EMEP-CCC
Progress of work

Wenche Aas, Anne Hjellbrekke, Sverre Solberg, Kjetil Tørseth and Karl Espen Yttri

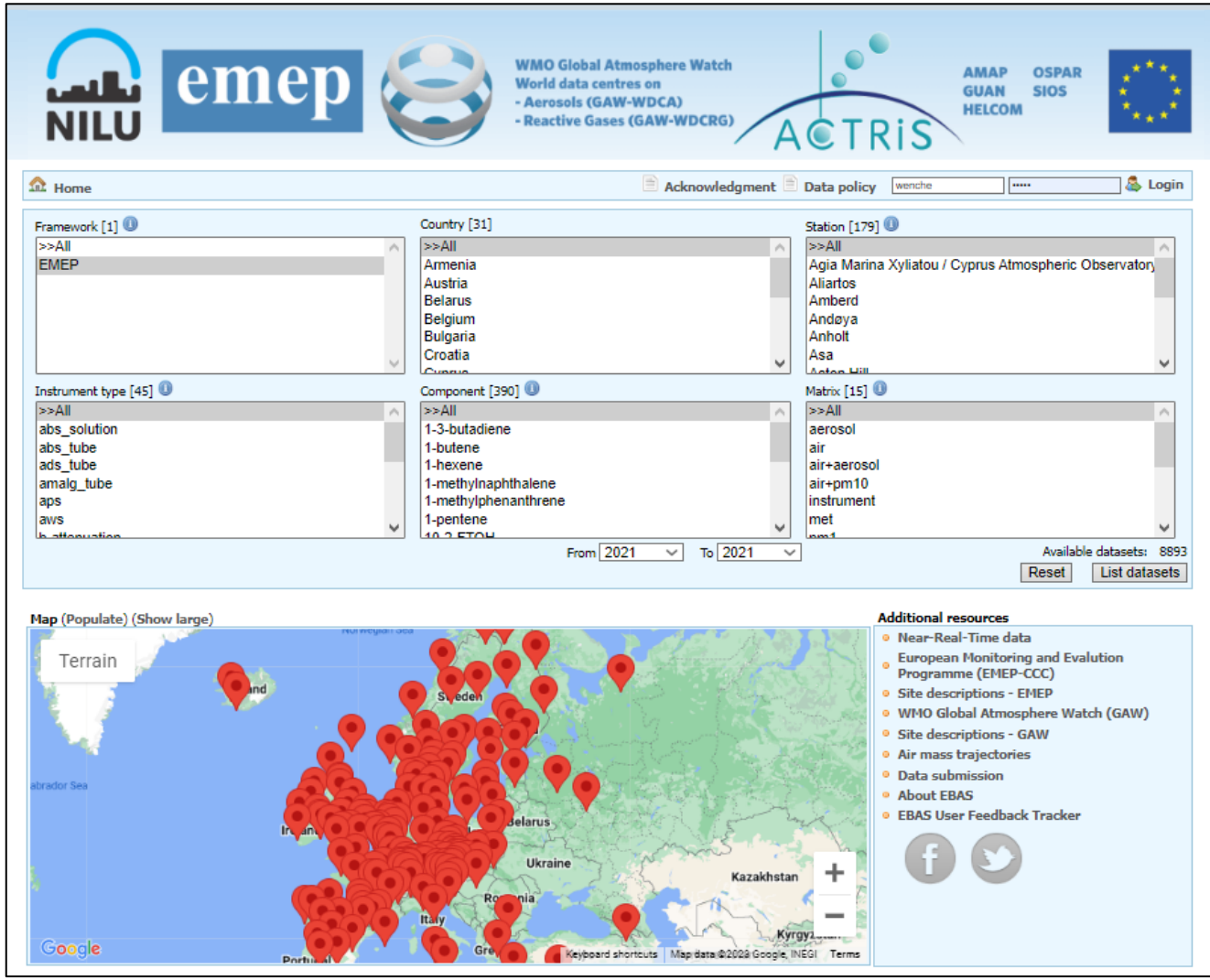
- ✓ Status 2021
- ✓ Intensive measurement period, summer 2022
- ✓ CEC workshop
- ✓ Future plans

The Climate and Environmental Research Institute NILU
A part of the research alliance NORIN

Steering Body, sept 2023

EMEP data, 2021

https://ebas-data.nilu.no/



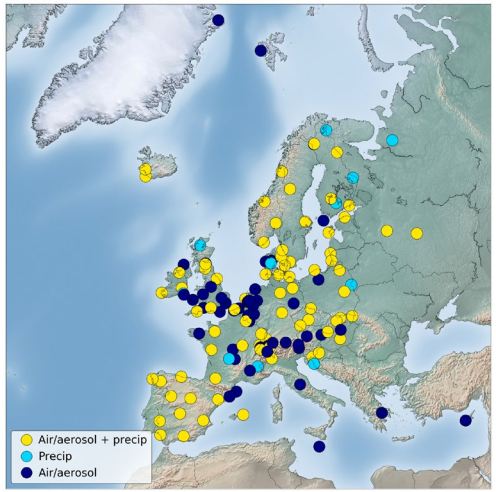
CCC reports 2023:

- **Data Report 2021 Particulate matter, carbonaceous and inorganic compounds**
  Anne-Gunn Hjellbrekke
  EMEP/CCC-Report 1/2023 pdf
- **Ozone measurements 2021**
  Anne-Gunn Hjellbrekke and Sverre Solberg
  EMEP/CCC-Report 2/2023: pdf
- **Heavy metals and POP measurements 2021**
  Wenche Aas, William Frederik Hartz, Katrine Aspmo Pfaffhuber, Helene Lunder Halvorsen and Nora Yttri
  EMEP/CCC-Report 3/2023 pdf
- **VOC measurements 2021**
  Sverre Solberg, Anja Claude and Stefan Reimann
  EMEP/CCC-Report 4/2023 pdf

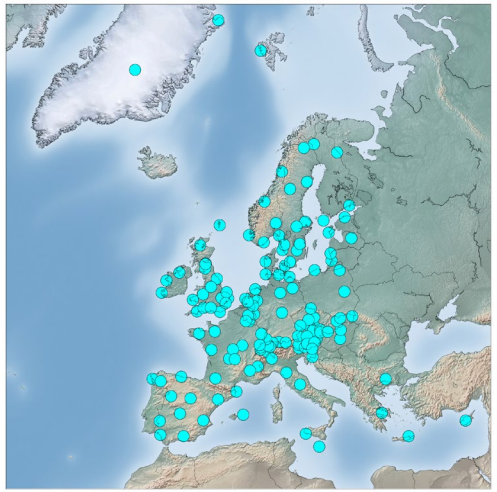
https://projects.nilu.no/ccc/reports.html

