	6,3	1,3
Atrazin	5,3	1,1
Desamino-diketo-metribuzin	5,1	1,7
AMPA	4,4	1,1
Dichlorprop	4,3	1,3
Mechlorprop	3,7	1
Diketo-metribuzin	3,6	1,2
Deisopropyl-hydroxy-atrazin	3,6	0,2
CGA 62826	2,8	0,1
Simazin	2,6	0,4
4-CPP	2,3	0,8
MCPA	2	0,3
Hexazinon	2	0,4
Deethyl-hydroxy-atrazin	1,9	0,1
Hydroxy-atrazin	1,8	0,1
Ethylthiourea	1,7	0,2
Metribuzin	1,5	0,5
Dichlobenil	1,4	0,1
Pendimethalin	1,3	0,1
Dinoseb	1,3	0,3
2,4-D	1,3	0,2
Terbutylazin	1,2	0
Desethyl-terbutylazin	1,2	0

Pesticidfund i GRUMO indtag 1990-2016

+ 23 stoffer med >0,1 µg/L i mindst
0,2% af de undersøgte indtag
+ 9 stoffer med færre fund
+4 stoffer uden fund
I alt 69 stoffer

*GRUMO screeningsundersøgelse

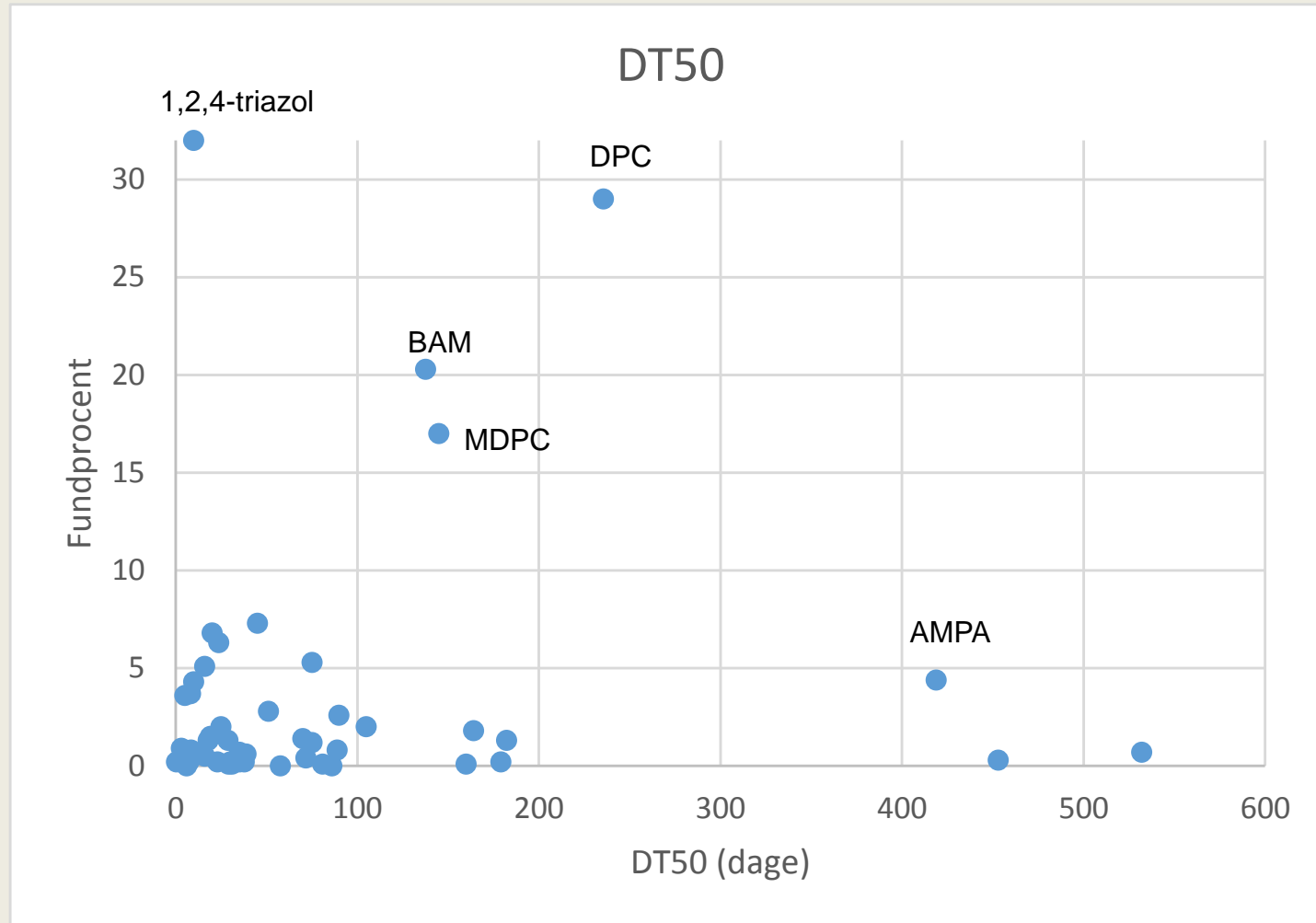
Sorption (Kf)

