TIMFIE sampler - A new time-integrating, active, low-tech sampling device for quantitative monitoring of pesticides in whole water

Time-Integrating, Micro Flow, In-line Extraction

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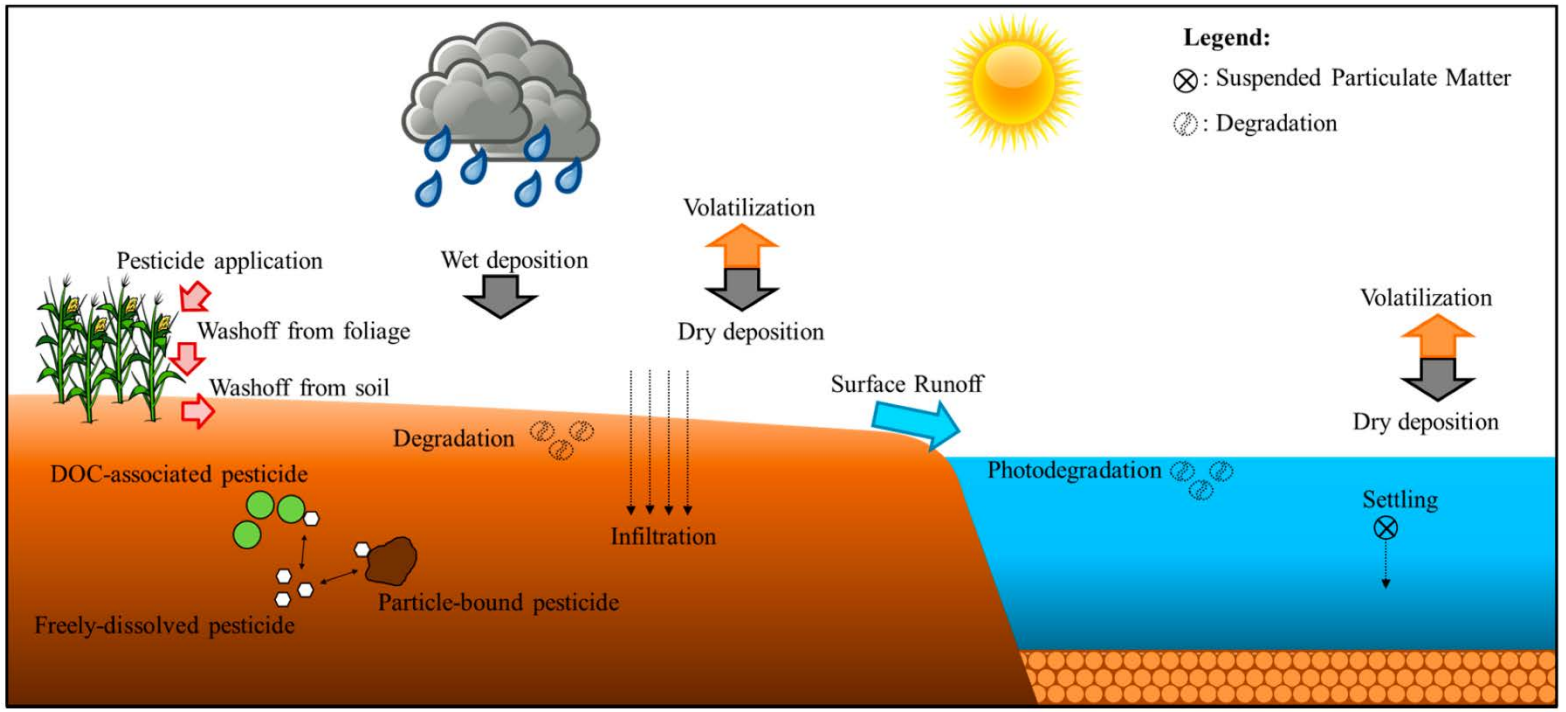
Pesticide fate

