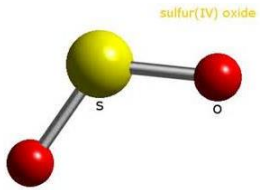
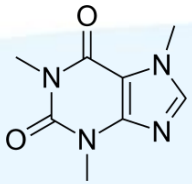
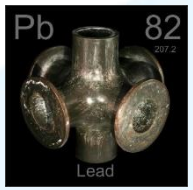
Vanlige kjemikalier i innemiljøer
–
Hva finner vi når vi måler

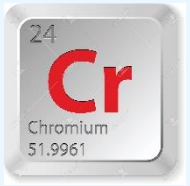
Pernilla Bohlin Nizzetto

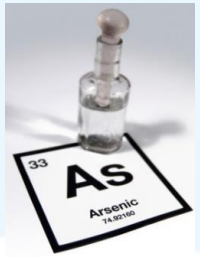
NILU – Norwegian Institute for Air Research

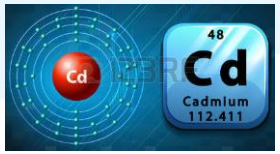




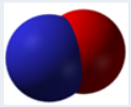
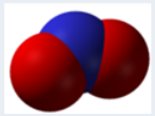


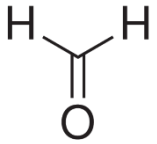


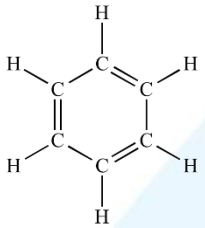


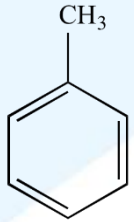


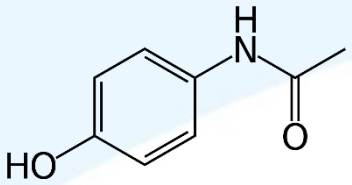
NOx (Nitrogen Oxide)

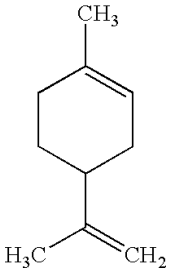
Nitric Oxide (NO)	Nitrogen Dioxide (NO_2)
	