Nedbrydning DT50

GUS-index

SCI-GROW groundwater index

Nedbrydning

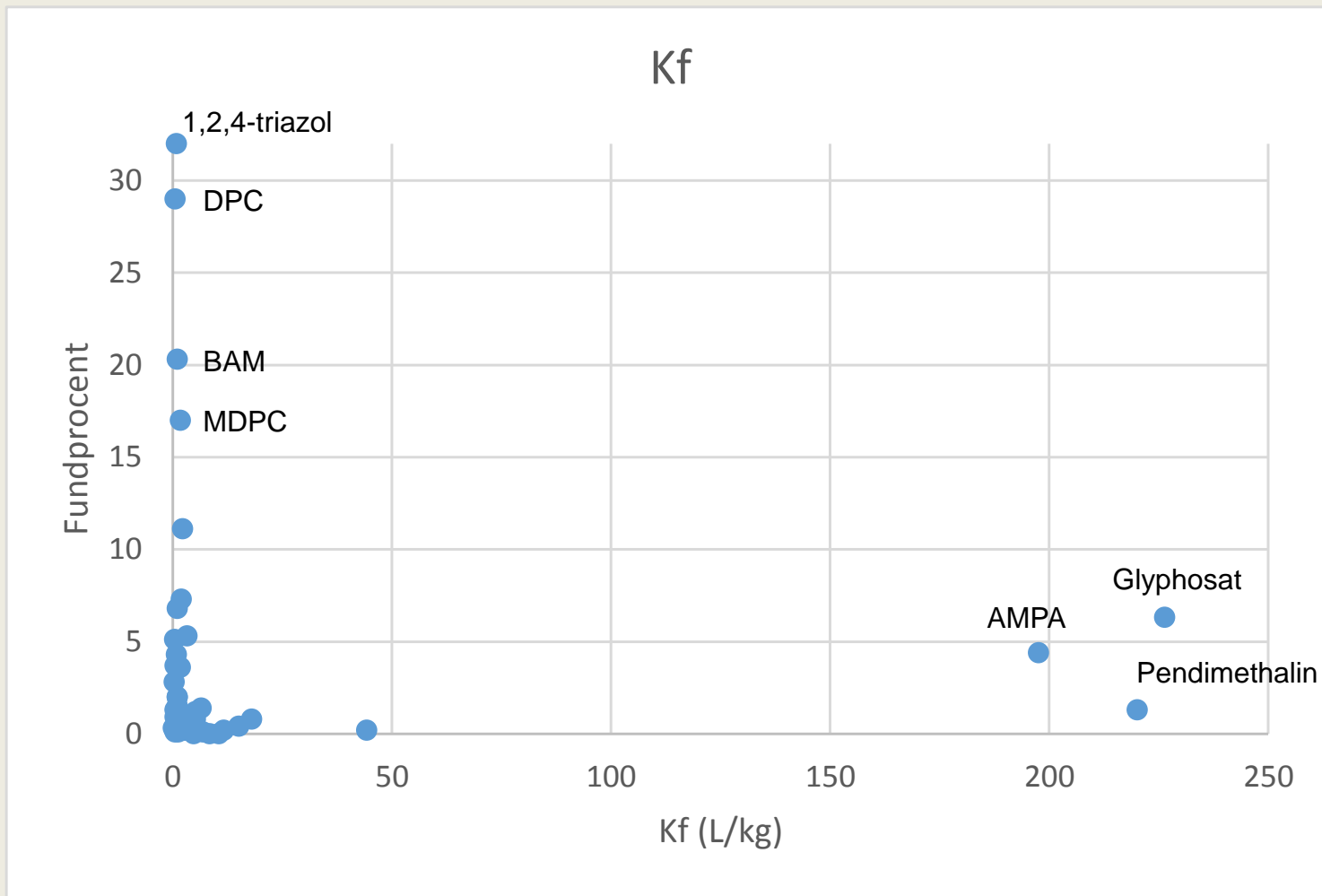


Reference:

PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>

DT50 field eller typisk (højeste valgt af de to)