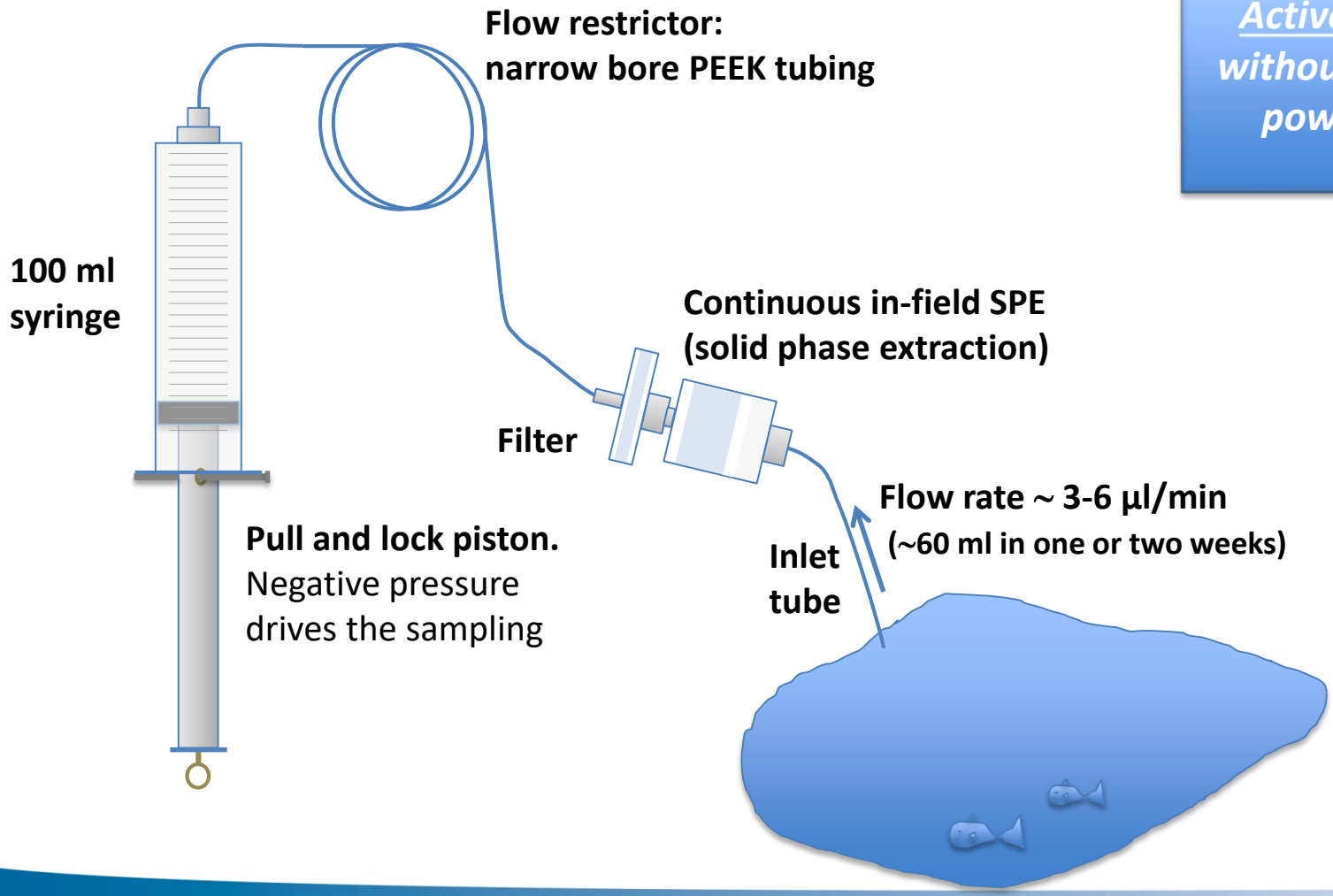


From: Water **2017**, *9*(7), 451

- Pesticide concentration in surface water will vary significantly over time
- Average concentrations? → Time proportional sampling.
- Maximum concentrations? → Event driven sampling.
- Grab sampling will not answer these questions