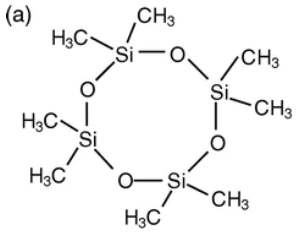


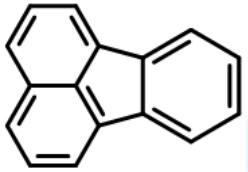


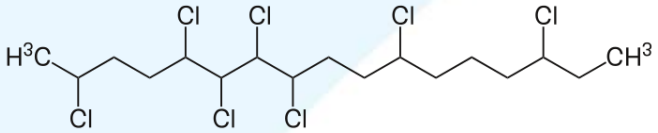


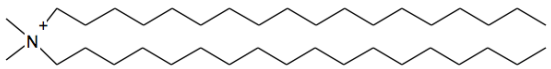


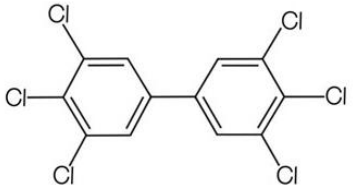


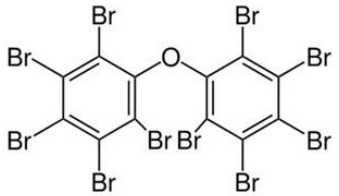


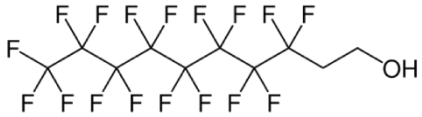


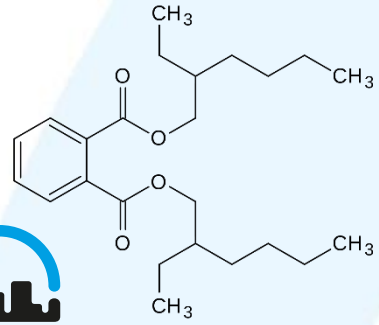


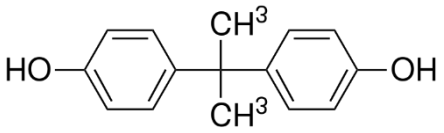


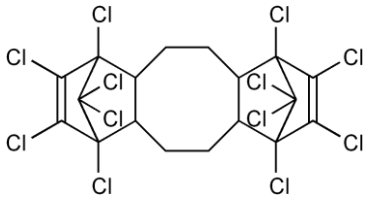


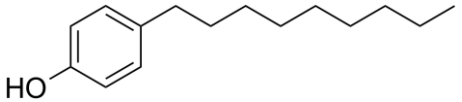












NILU

Organiske forbindelser

Flyktige organiske forbindelser
(Volatile organic chemicals)
VOCs

Semiflyktige organiske forbindelser
(Semi volatile organic chemicals)
SVOCs

Ikke flyktige organiske forbindelser
(Non volatile organic chemicals)
nVOCs

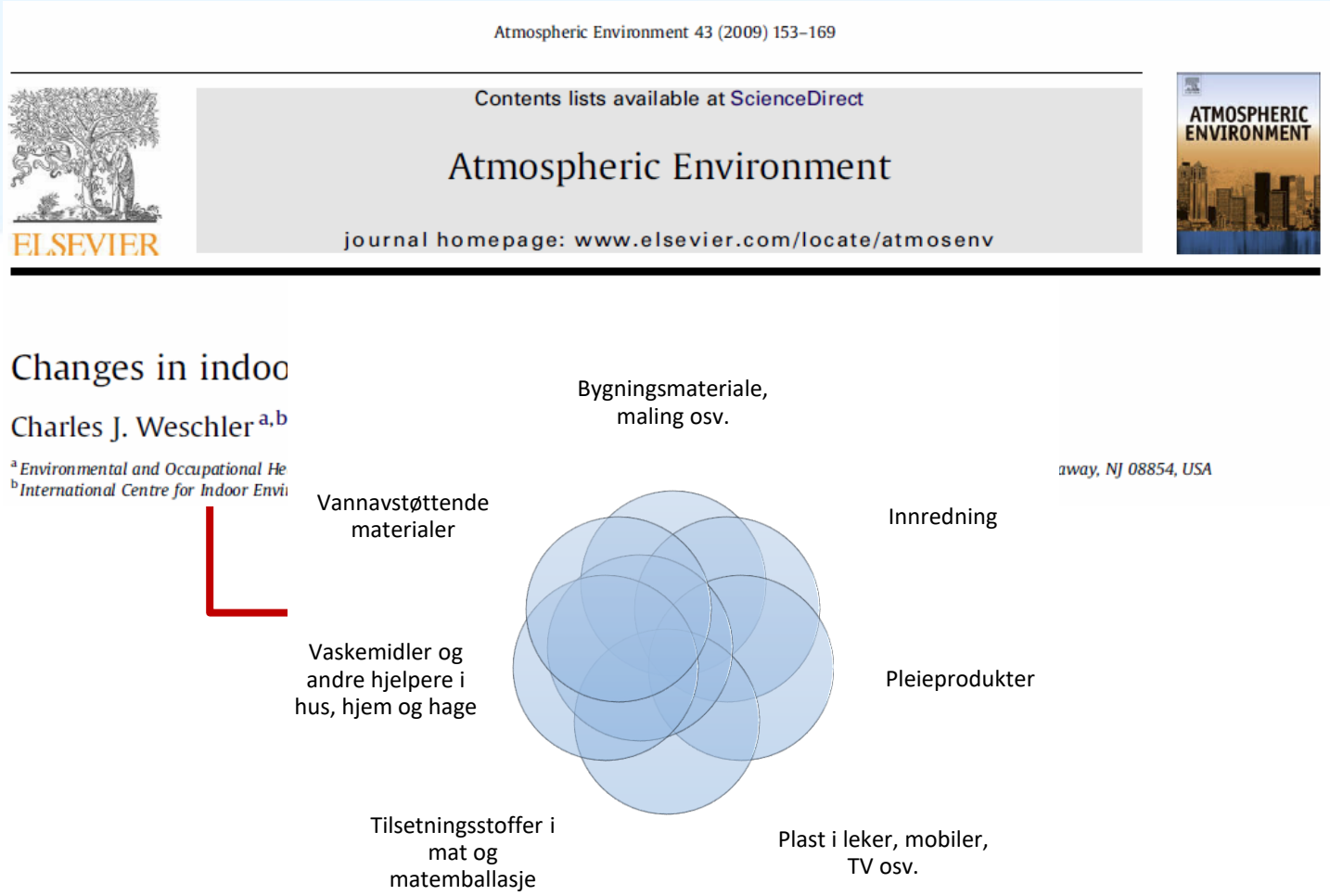
NILU

Inneklima/luftkvalitet

Inneluft er mer forurenset av kjemi enn uteluft.

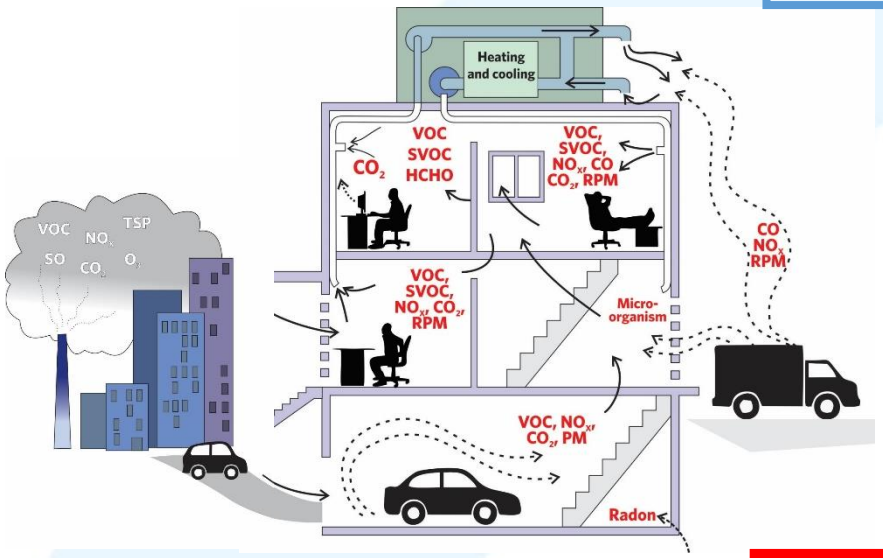
Utfordringer:

- Uorganiske kjemikalier
- Partikler
- Radon
- Mikroorganismer mm
- **VOCs**



Relevans for inneklima/luftkvalitet

Sources:
Building materials, Consumer products,
Indoor activities,
Intrusion of outdoor air,
etc



Release of chemicals:
* Volatilization/Emission
* Direct migration
* Abrasion

Air

Dust

Human exposure

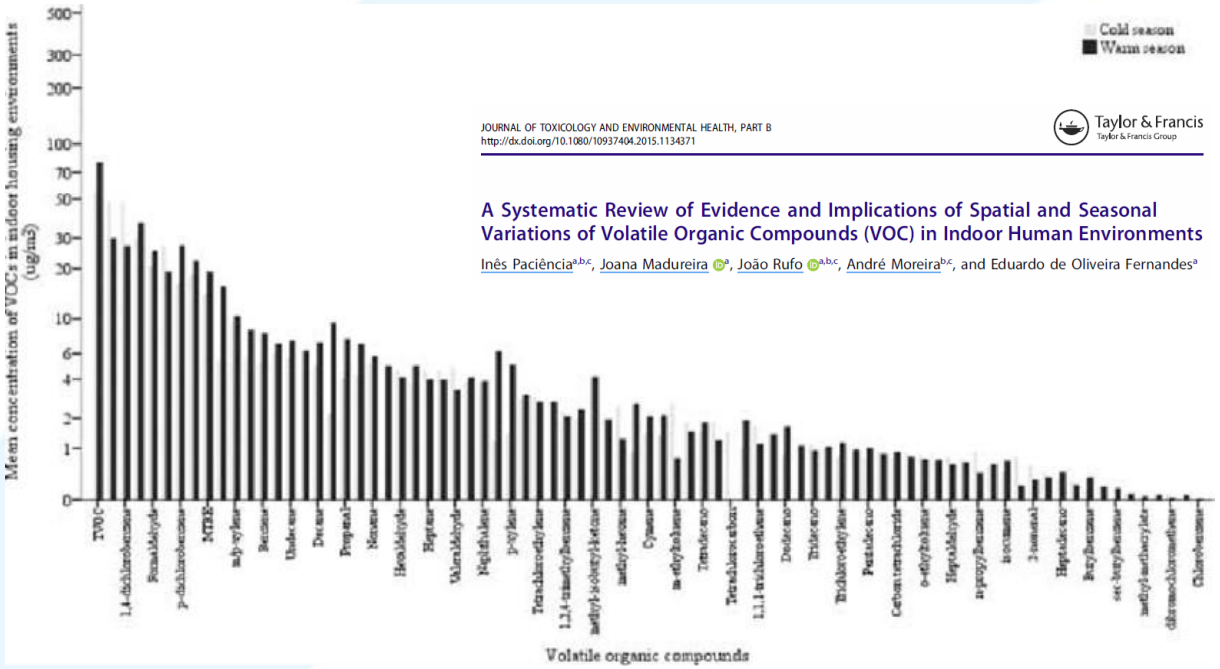
Exposure to the outdoor environment

NILU

Flyktige organiske forbindelser - VOCs

100s/1000s av VOCs målt i inneluft

(µg-mg/m³)