Measurement sites in 2021

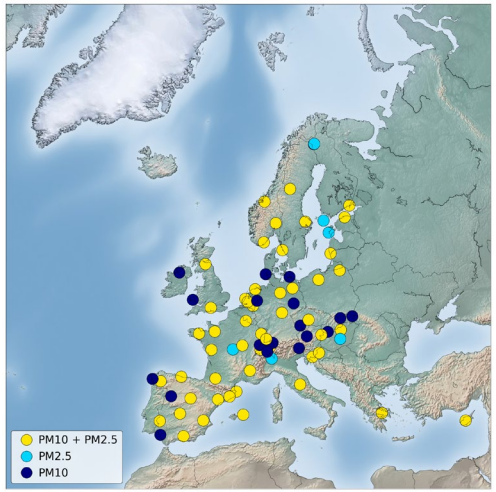
Inorg.:135 sites from 30 Parties



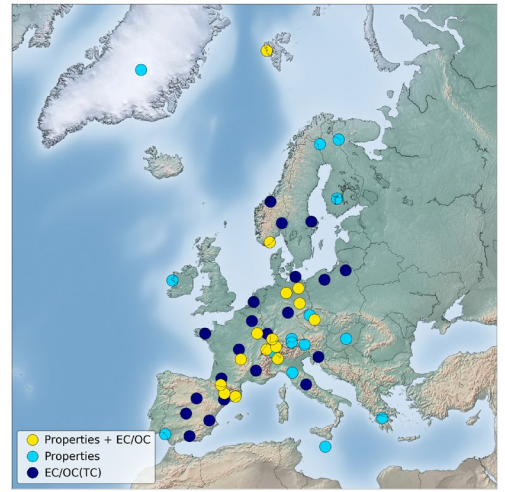
Ozone, 138 sites from 26 Parties



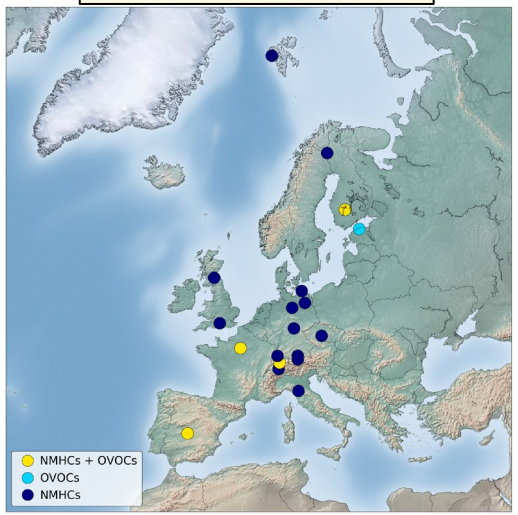
PM: 77 sites from 21 Parties



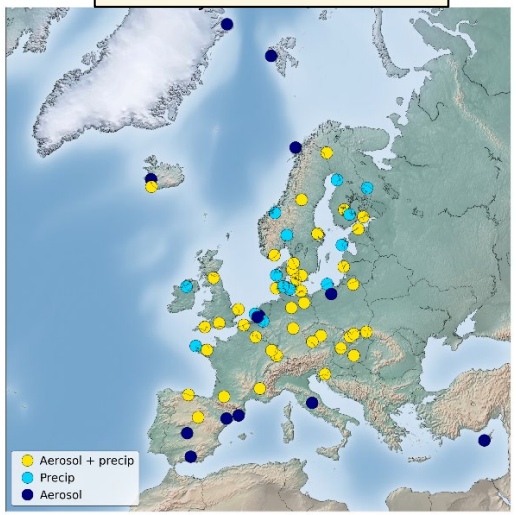
Aerosol prop: 52 sites from 18 Parties



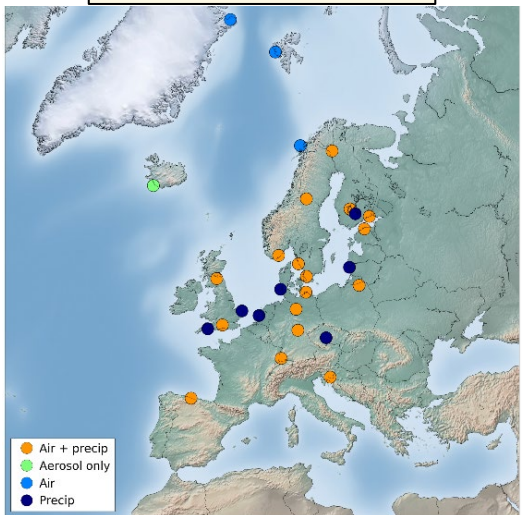
VOC: 19 sites from 10 Parties



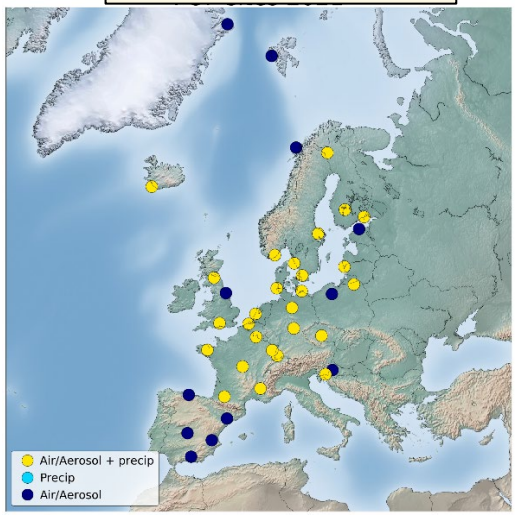
HM: 69 sites from 20 Parties



Hg: 30 sites from 13 Parties



POPs: 39 sites from 17 Parties



Convention on Long–Range Transboundary Air Pollution

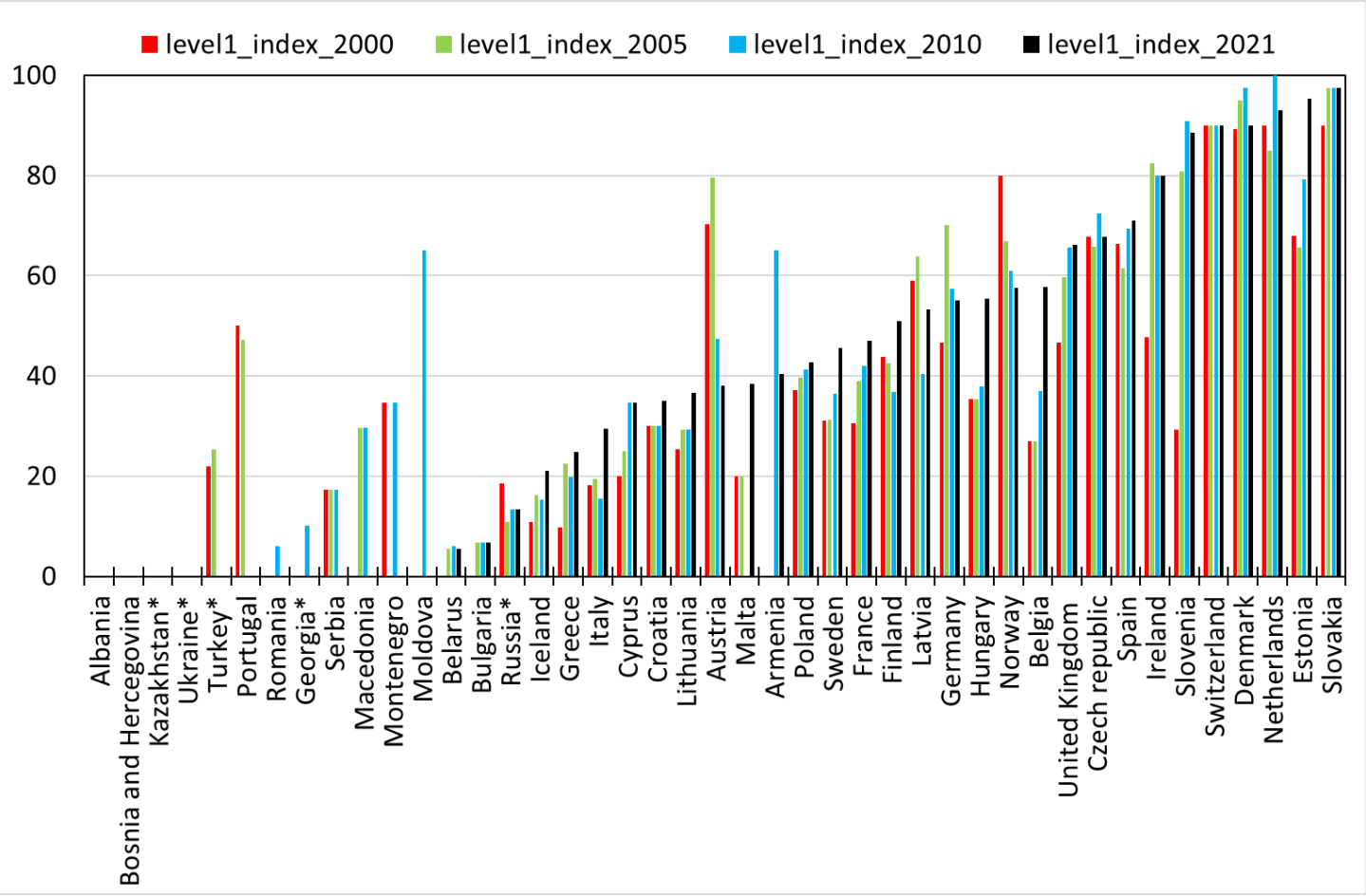
emep

Co–operative programme for monitoring and evaluation of the long–range transmissions of air pollutants in Europe

Results:

	EMEP40 2022	**EMEP39 2021**
	Cover letter	Cover letter
Plots/ Statistics	Youden plots Statistical summary Theoretical values Uncertainty in theoretical values	Youden plots Statistical summary Theoretical values Uncertainty in theoretical values
Deviation from expected values	B, C, J samples (air) G samples (precipitation) H samples (heavy metals)	B, C, J samples (air) G samples (precipitation) H samples (heavy metals)
Certificates	B samples C samples G samples H samples J samples	B samples C samples G samples H samples J samples
Participants	Status Last update: 2023.01.23	Status Last update: 2022.02.08

Implementation of monitoring strategy, level 1



Since 2010:

- 37% Parties improved
- 35% Parties reduced

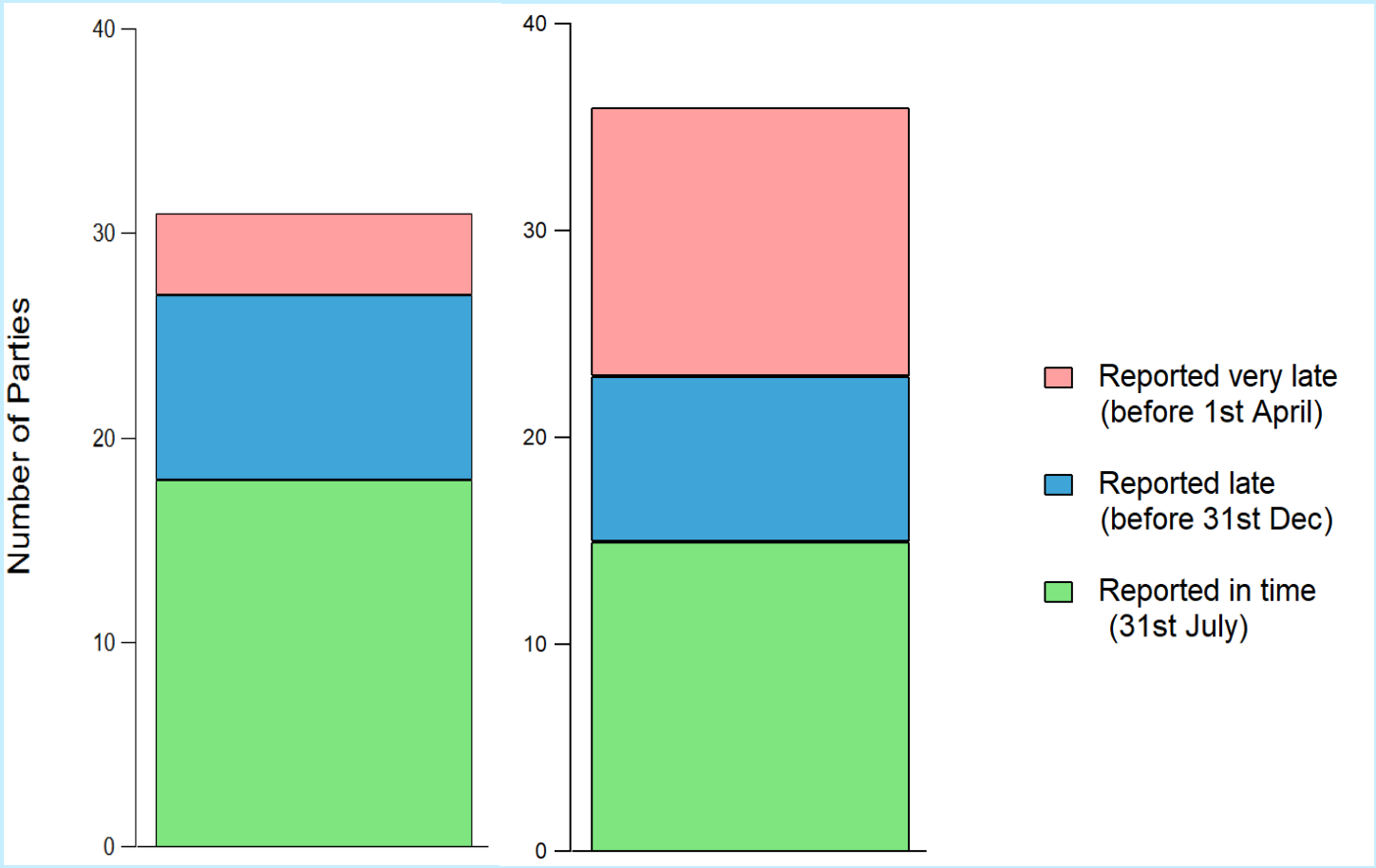
Since 2000:

- 60% Parties improved
- 19% Parties reduced

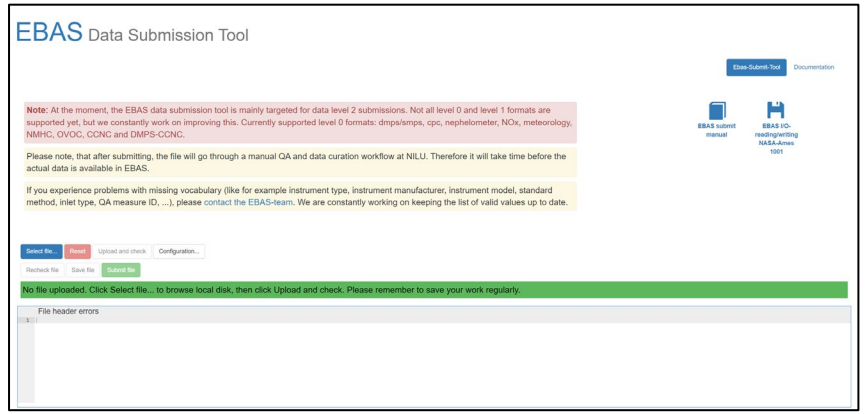
Thus:
Net improvement since 2000
Status quo since 2010

Timeliness and quality in reporting has improved

Time when Parties report their data



Improved tools and guidelines for reporting
https://ebas-submit-tool.nilu.no

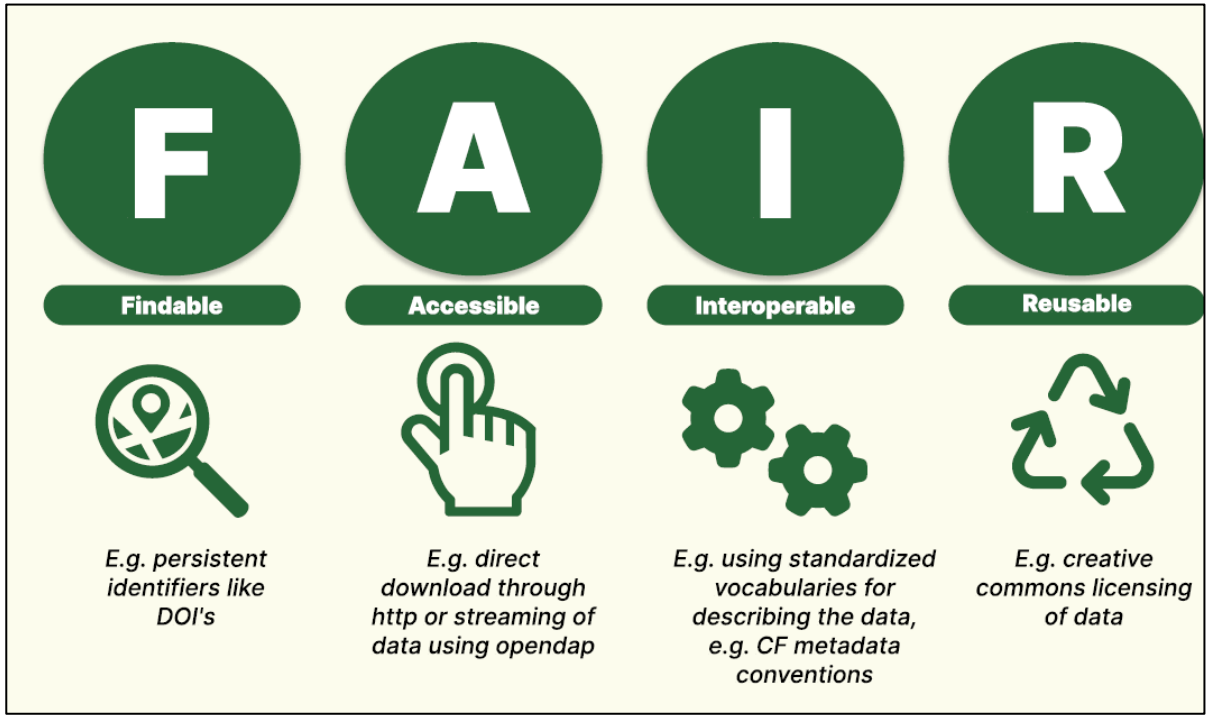


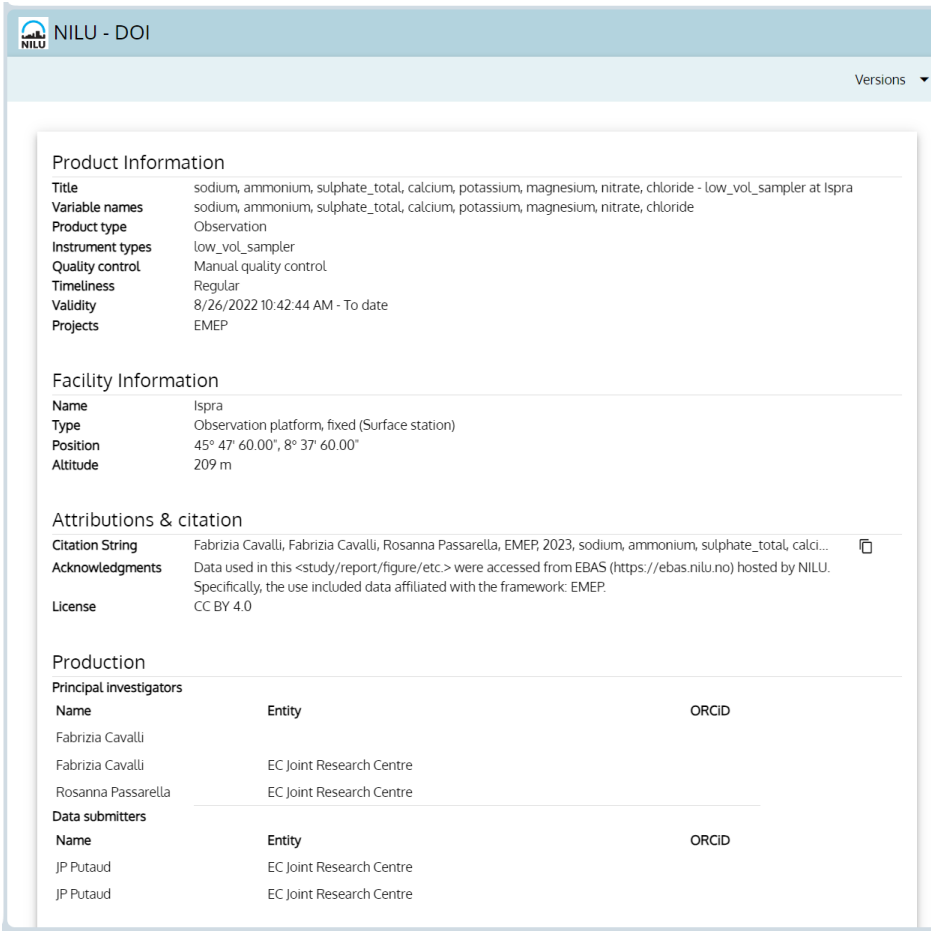
Large fraction of the 2022 data is already available in ebas