Principle of the TIMFIE sampler

Active sampling without battery or power supply

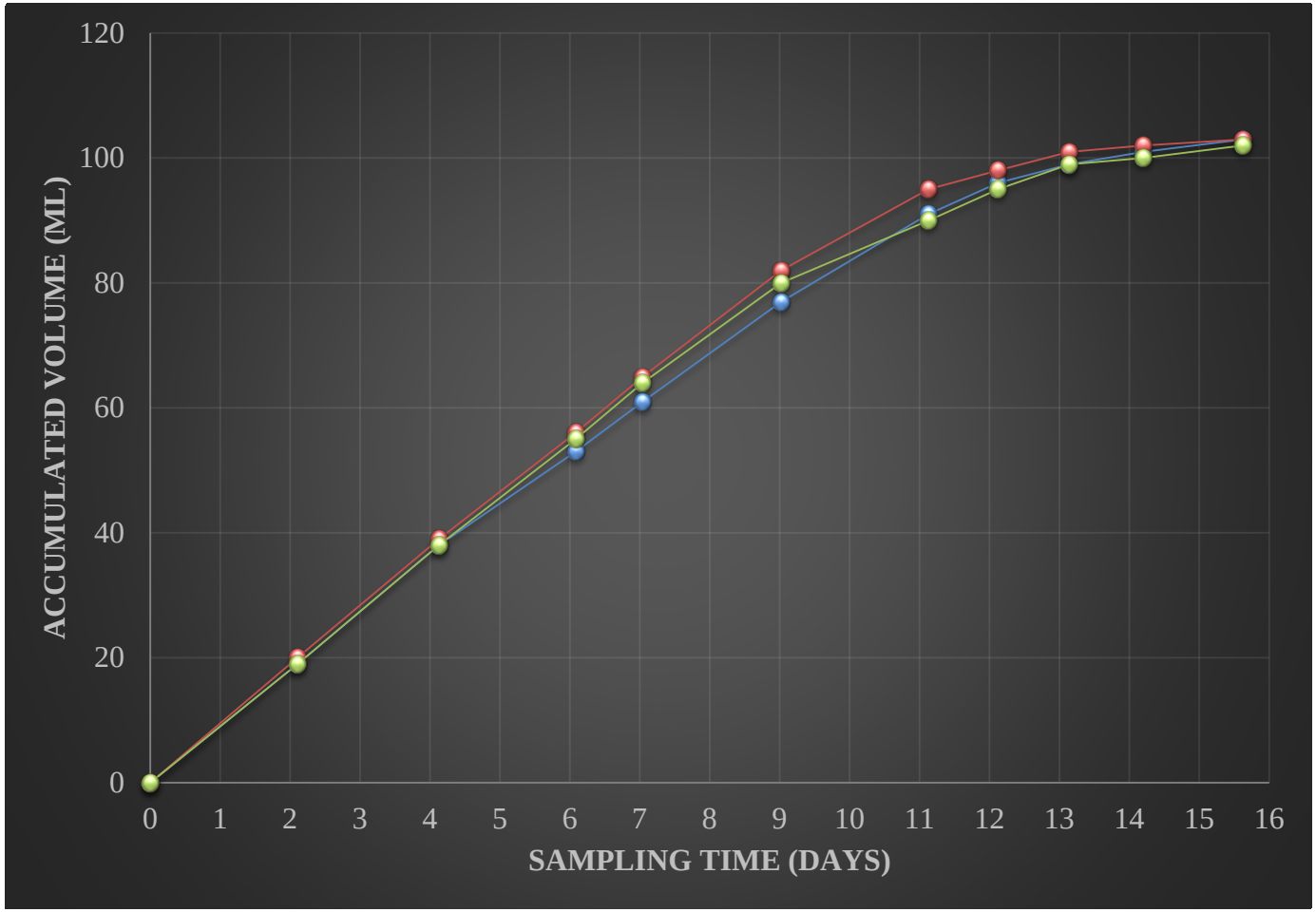


Quantitative analysis

Accurate determination of extracted sample volume

Photo: Ove Jonsson

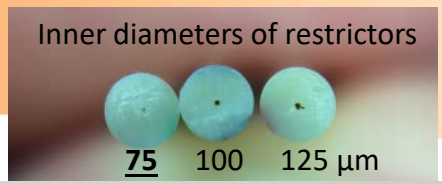
Extracted volume over time (example)



Linear range 0-80 ml
R^2=0.999

Sample volume between 30-80 ml is preferred

Consumables



Photos: Ove Jonsson

Cut inlet tubing to a point shape to avoid stops

TIMFIE field application (examples)

Photo: Roland Persson

Photo: Torbjörn Hansson, Grön Kompetens AB

Two weeks sampling

Changes in water level

Know your sampling site!

Winter sampling (Sweden) entire sampler below surface to avoid freezing.
TIMFIE mounted on a fishing-rod.

Photo: Torbjörn Hansson, Grön Kompetens AB

Hiding the TIMFIE in a small stream (storm water)

Syringe is hidden here

Flow restrictor under stones

SPE under this stone…

…and inlet tube here…

Inlet tube

Storm water wells in urban areas

Glyphosate and other urban used pesticide

Dam to increase water height
(Jeans leg with sand)