JOURNAL OF TOXICOLOGY AND ENVIRONMENTAL HEALTH, PART B
http://dx.doi.org/10.1080/10937404.2015.1134371
Taylor & Francis
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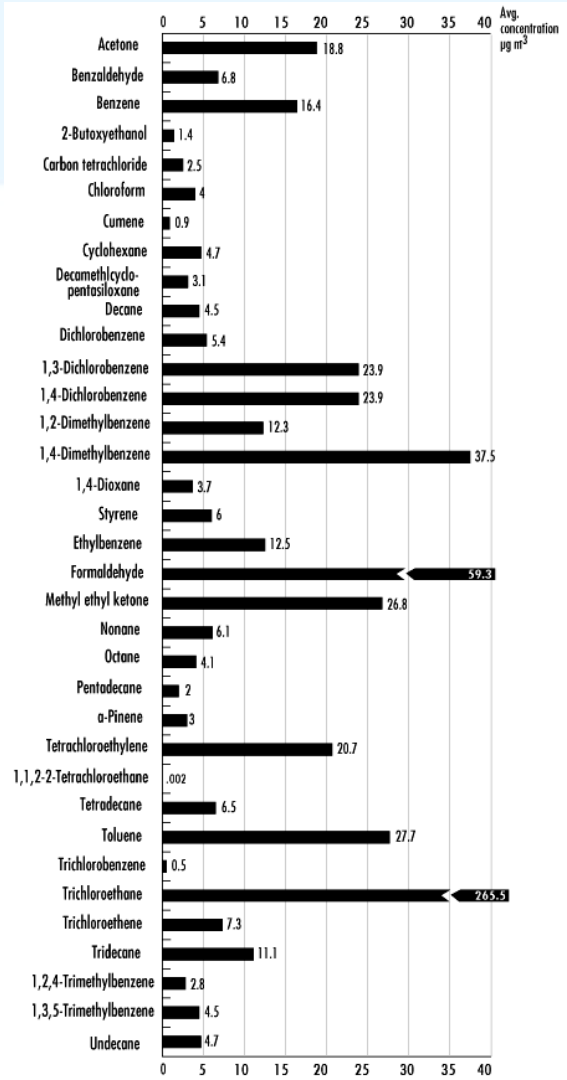
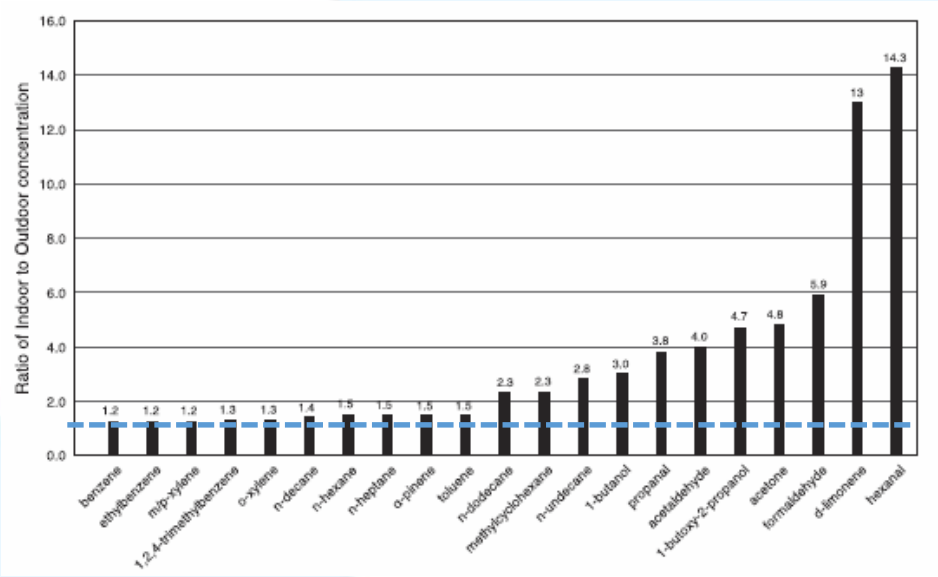
A Systematic Review of Evidence and Implications of Spatial and Seasonal Variations of Volatile Organic Compounds (VOC) in Indoor Human Environments

Inês Paciência[a,b,c], Joana Madureira[a], João Rufo[a,b,c], André Moreira[b,c], and Eduardo de Oliveira Fernandes[a]



Flyktige organiske forbindelser - VOCs

Høyere konsentrasjoner av mange VOCs inne enn ute (1-10s ggr)

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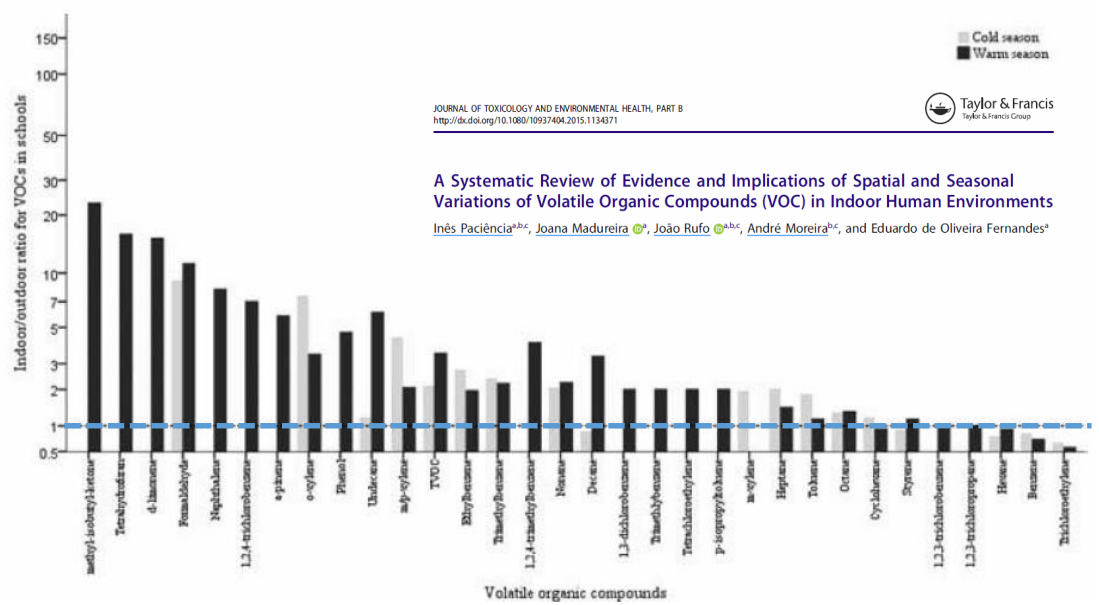
The AIRMEX study - VOC measurements in public buildings and schools/ kindergartens in eleven European cities: Statistical analysis of the data