NILU

FAIR principles implemented for the EMEP data (all the data in EBAS)

Landing pages for DOIs of all the data series in EBAS will be launched in short time





Workplan 2022-2023 –on track

- Contribute to the Gothenburg Protocol (Completed)
- Prepare and conduct an intensive measurement period on VOC and high ozone levels during heatwaves (Completed)
- Review of the use of in-situ VOC measurements (Completed/Ongoing)
- Workshop on monitoring of chemicals of emerging concern(CEC) (Ongoing)

EMEP intensive measurement period on ozone episodes, 12-19 July 2022

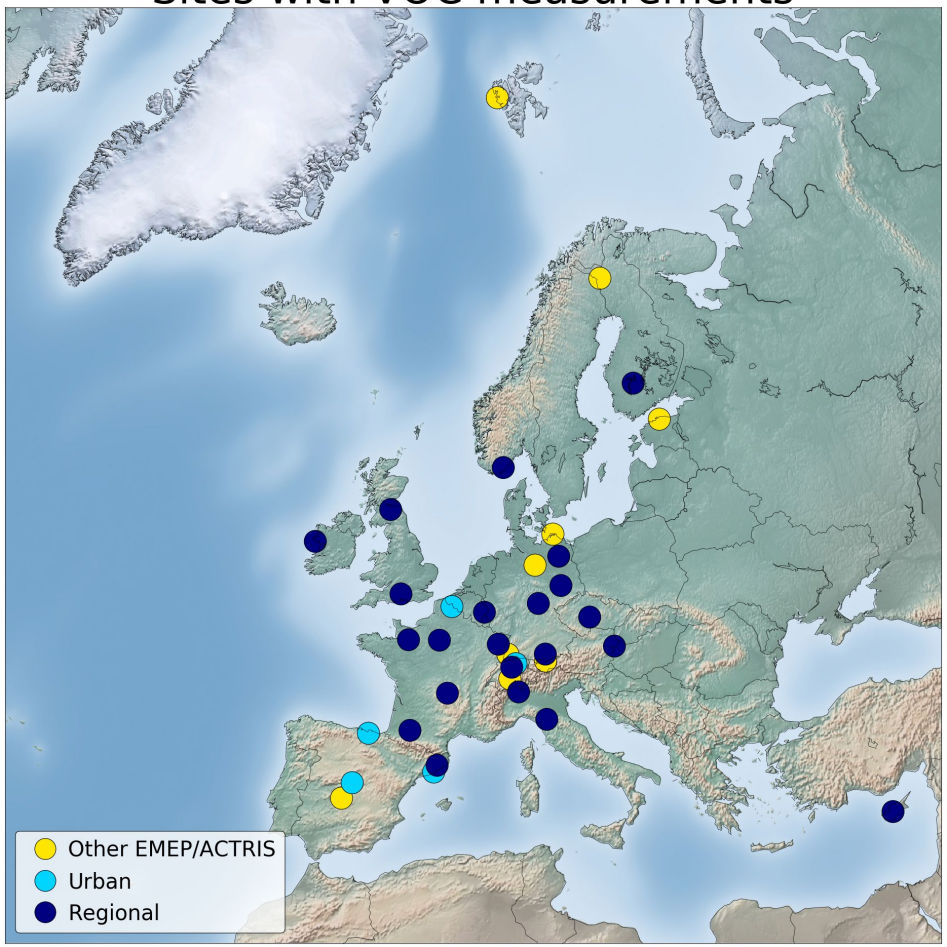
Measurements of:

- Ozone, NOx, EC/OC
- Non-methane hydrocarbons (NMHC)
- Oxygenated VOCs (OVOCs)
- Monoterpenes
- Tracers for biogenic secondary organic aerosols (BSOA)

The overall question:
Which VOCs contribute to high ozone concentrations?

27 sites participated

Sites with VOC measurements



A lot of species measured; several new components defined

118 Different VOCs measured +several new group names

1-2-3-4-tetramethylbenzene	acetonitrile	methyl-cyclopentane
1-2-3-trimethylbenzene	alpha-humulene	monoterpenes
1-2-4-5-tetramethylbenzene	alpha-phellandrene	m-p-xylene
1-2-4-trimethylbenzene	alpha-pinene	myrcene
1-3-5-triethylbenzene	anthracene	naphthalene
1-3-5-trimethylbenzene	benzaldehyde	n-butanal
1-3-butadiene	benzene	n-butane
1-3-diethylbenzene	beta-caryophyllene	n-decane
1-4-diethylbenzene	beta-farnesene	n-dodecane
1-butene	beta-pinene	n-heptane
1-ethyl-2-methylbenzene	bornylacetate	n-hexane
1-ethyl-3-methylbenzene	butanales	n-nonane
1-ethyl-4-methylbenzene	butanone	n-octane
1-hexene	butenes	nopinone
1-methyl-2-propylbenzene	camphene	n-pentadecane
1-pentene	chlorobenzene	n-pentane
2-2-4-trimethylpentane	cis-2-butene	n-propanol
2-2-dimethylbutane	cyclo-hexane	n-propylbenzene
2-3-dimethylbutane	ethanal	n-tetradecane
2-3-dimethylpentane	ethane	n-tridecane
2-4-dimethylpentane	ethanedial	n-undecane
2-ethyl-p-xylene	ethanol	o-xylene
2-methyl-2-butene	ethene	p-cymene
2-methylbutane	ethylbenzene	pentanal
2-methylhexane	ethyne	pentenes
2-methylpentane	eucalyptol	phenylmethanol
2-methylphenol	fluorene	propanal
2-methylpropane	furfural	propane
2-methylpropenal	hexanal	propanone
2-methylpropene	isoheptanes	propene
2-oxopropanal	isohexanes	propyne
2-propanol	iso-longifolene	sabinene
3-buten-2-one	isoprene	styrene
3-carene	limonene	terpinolene
3-methylheptane	linalool	tert-butylbenzene
3-methylhexane	longicyclene	toluene
3-methylpentane	methanal	trans-2-butene
4-methylphenol	methanol	trans-2-pentene
acenaphthene	methyl_acetate	
acenaphthylene	methyl-cyclohexane	

Defined new group compunds fro PTR-MS
mass_107.086_organic_compounds
mass_107_organic_compounds
mass_121_organic_compounds
mass_59_organic_compounds
mass_69_organic_compounds
mass_71_organic_compounds
mass_73.065_organic_compounds
mass_73_organic_compounds

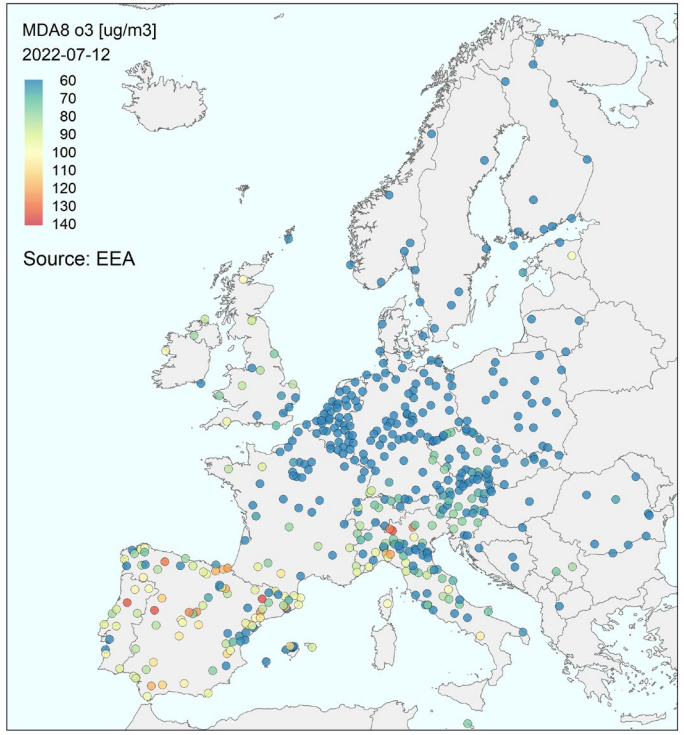
Organic tracers (46 different)