SPE possibilities

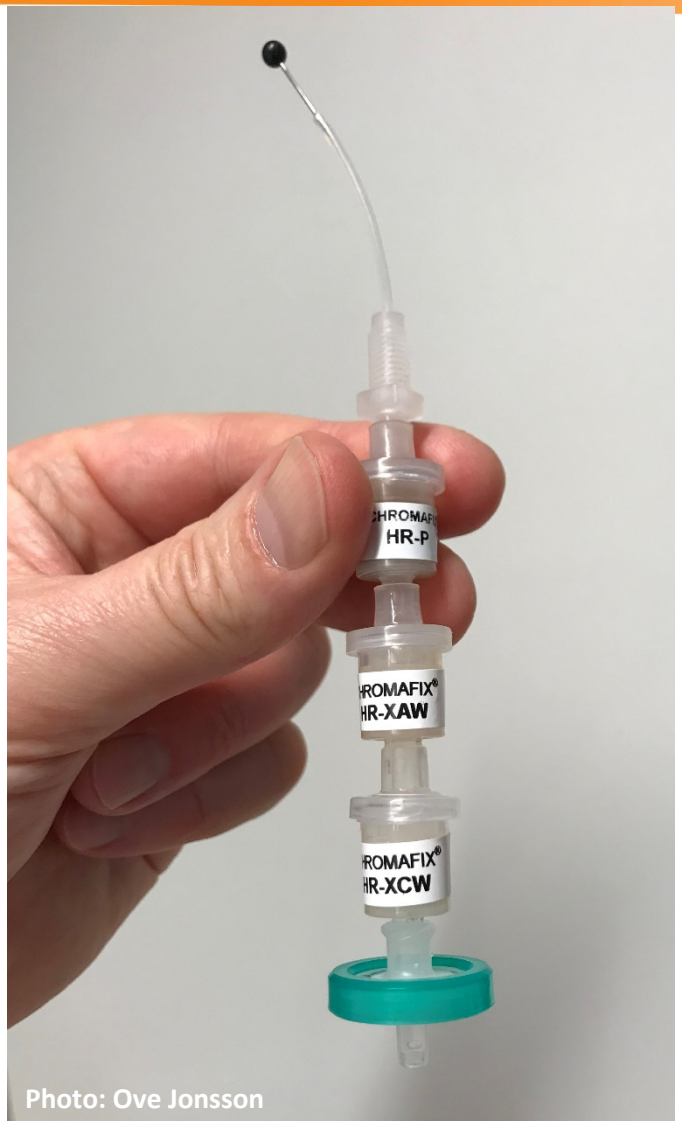


Photo: Ove Jonsson

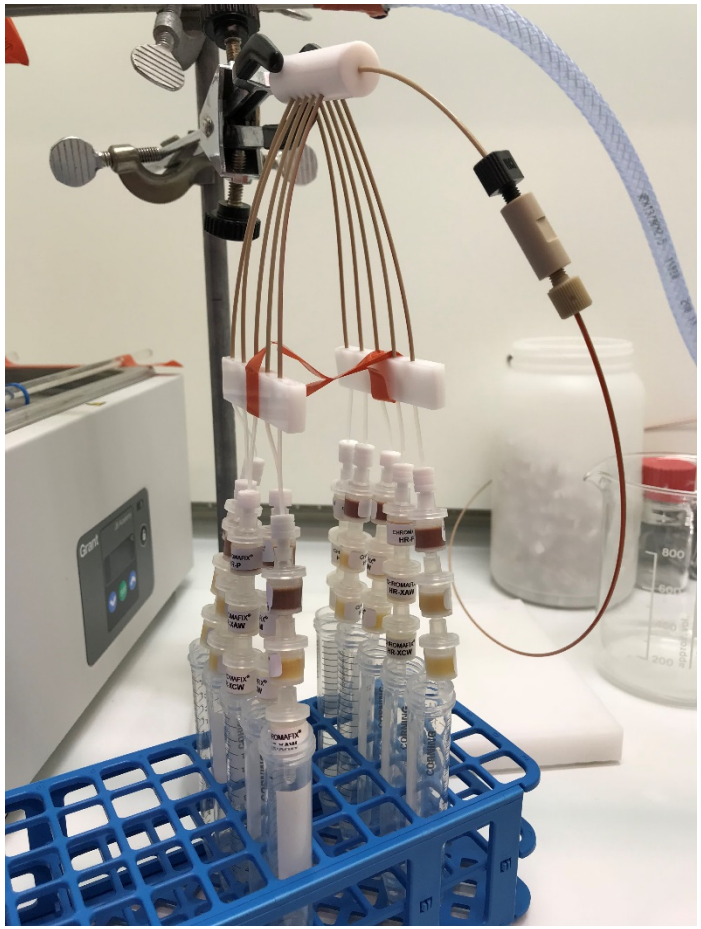
- ✓ Closed flow system, small format
- ✓ Stack cartridges in series to extract different compound classes
- ✓ Minimized solvent consumption
- ✓ Simple, inexpensive shipping and storage