Otmar Geiss, Georgios Giannopoulos*, Salvatore Tirendi, Josefa Barrero-Moreno, Bo R. Larsen, Dimitrios Kotzias



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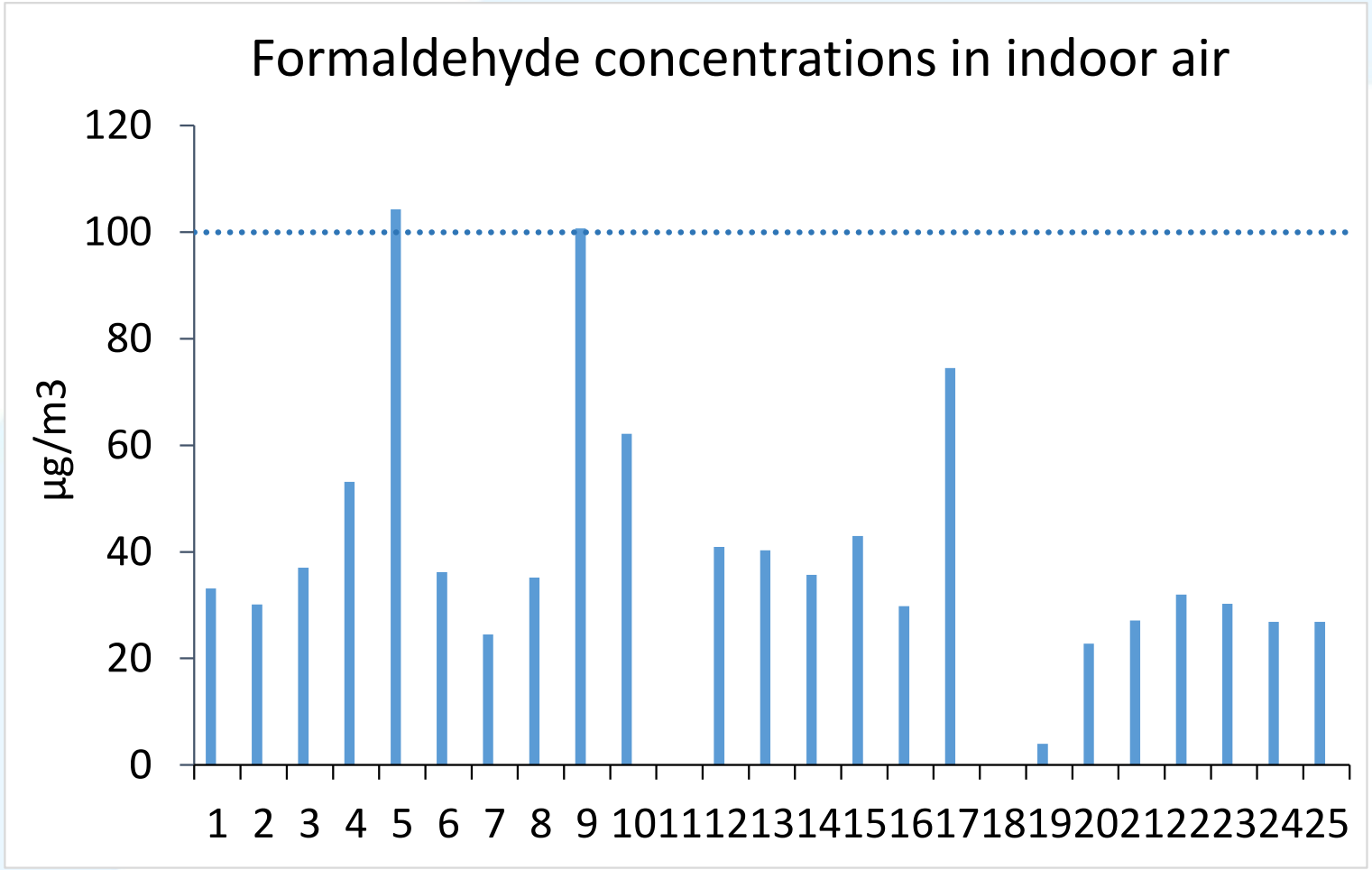
Flyktige organiske forbindelser - VOCs

Hva gjør vi?

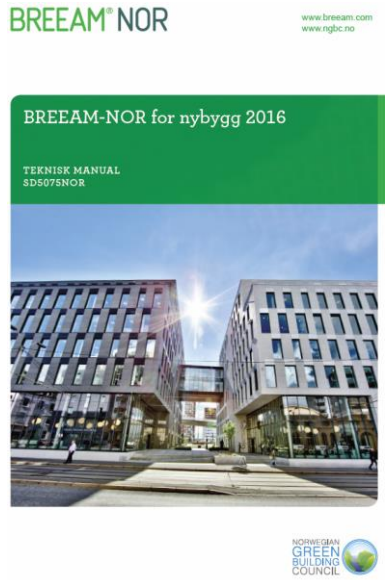
- Måling av emisjoner
  - TVOC & formaldehyd i inneluft
  - Passiv prøvetaking
  - 7 dager
- Nye boliger/bygg
- Forskjellige typer av boliger/bygg
- Før innflytting, etter innflytting (3-6 mån + 12 mån)

- Formål:
  - Økt kunnskap om VOC-nivåer og mønster i norske boliger
  - Tidstrender: nivåer og mønster
  - Effekt av tiltak (BREEAM-sertifisering etc)