Mobilitet

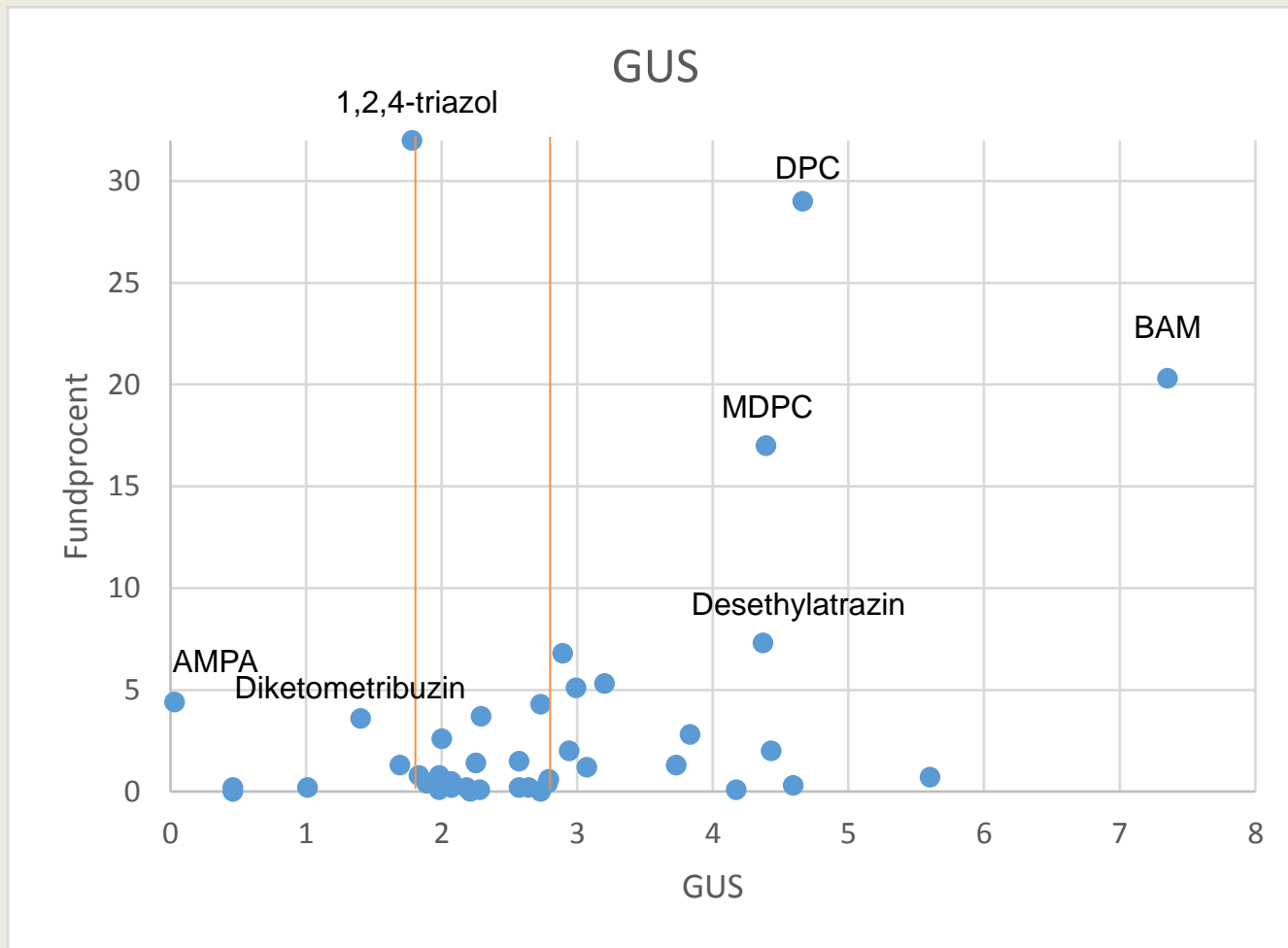


Reference:

PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>

I nogle tilfælde er Kf beregnet ud fra Kfoc og et antaget organisk kulstof indhold på 1,7%