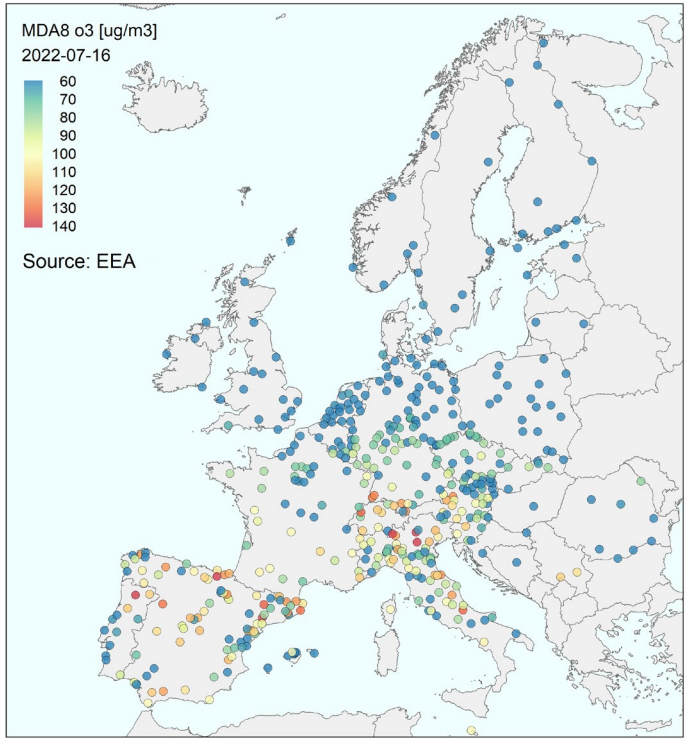
MSA	Glycolic	Glucose
Pinic	Glyoxylic	Fructose
Cis-Pinonic	Oxalic	Mannose
3-MBTCA	Lactic	Sucrose
	Pyruvic	Maltose
2-MT	Malonic	Lactose
Levoglucosan	3-Hydroxybutyric	Trehalose
Rhamnose	2-Ketobutyric	Melezitose
	Malic	Arabitol
Glutaric	Tartaric	Adonitol
Adipic	Caproic	Inositol
Pimelic	Gluconic	Sorbitol
Suberic	4-Oxoheptanoic	Mannitol
Azelaic	Benzoic	
Sebacic	4-Hydroxybenzoic	
Phthalic	Succinic	
	Citric	
	4-Methylphtalic	existing
	Citraconic	in EBAS
	Maleic	

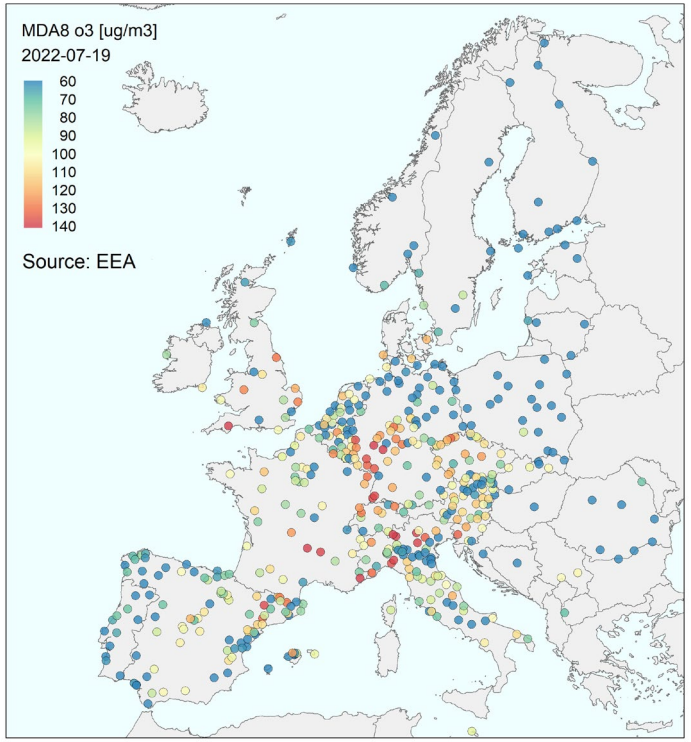
Additional parameters:
NOx,O_3,EC,OC,PM,inorganic ions, met

Ozone episode 12-19 July 2022 (MDA 8h)

- Polluted air transported from south to north during the week

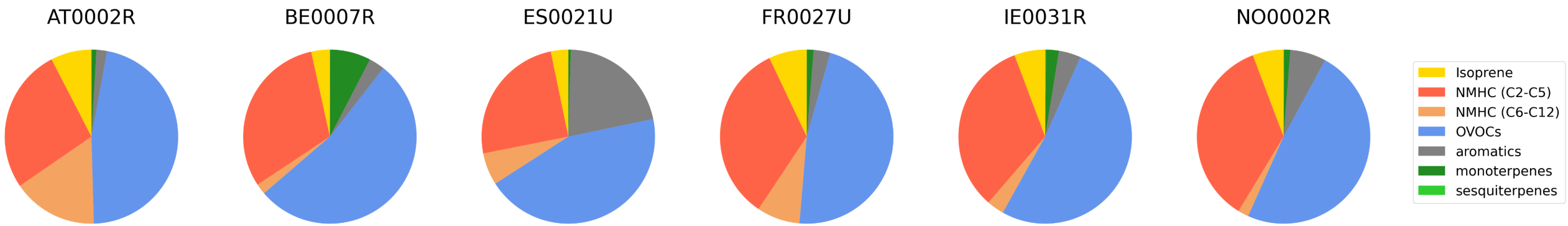






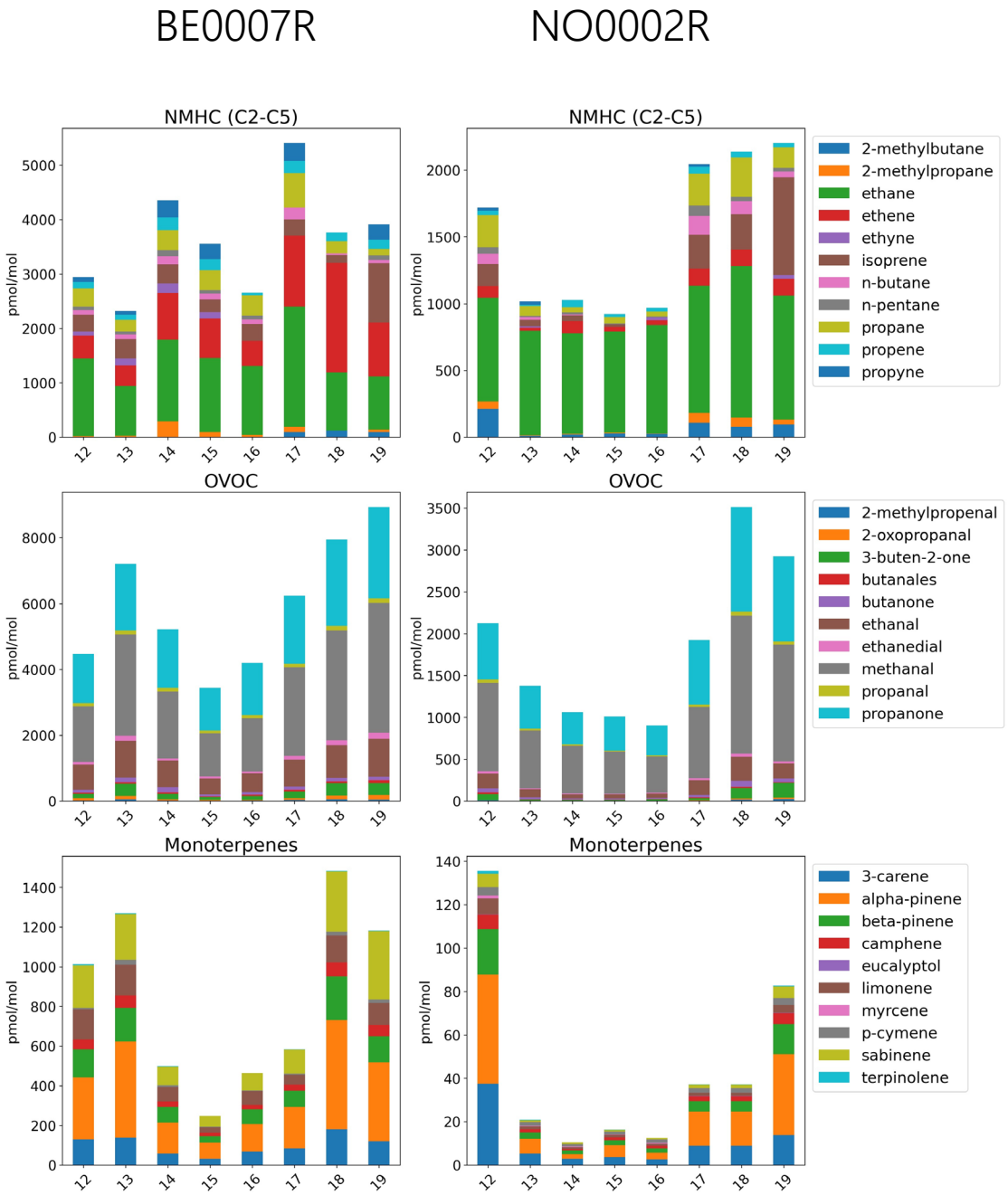
Distribution of different VOC groups at selected sites

- Only compared components measured with comparable methods (central analysis).
- All the sites are dominated by OVOCs and C2-C5 NMHCs, and their relative contribution does not vary very much between the sites even though they are situated in quite different environments, some differences seen though:
  - Illmitz (AT0002R) that has a larger fraction of C6-C12 NMHCs.
  - Madrid (ES0021U) has the highest relative influence of aromatic VOCs
  - Viesalam (BE0007R) is situated in a forest and has relatively large contribution of monoterpenes



Chemical composition of the different VOC groups

- **NMHC**: Different temporal variation between sites, inline with the general development of the episode moving across the continent. The absolute levels reflect the station type
- **OVOC:** Similar temporal variations as for NMHC though the relative distribution is strikingly similar between the stations
- **Monoterpenes**: a large spread in the mean concentrations with no clear patterns except that α-pinene is the most abundant species at all sites.