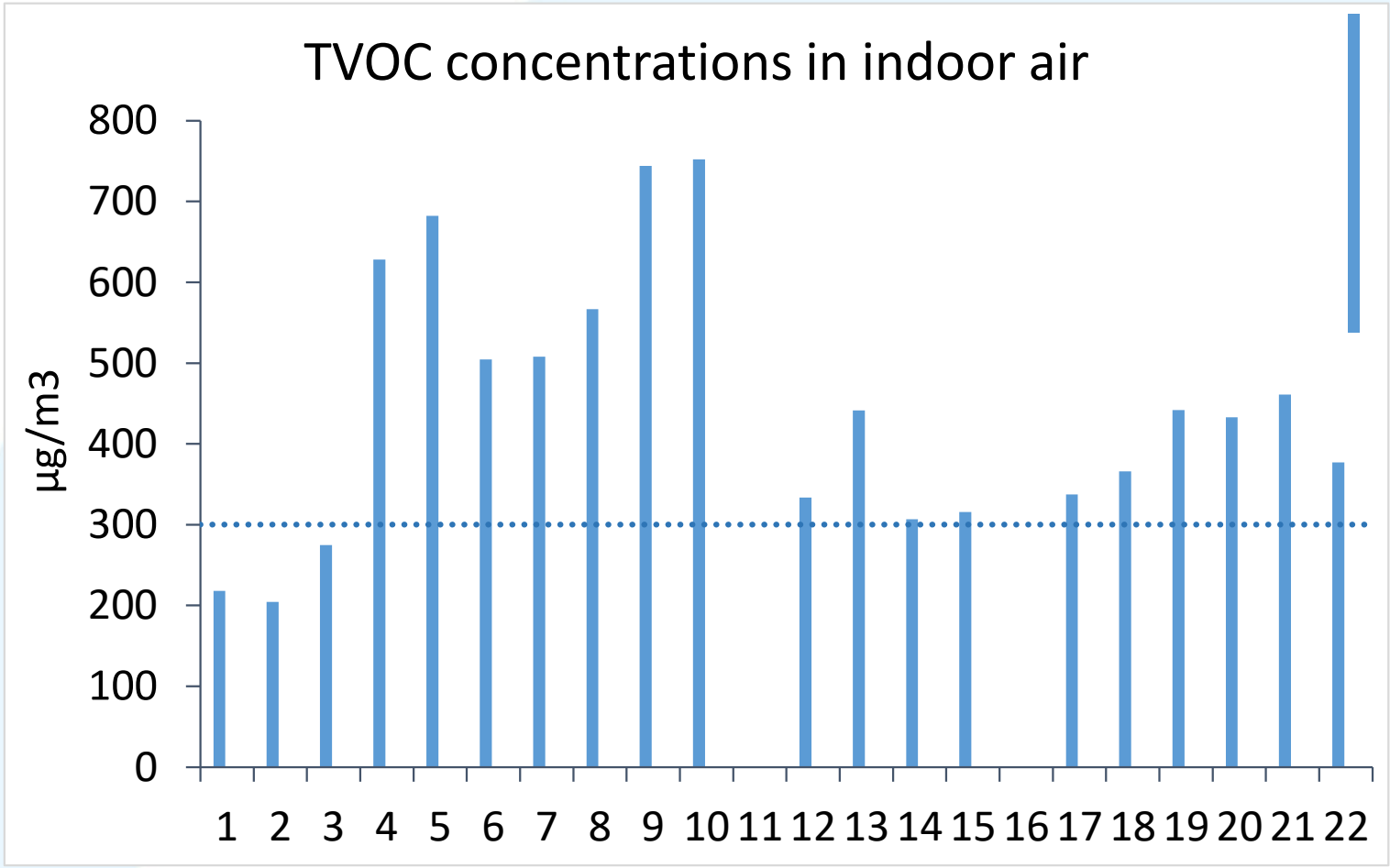
Formaldehyde



Kriterie for mønstergyldig nivå: 100 µg/m^3 for formaldehyd.

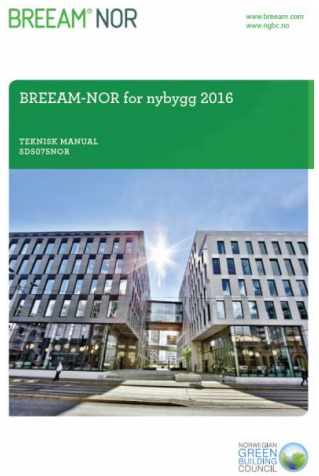


TVOC



200-220 individuelle VOC-komponenter

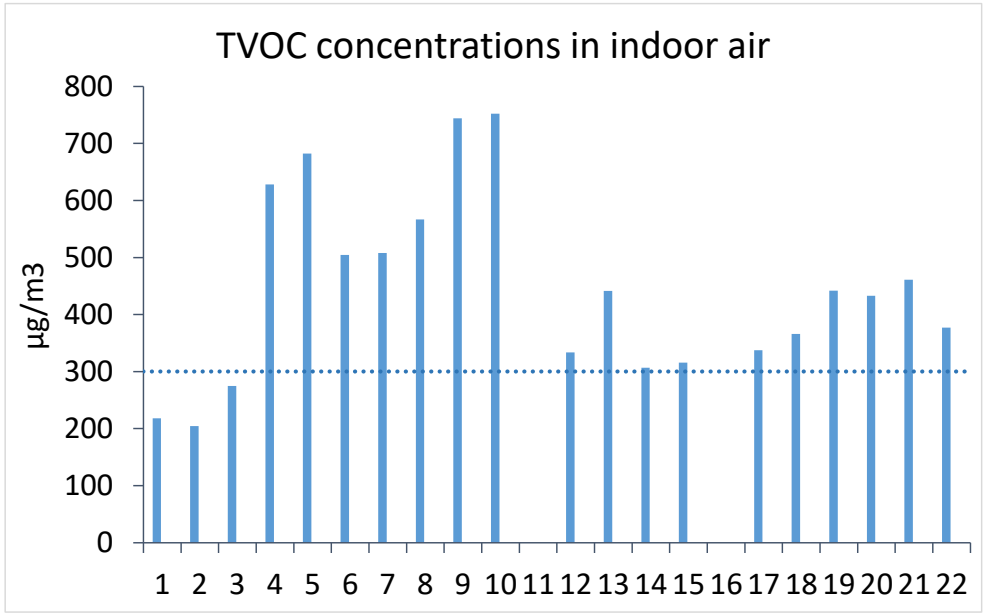
Kriterie for mønstergyldig nivå: 300 µg/m^3 for TVOC.



TVOC

De mest forekommende komponentene er identifisert (n~35 per prøve):

- α-pinene
- 3-carene
- Limonene
- Acetophenone
- Benzophenone
- Acetic acid
- Propanoic acid
- Dodecane
- Tridecane
- Siloxanes (D3-D6, L6-L7)