- ✓ Rational internal standard addition

Chromafix HR-P, HR-XAW and HR-XCW polymeric columns from Macherey-Nagel

Automation: Conditioning of SPE columns, 10 in parallel

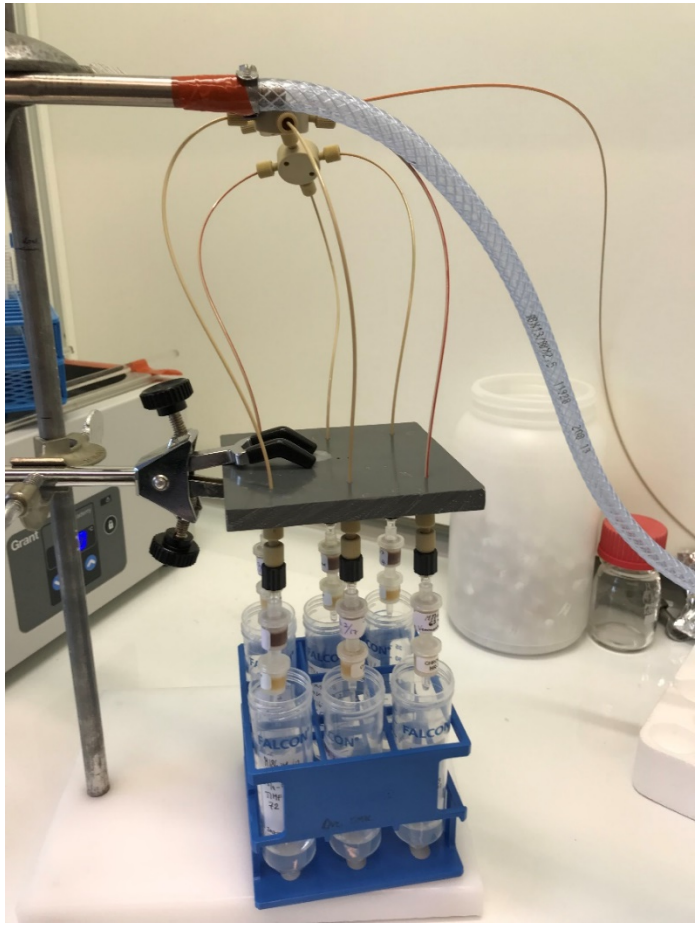
MeOH followed by H_2O



Quaternary LC pump

Automation: Elution of SPE columns, 6 in parallel

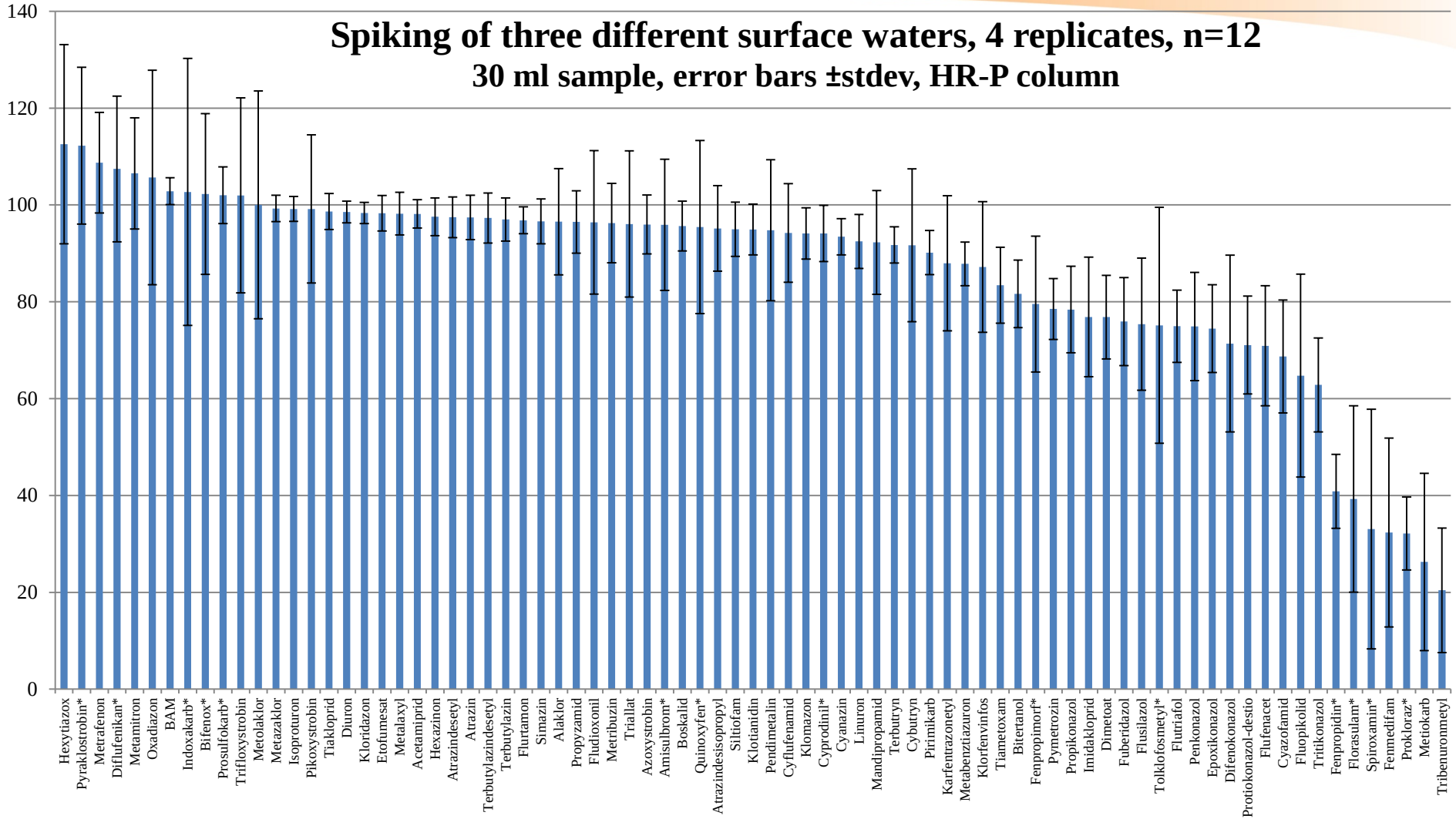
Methanol, acetone and
methanol with 80 mM ammoniac