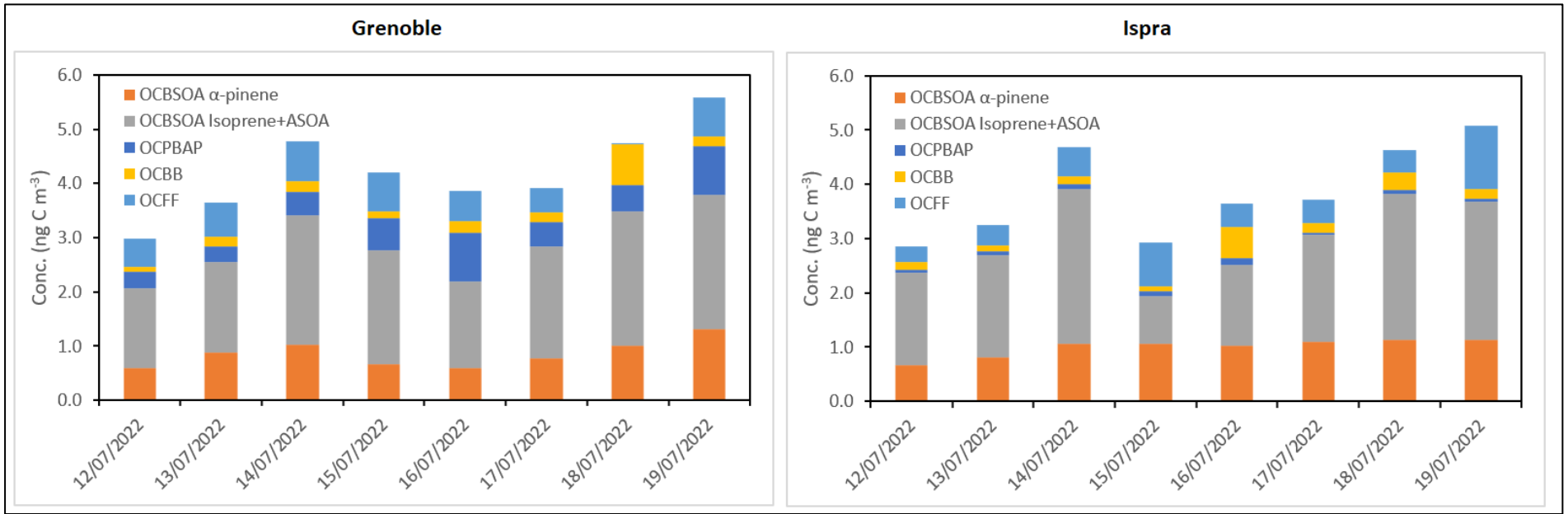


Tracers used for apportioned biogenic organic aerosols into secondary and primary categories, at Ispra and Grenoble

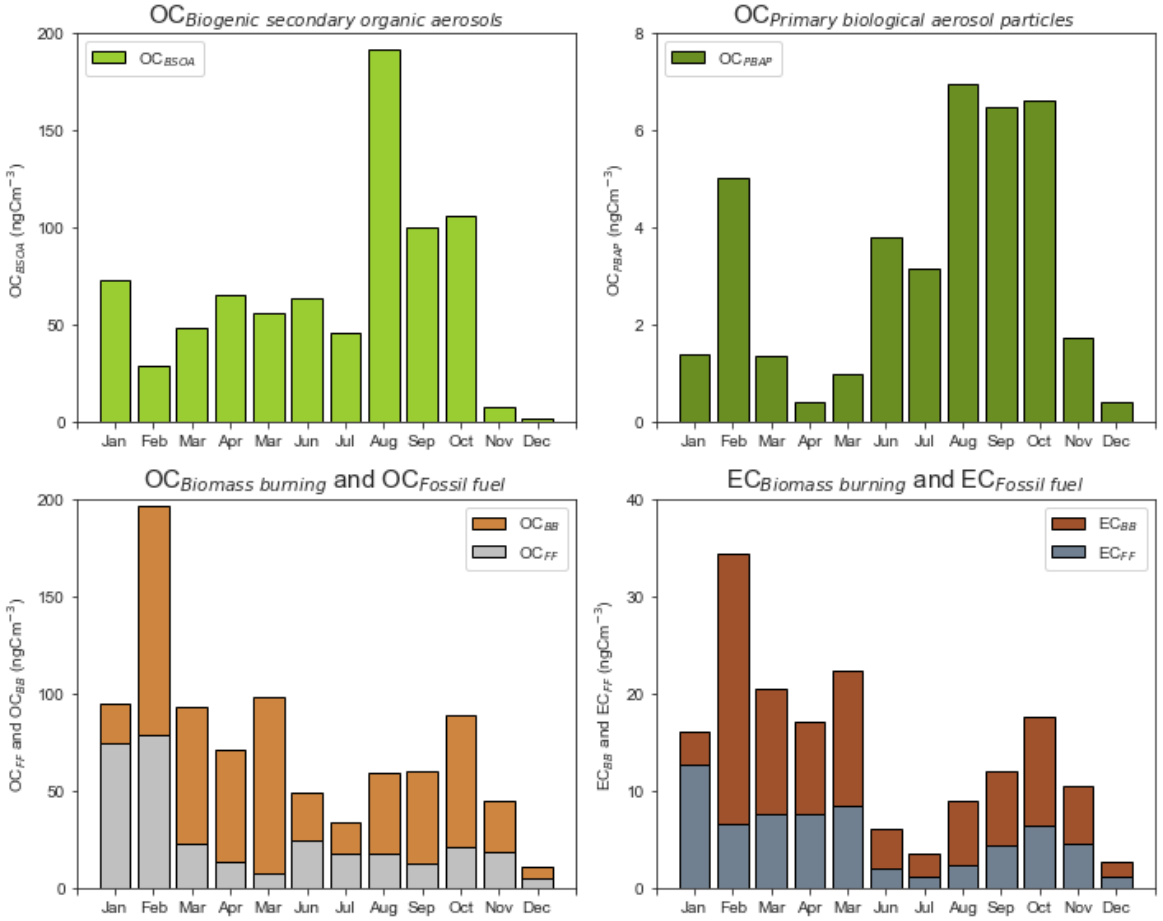
Organic aerosols during the intensive measurement week (IMP) was apportioned to:

- 20% from oxidation of α-pinene
- 50% from oxidation products of isoprene and anthropogenic emissions
- 13% -14% from fossil fuel (FF)
- 6% OC from biomass burning (BB)
- Primary biological particles (PBAP): 13% at Grenoble but only 2 % at Ispra

Up to 80% of organic aerosol was attributed to SOA



Organic tracers are important observations, used for allocating sources of carbonaceous matter



- Combination with statistical methods (PMF)
- Example from study with observations at Zeppelin in the Arctic. Paper in preprint

https://doi.org/10.5194/egusphere-2023-615
Preprint. Discussion started: 25 April 2023

EGUsphere Preprint repository

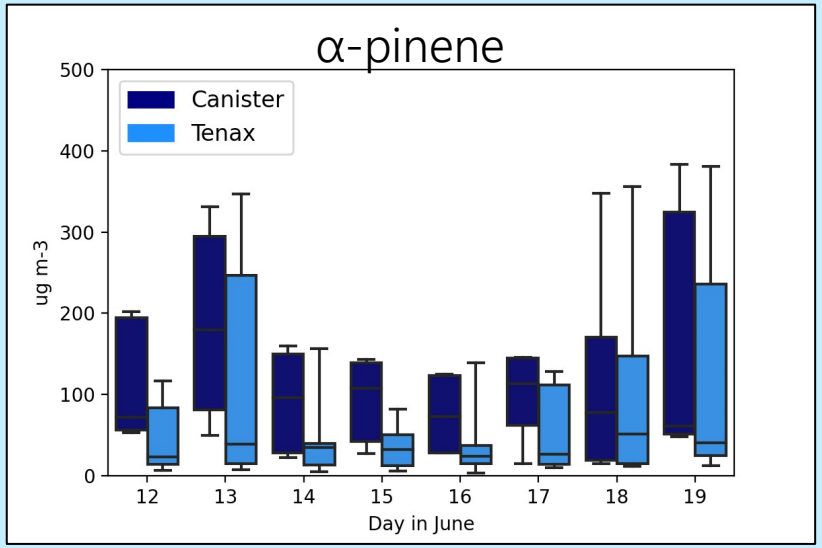
Composition and sources of carbonaceous aerosol in the European Arctic at Zeppelin Observatory, Svalbard