SVOCs/nVOCs

Siloxanes

PFASs

PCBs

Bisphenols

Ftalater

Chlorinated paraffins

Flame retardants

Phenols

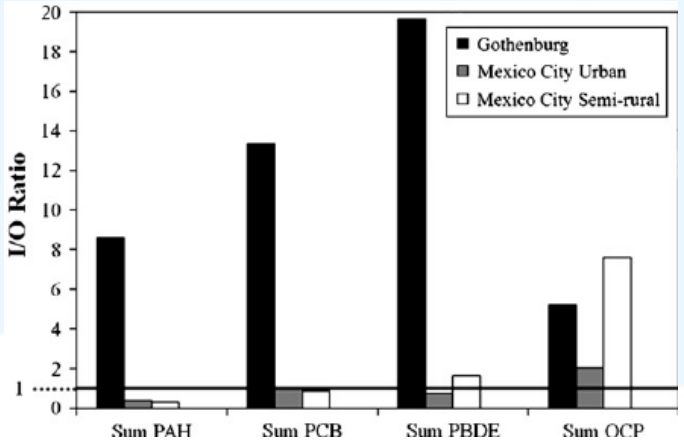
More…

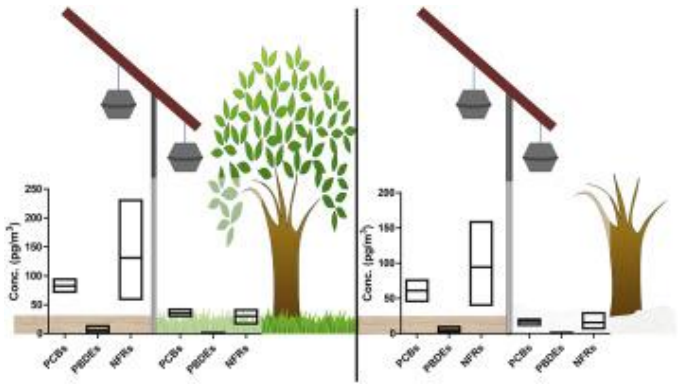
Replacements

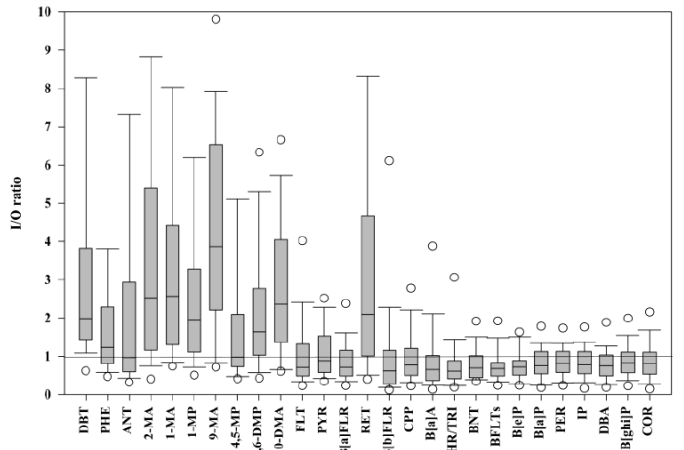
NILU

SVOCs/nVOCs

- Emitteres som gasser
- Frigjøres som partikler eller til partikler
  - slitasje etc – emisjonsfaktorer fungerer ikke
- Høyere konsentrasjoner av de fleste SVOCs/nVOCs inne enn ute (1-10s ggr)
- Mer diffuse helseeffekter enn VOCs:
  hormonhemmere – reproduksjonstoksiske, utviklingsforstyrrelser







NILU Norsk Institutt for luftforskning Norwegian Institute for Air Research

OR 29/2015
M-430|2015

PFASs in house dust

Pernilla Bohlin-Nizzetto,
Linda Hanssen, Dorte Herzke

ENVIRONMENTAL Science & Technology

ARTICLE

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Investigation on Per- and Polyfluorinated Compounds in Paired Samples of House Dust and Indoor Air from Norwegian Homes

Line S. Haug,*[,†] Sandra Huber,[‡] Martin Schlabach,[§] Georg Becher,[†,⊥] and Cathrine Thomsen[†]

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[‡]Norwegian Institute for Air Research (NILU), FRAM Centre, Hjalmar Johansens gate 14, NO-9296 Tromsø, Norway
[§]Norwegian Institute for Air Research (NILU), Instituttveien 18, NO-2007 Kjeller, Norway
[⊥]Department of Chemistry, University of Oslo, P.O. Box 1033 Blindern, NO-0315 Oslo, Norway

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ELSEVIER

Per- and polyfluorinated compounds in house dust and indoor air from northern Norway – A pilot study

Sandra Huber[a,*], Line Småstuen Haug[b], Martin Schlabach[c]

[a]Norwegian Institute for Air Research (NILU), FRAM Centre, Hjalmar Johansens gate 14, NO-9296 Tromsø, Norway
[b]Norwegian Institute of Public Health, Department of Environmental Medicine, P.O. Box 4404 Nydalen, NO-0403 Oslo, Norway
[c]Norwegian Institute for Air Research (NILU), Instituttveien 18, NO-2007 Kjeller, Norway

NILU

ENVIRONMENTAL Science & Technology

Article

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Occurrence of a Broad Range of Legacy and Emerging Flame Retardants in Indoor Environments in Norway

Enrique Cequier,*[,†,‡] Alin C. Ionas,[§] Adrian Covaci,[§] Rosa Maria Marcé,[‡] Georg Becher,[†,∥] and Cathrine Thomsen[†]

[†]Department of Exposure and Risk Assessment, Norwegian Institute of Public Health, P.O. Box 4404, Nydalen, 0403 Oslo, Norway
[‡]Department of Analytical Chemistry and Organic Chemistry, Universitat Rovira i Virgili, Marcel·lí Domingo s/n, 43007 Tarragona, Spain
[§]Toxicological Centre, University of Antwerp, Universiteitsplein 1, 2610 Wilrijk-Antwerp, Belgium
[∥]Department of Chemistry, University of Oslo, P.O. Box 1033, Blindern, 0315 Oslo, Norway

Miljøgifter i innemiljøet

Ftalater, PCB, PBDE og klorparafiner i norske innemiljøer

Amrit Kaur Sakhi
Rune Becher
Anette Kocbach Bølling
Georg Becher
Per Schwarze
Jon Christoffersen
Cathrine Thomsen

folkehelseinstituttet

SVOCs/nVOCs

Hva/hur gjør vi?