Evaporation in water bath
at 40°C and N_2 flow.
50 µl DMSO as a keeper

Dissolve in 3 ml ammonium
acetate buffer at pH 5
Inject 0.5 ml

TIMFIE absolute recoveries pesticides LC-(+ESI)MS



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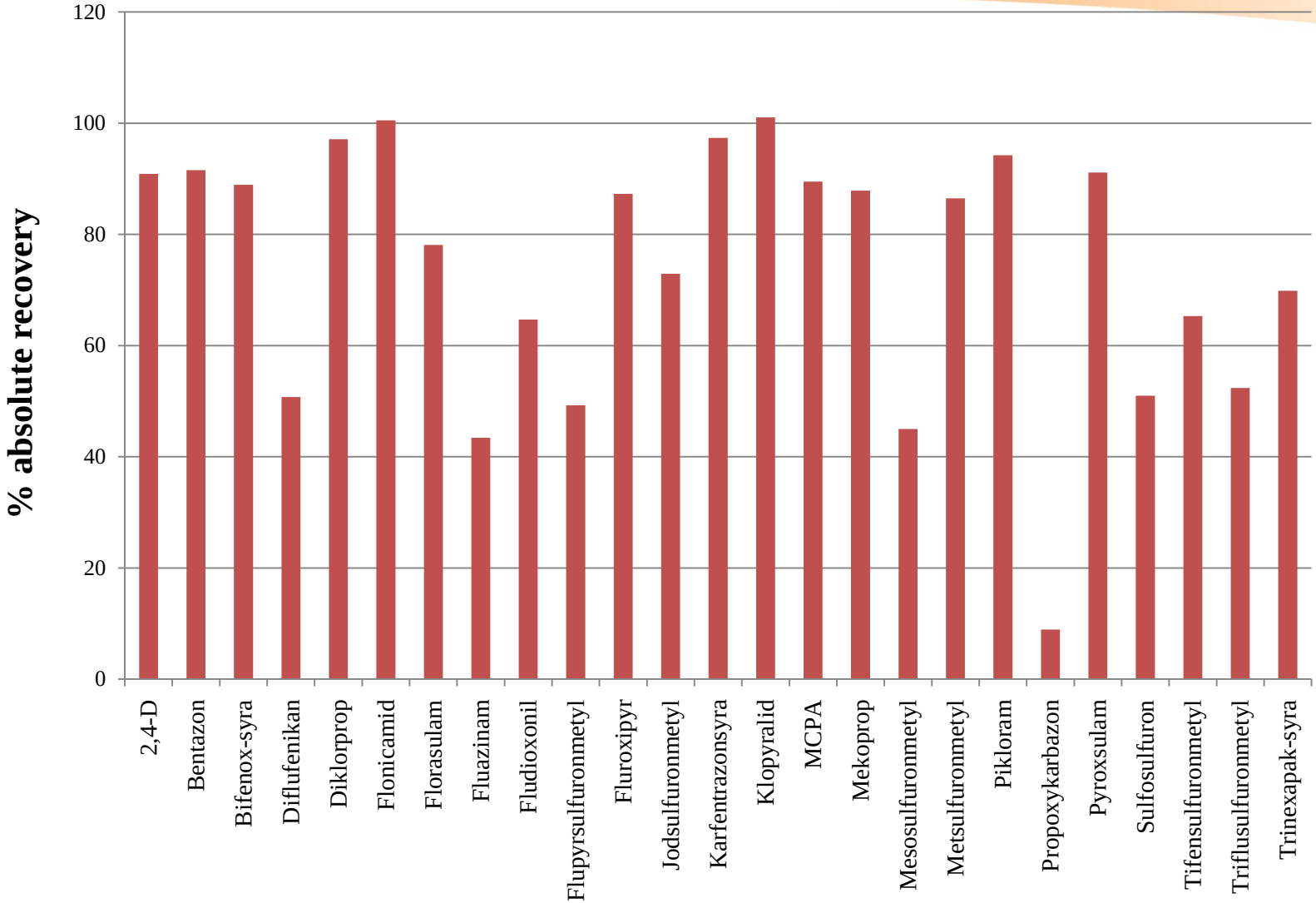
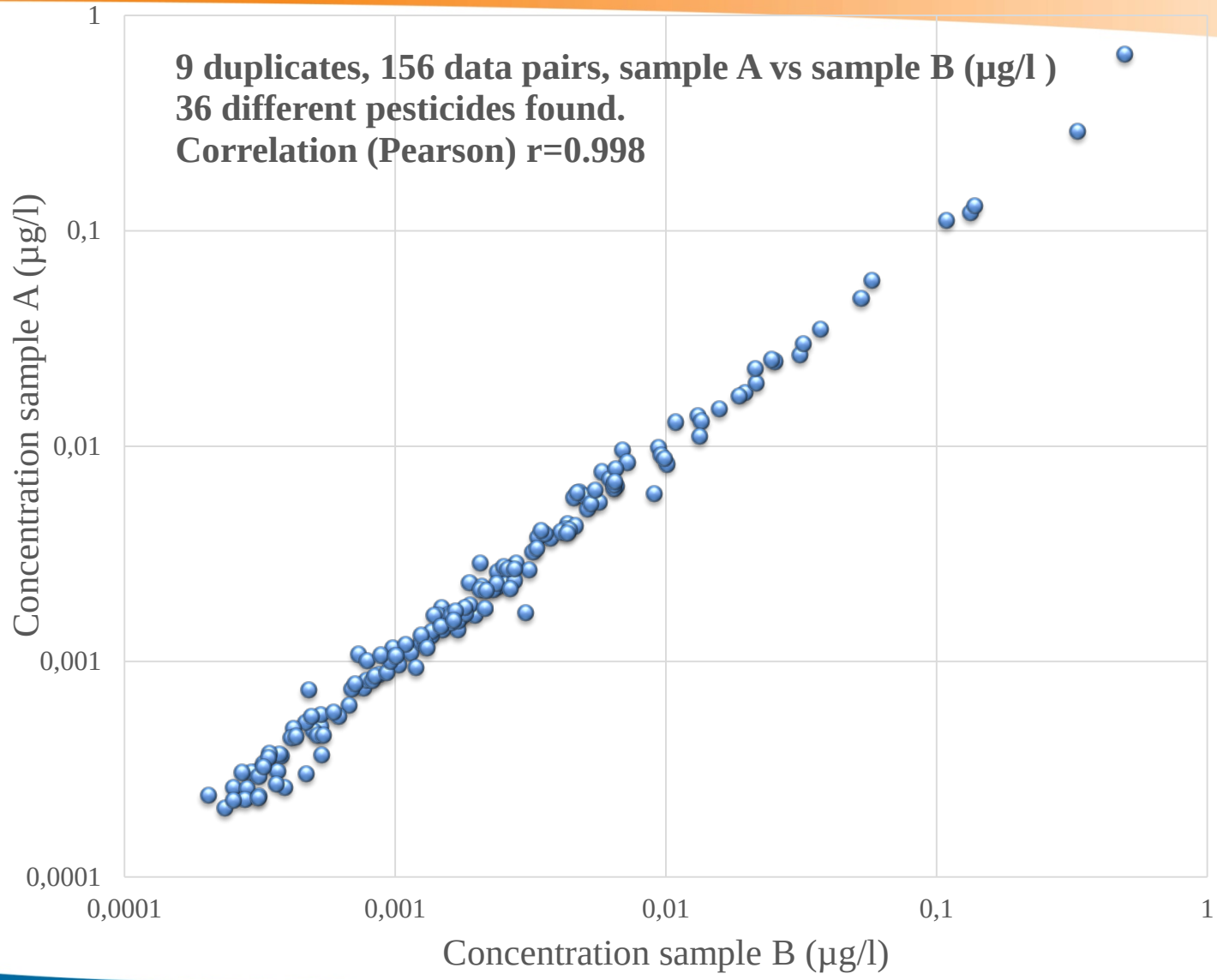
TIMFIE absolute recoveries acidic pesticides LC-(-ESI)MS