Karl Espen Yttri[1]*, Are Bäcklund[1], Franz Conen[2], Sabine Eckhardt[1], Nikolaos Evangeliou[1], Markus Fiebig[1], Anne Kasper-Giebl[3], Avram Gold[4], Hans Gundersen[1], Cathrine Lund Myhre[1], Stephen Matthew Platt[1], David Simpson[5,6], Jason D. Surratt[4,7], Sönke Szidat[8], Martin Rauber[8], Kjetil Tørseth[1], Martin Album Ytre-Eide[1], Zhenfa Zhang[4] and Wenche Aas[1]

Quality assurance of the VOC and tracer measurements

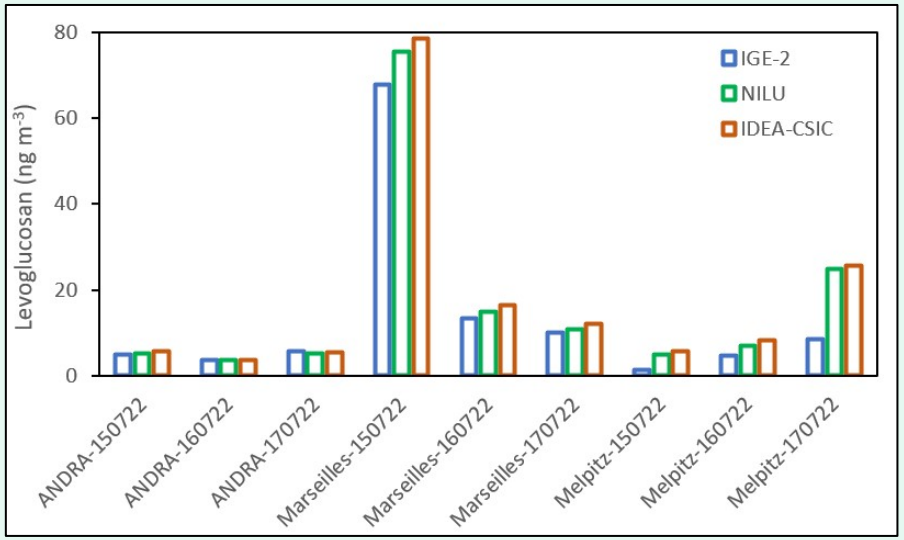
Parallel VOC measurements, e.g.:

- α-pinene and limonene: canisters and tenax tubes.
- Isoprene: PTR-MS and canisters.
- Propanone and butanone: DNPH cartridges and canisters.
- Methanal: DNPH cartridges and PTR-MS



Intercalibration of the tracer analysis

- All the analysis for IMP was done at central lab (IGE-2)
- 9 samples from 3 locations also analysed at NILU and IDEA-CSIC for selected compounds using different methods
- High correlation coefficients but significant variability to produce comparable concentration levels



Ongoing and future work related to the summer campaign

Peer reviewed publication(s) of the results

- Evaluate the ozone formation potential of the different VOCs
- Link NOx data and VOCs to assess their temporal and spatial importance
- Look more closely into SOA originating from isoprene oxidation.
- Integrate model results in the interpretation

Quality assurance:

- Assess the quality and uncertainty in the different VOC measurements
- Improve reporting guidelines and define SOPs for PTR-MS measurements
- A laboratory intercomparisons for the most used organic tracers with more analytical methods than used here is strongly needed. This will followed up in co-operation with ACTRIS

Potentially a new VOC campaign during (winter) 2024 to improve emission estimates.

ACTRIS ERIC established; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023D0900&qid=1683103665359

Document 32023D0900

? Share

Commission Implementing Decision (EU) 2023/900 of 25 April 2023 setting up the Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS ERIC) (notified under document C(2023) 2646) (Only the Bulgarian, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Italian, Polish, Romanian, Spanish and Swedish texts are authentic) (Text with EEA relevance)

C/2023/2646

OJ L 115, 3.5.2023, p. 15–19 (BG, ES, CS, DA, DE, ET, EL, EN, FR, GA, HR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV)

- Labelling of ACTRIS National Facilities under preparation

FLEXPART

Home Request Access FLEX

ATMO-ACCESS

FLEXPART products for ground based aerosol and trace gas observations

Landing page for the ATMO-ACCESS FLEXPART products.

FLEXPART Model Run

Request access to FLEXPART model run

Request Access

FLEXPART Products and Information

Access FLEXPART products and descriptions

Access Data

General Support

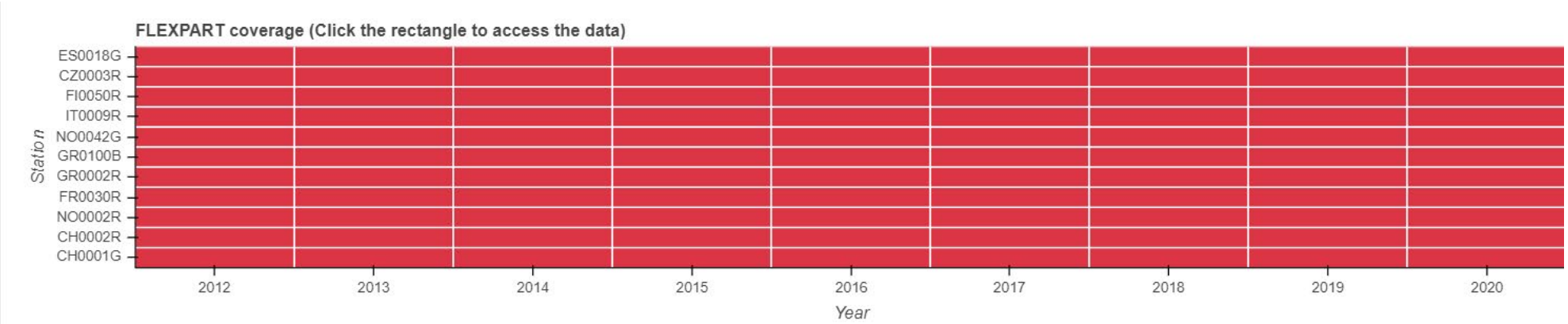
Do you have questions regarding the FLEXPART products in ATMO-ACCESS?