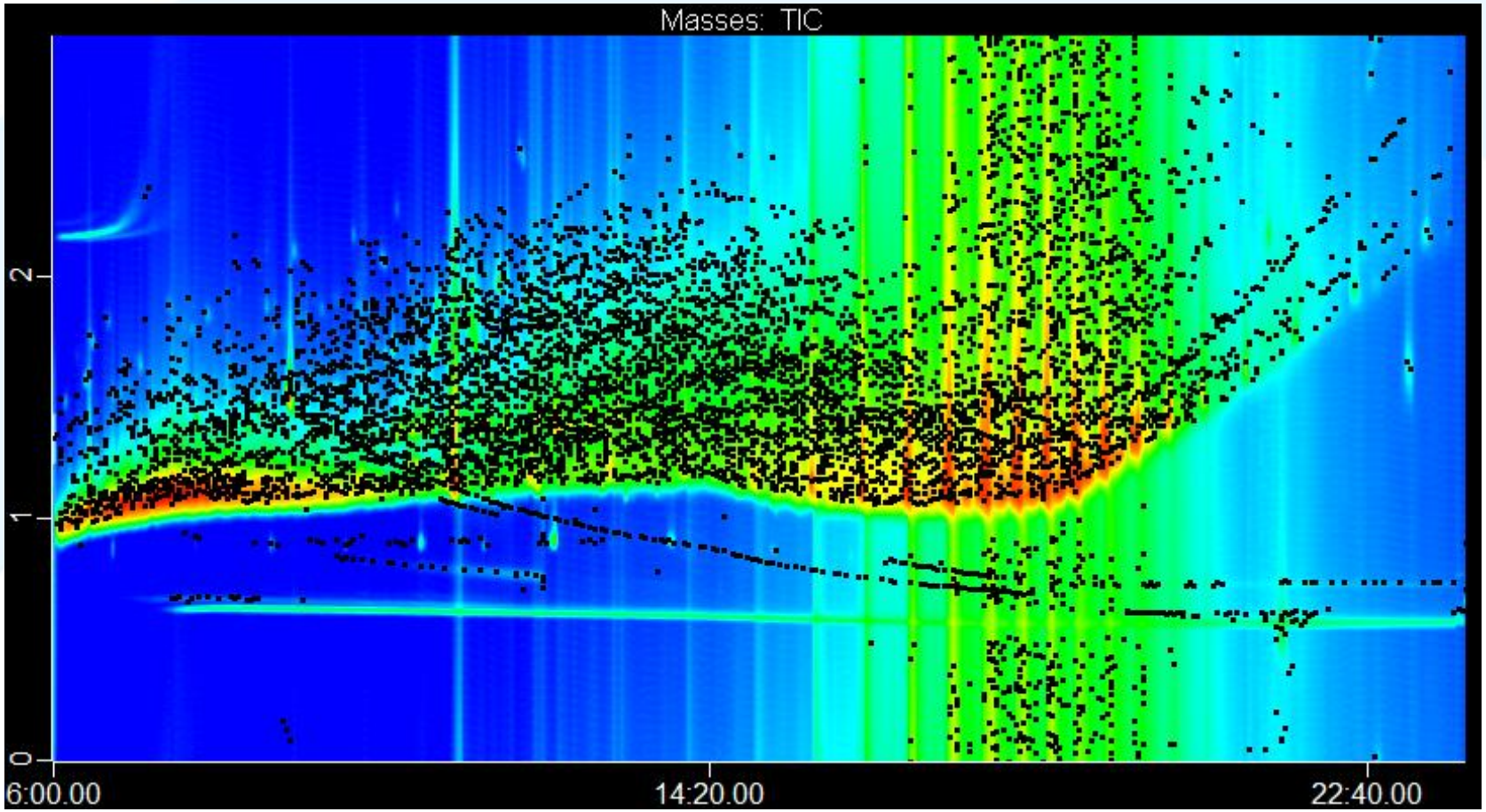
- Måling av luft & støv i innemiljøer
  - Passiv luftprøvetaking
  - Støvprøvetaking
- Nye boliger/bygg
- Gamle boliger/bygg
- Forskjellige typer av boliger/bygg
- Med tiden

- Formål:
  - Økt kunnskap om nivåer og mønster av SVOC/nVOC i boliger/bygg
  - Identifisering av nye SVOCs/nVOCs
  - Tidstrender: nivåer og mønster
  - Effekt av tiltak (BREEAM-sertifisering etc)