GUS – Groundwater Ubiquity Score

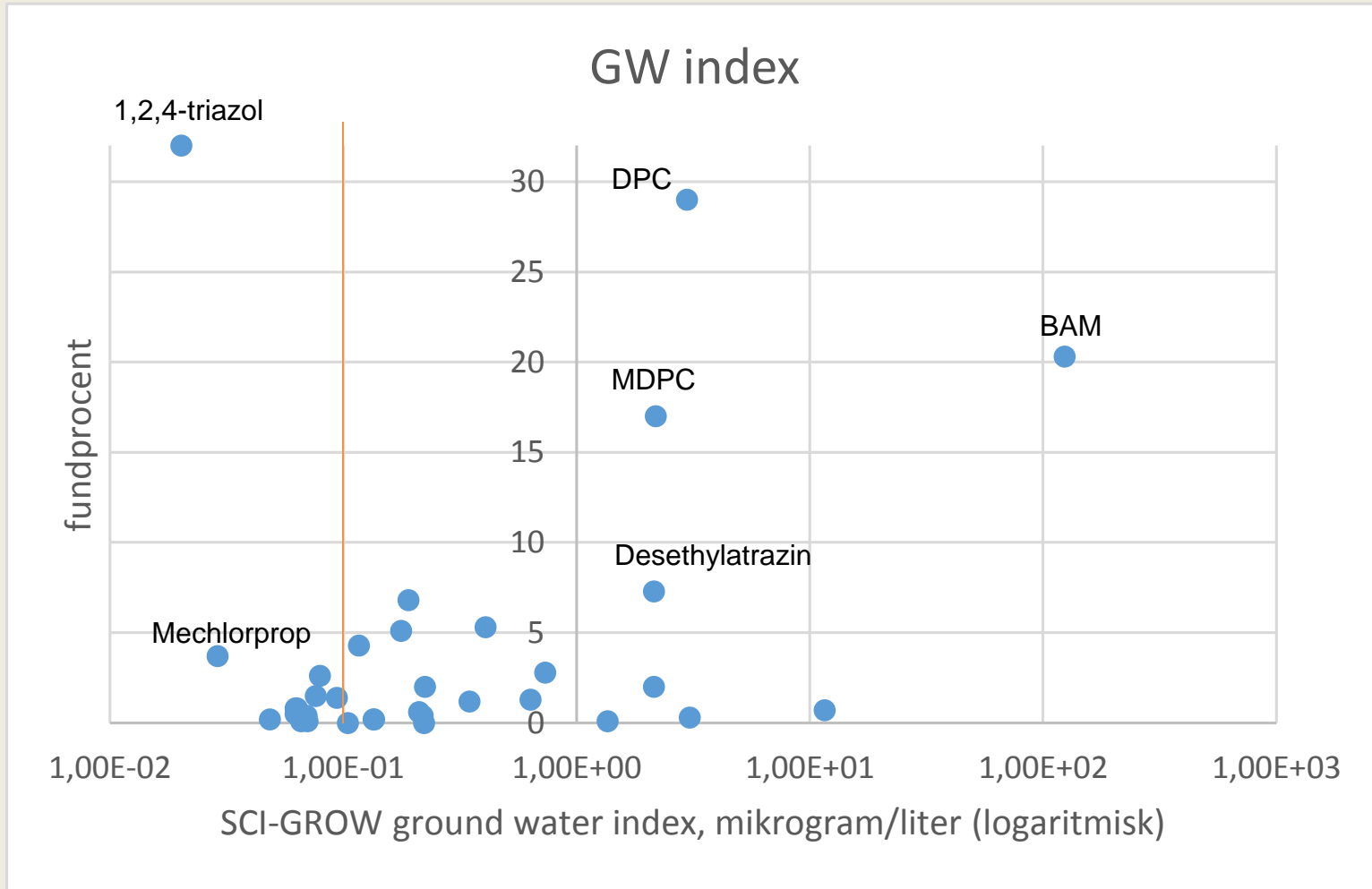


GUS
 $= \log(\text{DT50}) \times (4 - \log(\text{Koc}))$

>2,8: stor risiko
 1,8-2,8 moderat risiko
 <1,8 lille risiko

Reference:
 PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>
 Gustafson, DI (1989). Environ Toxicol Chem 8:339-357

Model – SCI GROW grundvandsindex



Reference:
 PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>
 US-EPA: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/about-water-exposure-models-used-pesticide#scigrow>

Nedbrydningsprodukter

Eksempel fra PPDB: atrazin

PPDB: Pesticide Properties DataBase

University of
Hertfordshire



Select Option

- Home
- A to Z
- Search
- Terms & Conditions
- Support Information
- Purchasing & Other Services
- Video User Guides

GET ADDITIONAL DATA HERE!

PhD Opportunity with Syngenta & the University of Hertfordshire

Find us on: facebook

Like 838 Share

pH sensitivity -

Key metabolites:

Metabolite	Formation medium	Estimated maximum occurrence fraction	1107/2009 relevancy
6-deisopropyl atrazine (Ref: G-28279)	Soil	0.33	Major, Relevant
deethylatrazine (Ref: G-30033)	Soil	0.21	Major, Relevant
2-hydroxyatrazine (Ref: G-34048)	Soil	-	Non Relevant

Other known metabolites:

Metabolite name and reference	Aliases	Formation medium / Rate	Estimated maximum occurrence fraction	Metabolising enzymes
deisopropyldeethylhydroxyatrazine (Ref: G-17791)	-	Soil	0.004	-
deisopropylhydroxyatrazine (Ref: G-17792)	-	Soil	0.08	-
deethylhydroxyatrazine (Ref: G-17794)	-	Soil	0.08	-
deisopropyldeethylatrazine (Ref: G-28273)	-	Soil	0.08	-



DEIA 2016
Fund: 13,8%
>0,1 µg/L: 1,5%

Referencer:

PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>

Thorling m.fl., 2018. Grundvand. Status og udvikling 1989-2016. GEUS.