WAX-column in series with hydrophobic polymer



TIMFIE duplicate field sampling



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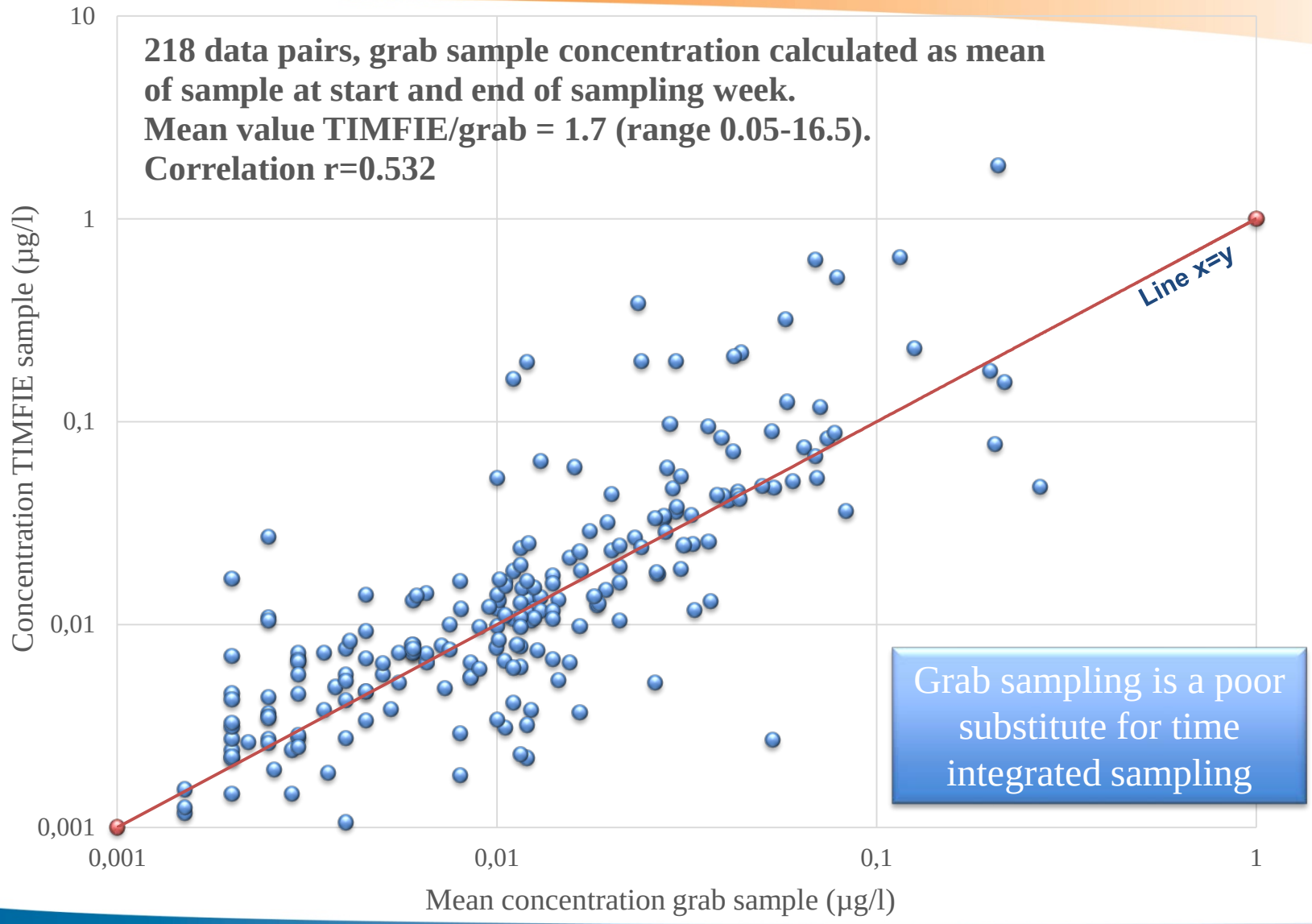
TIMFIE vs grab sampling



Summary TIMFIE sampling

Pros

- Time integrated sample 1-2 weeks
- Whole water
- Quantitative
- Pre-concentration
- Validation process according to established procedures
- Flexible, different SPE materials
  Translate current SPE methods to TIMFIE conditions
- Small format, flexible application
- Transport and storage
- Inexpensive
- Use syringe water for further analysis

Cons

- No pH adjustment
- Restricted sample volume

Acknowledgement

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Photo: Therese Nanos

Thank you for your time!