NILU

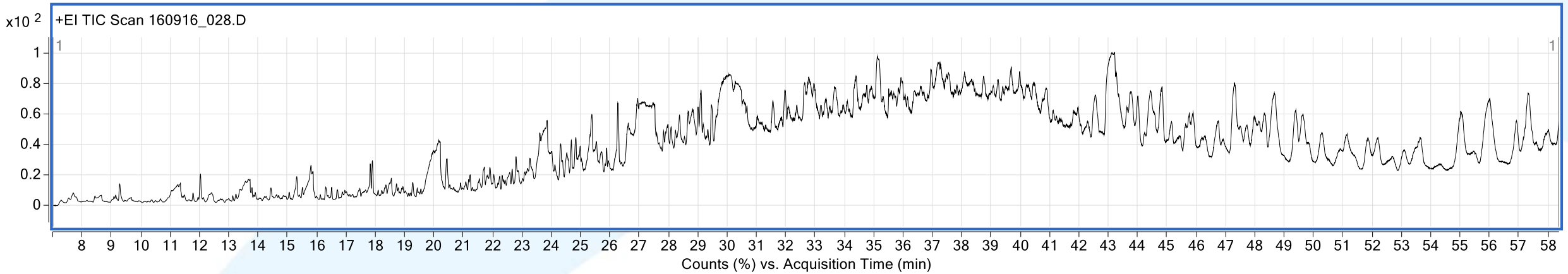
SVOCs/nVOCs

- Identifisering



>10 000 organic chemicals detected

SVOCs/nVOCs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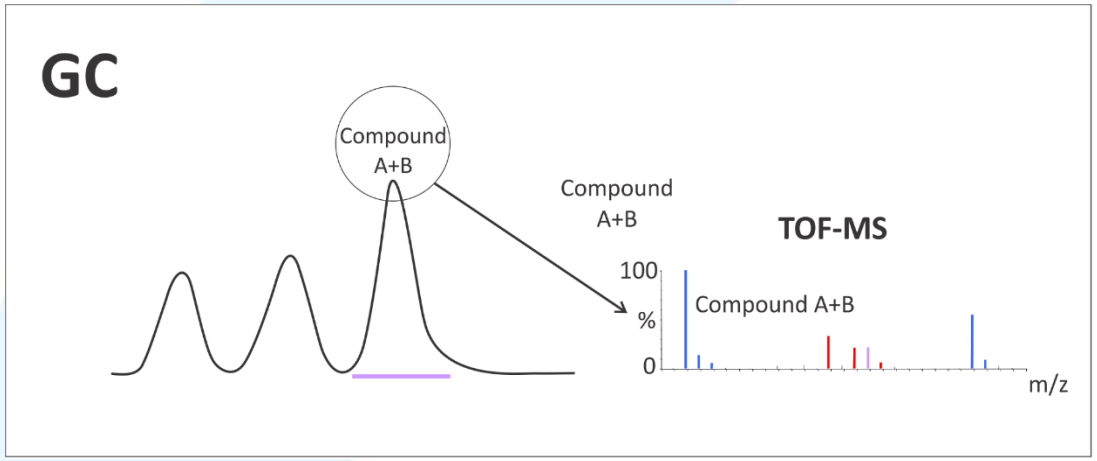
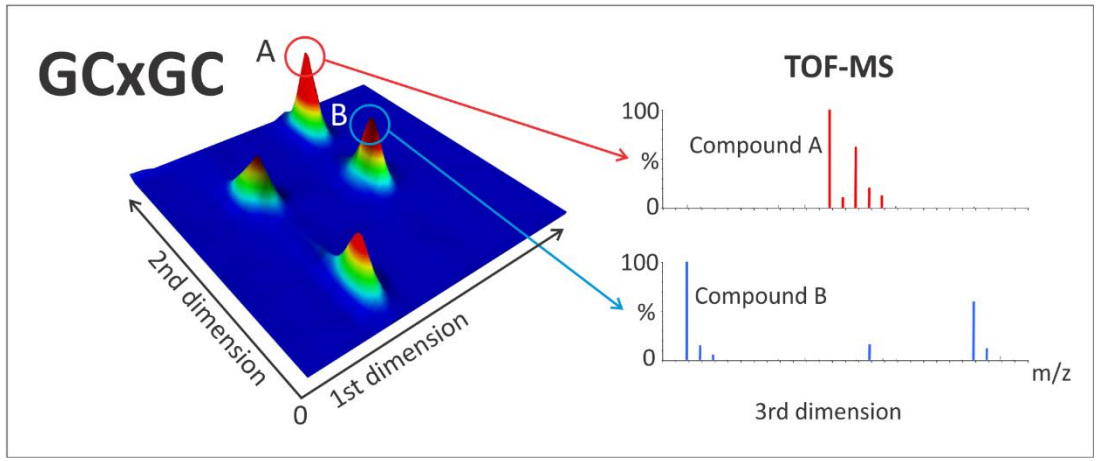
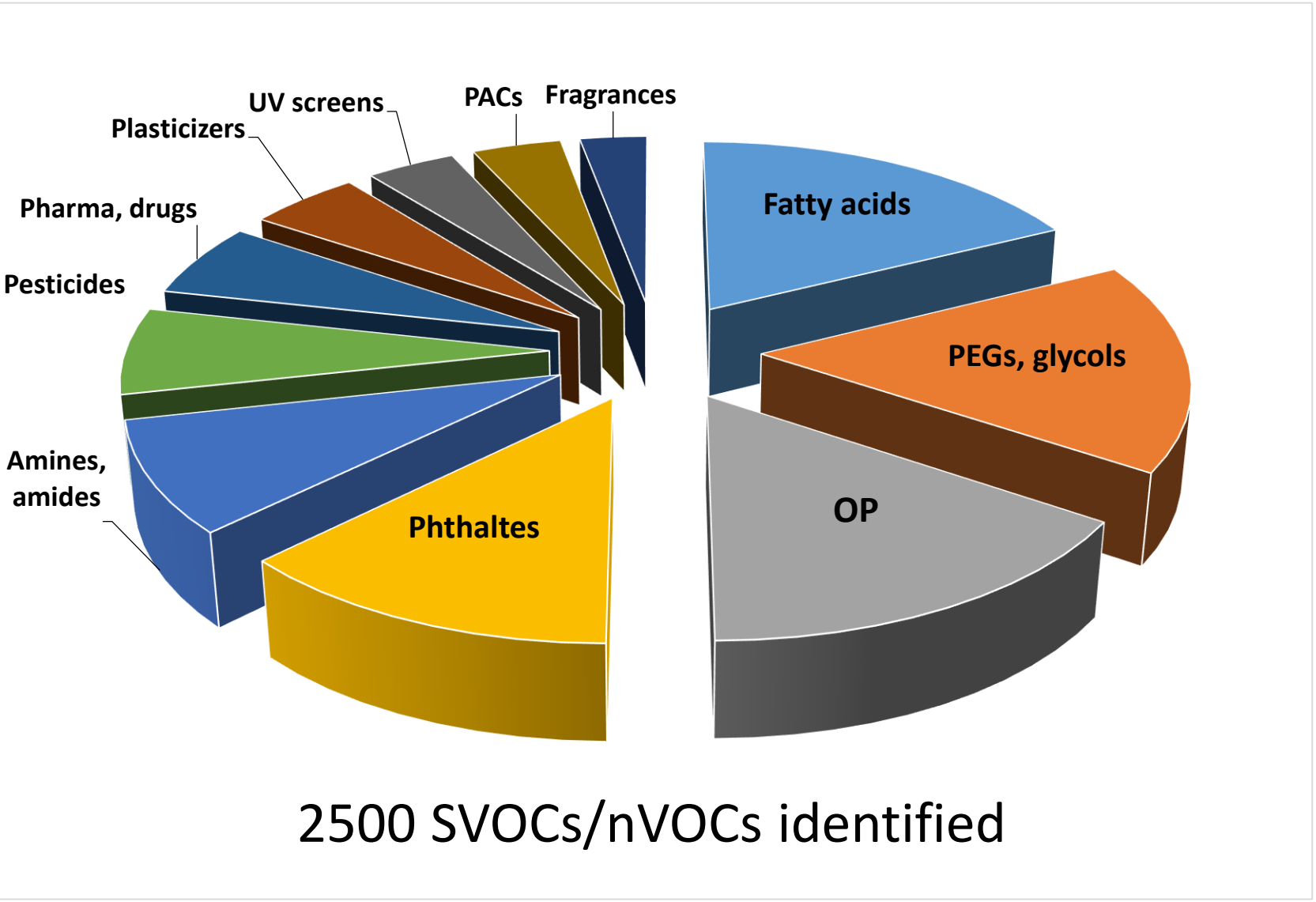
+EI TIC Scan 160916_028.D
1
0.8
0.6
0.4
0.2
0
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
Counts (%) vs. Acquisition Time (min)


GC
Compound
A+B
Compound
A+B
TOF-MS
100
%
0
Compound A+B
m/z


GCxGC
A
B
2nd dimension
1st dimension
0
TOF-MS
100
%
0
Compound A
100
%
0
Compound B
m/z
3rd dimension

SVOCs/nVOCs



2500 SVOCs/nVOCs identified

Dagbladet Nyheter
torsdag 4. desember 2014

Foto: Gorm Kallestad / SCANPIX

Tester avslørte skadelige kjemikalier på barnerom hjemme hos politikere

Avdekket en rekke skadelige kjemikalier fra leker, klær og andre produkter.

VG FORBRUKER
BIL, BÅT OG MOTOR REISE TEKNOLOGI HELSE
TIPS 2200

Fant giftige kjemikalier på barnerommet til topp-politikere

VEKKER: Høyres Nikolai Astrup er skremt av kjemikalie-funnene på barnerommet til hans datter på Bygdøy i Oslo. Foto: Frode Hansen

Av STELLA BUGGE og FRODE HANSEN (FOTOGRAF)
(VG) 14.05.2013 09:30

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Siste saker fra Forbruker

NILU

Hvor står vi? Fremtiden? Hvordan kan vi hjelpe?

- Er de organiske forbindelsene i innemiljøen et problem for
  - Vår helse?
  - Den yttre miljøen?
- Stadig forandring av stoffer i innemiljø krever stor årvåkenhet
- Kan tiltak redusere nivåene og antallet organiske forbindelser i innemiljøer?
  - Ser vi effekter av dagens tiltak?
  - Hva trengs for å få effekt?
  - Samarbeid!
- Etablere overvåking av innemiljø
  - Nye boliger/bygg
  - Eksisterende boliger/bygg

NILU

TAKK!

For more information, www.nilu.no:
pbn@nilu.no