Nedbrydningsprodukter

Eksempel fra PPDB: tolylfluamid

University of Hertfordshire
PPDB: Pesticide Properties DataBase

Select Option

[Home](#)

[A to Z](#)

[Search](#)

[Terms & Conditions](#)

[Support Information](#)

[Purchasing & Other Services](#)

[Video User Guides](#)

GET ADDITIONAL DATA HERE!

PhD Opportunity with Syngenta & the University of Hertfordshire

f Find us on: **facebook**

Like 838
 Share

Key metabolites:

Metabolite	Formation medium	Estimated maximum occurrence fraction	1107/2009 relevancy
N,N-dimethyl-N'-p-tolylsulphamide	Soil	0.737	Major fraction, Relevant

Other known metabolites:

Metabolite name and reference	Aliases	Formation medium / Rate	Estimated maximum occurrence fraction	Metabolising enzymes
4-(dimethylaminosulfonylamino)-benzoic acid	-	Rat	-	-
thiazolidine-2-thione-4-carbonic acid	-	Rat	-	-
4-hydroxymethyl-DMST-glucoside	-	Plant	0.460	-
2-hydroxyphenyl-DMST-glucoside	-	Plant	0.130	-
4-(dimethylaminosulfonylamino)hippuric acid (Ref: KUE 5156)	TTCA	Rat	-	-

Dimethylsulfamid?

Referencer:
 PPDB Pesticides Properties Database, <https://sitem.herts.ac.uk/>

Sprækketransport



0-1 meter under terræn:
To blotlagte sprækker. Mange ormegange
er forbundet med de større sprækker. Stevns

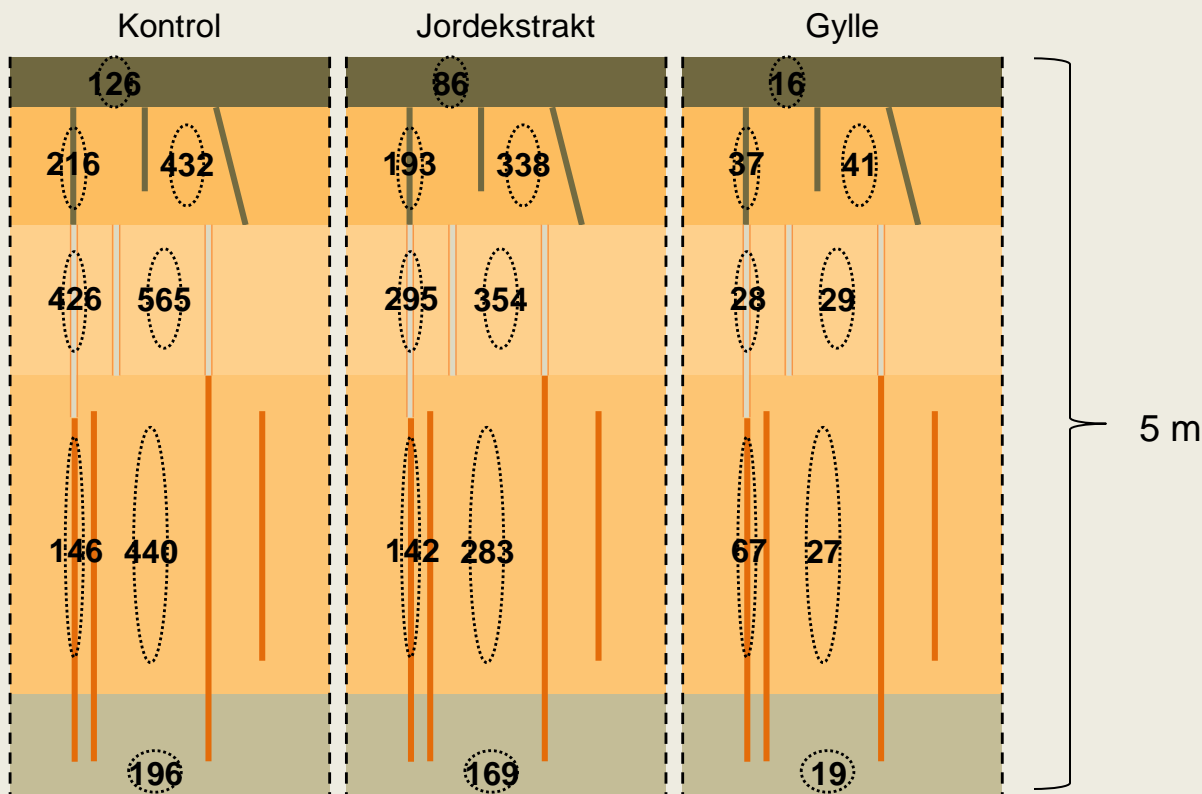
2,0-3,9 meter under terræn:
Lange tektoniske sprækker
med udfældninger. Stevns.



Gedser Odde



Sorption varierer - glyphosat



Forskellige vandfaseres effekt på glyphosats sorption (KFex) i otte jorddomæner i opsprækket moræneler. De angivne KFex er den beregnede Kd (L/kg) ved en koncentration på 1 µg/L glyphosat i væskefasen.

Kontrol: uden behandling. Jordekstrakt: 1:2 fortynding. Gylle: gyllevæske i en koncentration på 100 mL/L.

GRUMO 2017-2021 analyseprogram

Pesticid/nedbrydningsprodukt*	Status
Glyphosat	Godkendt
AMPA (aminomethyl-phosphorsyre)*	Godkendt
Bentazon	Reguleret
ETU (ethylthiourea)*	Reguleret
Dichlorprop	Reguleret
Mechlorprop	Reguleret
2,4-D	Reguleret
MCPA	Reguleret
4-CPP*	Reguleret
2,6-DCPP*	Reguleret

Reference:
NOVANA Det nationale overvågningsprogram
for vandmiljø og natur 2017-21.
Programbeskrivelse. Miljøstyrelsen 2017

Pesticid/nedbrydningsprodukt*	Status
Atrazin	Forbudt
Hydroxy-atrazin	Forbudt
Desethyl-atrazin*	Forbudt
Desisopropyl-atrazin*	Forbudt
DEIA (desethyl-deisopropyl-atrazin)*	Forbudt
Desethyl-hydroxy-atrazin*	Forbudt
Deisopropyl-hydroxy-atrazin*	Forbudt
Didealkyl-hydroxy-atrazin*	Forbudt
Hexazinon	Forbudt
Metribuzin	Forbudt
Desamino-metribuzin*	Forbudt
Diketo-metribuzin*	Forbudt
Desamino-diketo-metribuzin*	Forbudt
Simazin	Forbudt
Hydroxy-simazin*	Forbudt
Desethyl-terbuthylazin*	Forbudt
4-Nitrophenol*	Forbudt
Metalaxyl/metalaxyl-M	Forbudt
CGA62826*	Forbudt
CGA108906*	Forbudt
Diuron	Forbudt
Dichlobenil	Forbudt
BAM (2,6-Dichlorbenzamid)*	Forbudt
2,6-Dichlorbenzosyre*	Forbudt

GRUMO screeninger

2013: Metalaxyl+2 metabolitter
(fra VAP)

2016-17: 1,2,4-triazol
(fra VAP)

2016-17: Despehnylchloridazon
Methyldepehnylchloridazon
(fra regionernes depotundersøgelser)

2018: N,N-dimethylsulfamid
Tolyfluamid
(fra HOFOR)

MST: et stof overvejes medtaget på boringskontrollens obligatoriske liste hvis det findes i >1% af de undersøgte boringer eller overskrider kravværdien i 0,2% af de undersøgte boringer.

Hvad med alle de stoffer som aldrig er blevet testet i VAP, GRUMO eller generelt i vandværkerne?

Forslag:
Udvikling af high-resolution massespektrometri metoder til vand.

Screening 1 gang pr GRUMO programperiode med high-resolution massespektrometri?