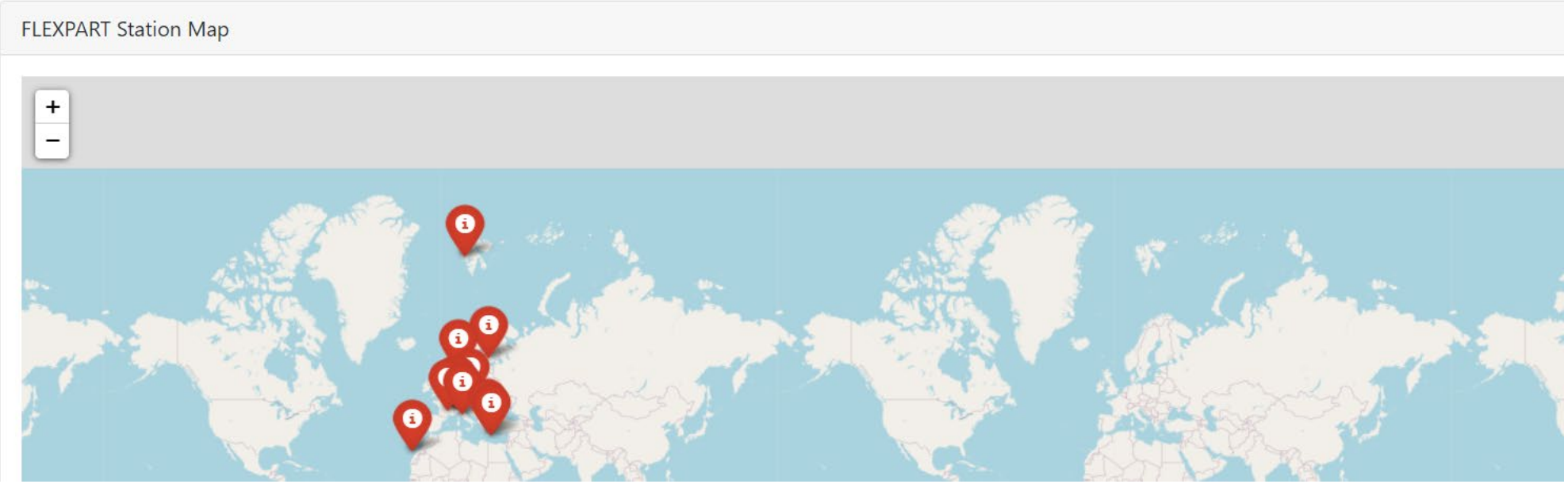
Get Support

NILU

Operational from May 15th 2023

Flexpart products



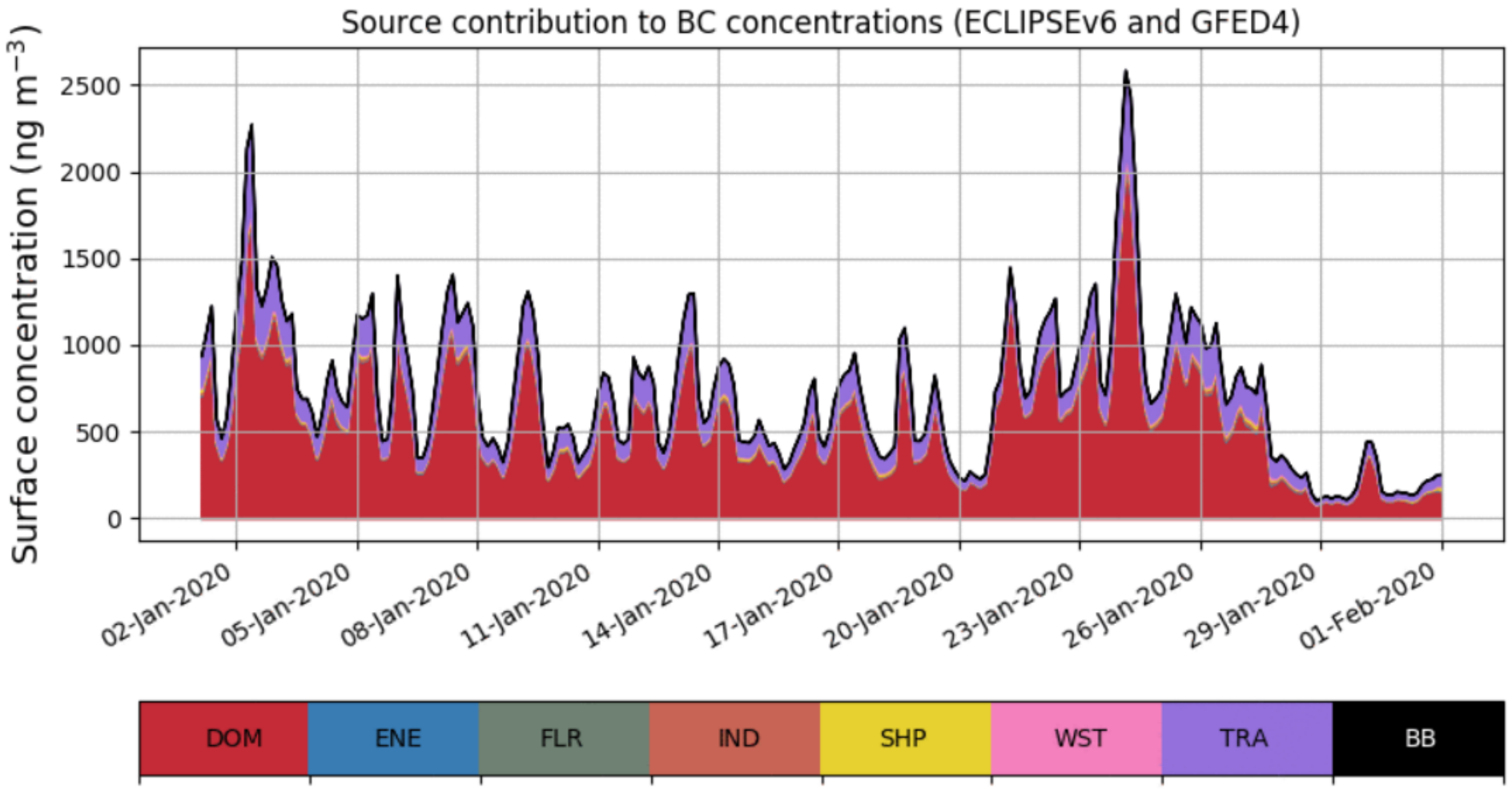


FLEXPART products for BC measurements

For support and more information please submit a request here: https://flexpart-request.nilu.no/support

IT0009R | 2020 | January | Source Spec | TOTAL | VIEW PLOT | VIEW DATA

SUBMIT



NILU

Revision of the EU Directive (AQFD)

CCC gave an input to the hearing to ensure harmonised observations

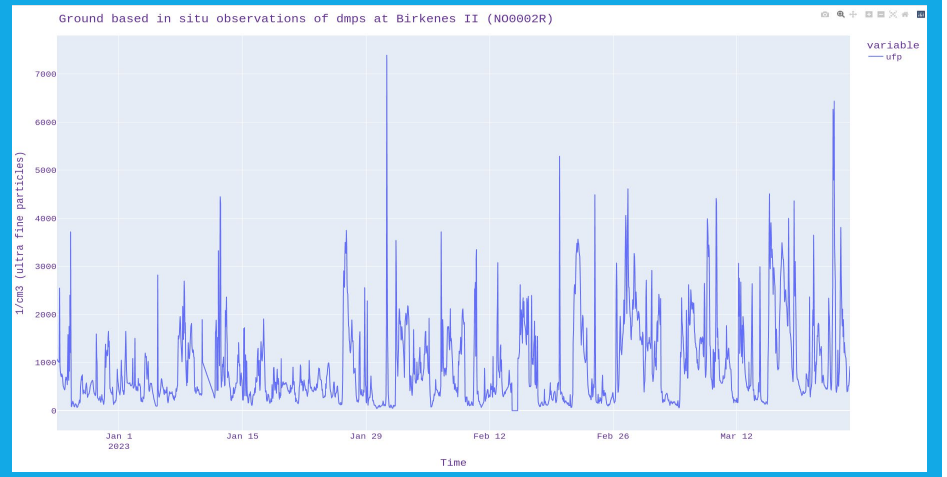
Likely new items that are relevant for EMEP:

- **Ultrafine particles (UFP).** EMEP long experience in observations of size distribution. 36 sites with continuous monitoring EMEP, ACTRIS, GAW).

- **NH_3.** EMEP long experience. Observations very sensitive to location and method.

- **Urban supersites.** Building on the experience from EMEP supersites (ACTRIS, GAW)

UFP, time series at NO0002R



Minamata – Effectiveness Evaluation - Open Ended Science Group (OESG)

"PLAN FOR MONITORING DATA COMPILATION AND SUMMARY"
TO INFORM THE EFFECTIVENESS EVALUATION OF THE MINAMATA CONVENTION

Addendum 1. Existing sources of mercury monitoring data in air

1. ATMOSPHERIC MERCURY MONITORING

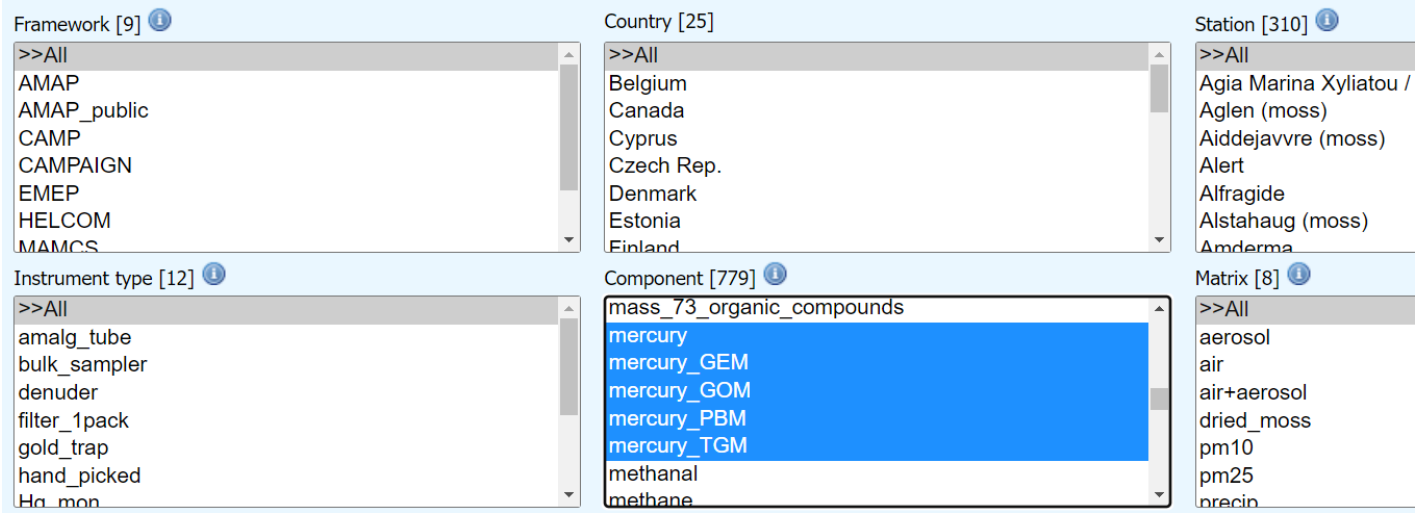
This document reproduces pages 4-12 of the "Supplementary material – Guidance on monitoring of mercury and mercury compounds to support evaluation of the effectiveness of the Minamata Convention" as contained in document UNEP/MC/COP.4/INF/25.

The purpose of the "Plan for Monitoring Data Compilation and Summary (hereafter "monitoring data plan") is to structure and guide the process for data submission, collection, management, and accessibility in support of the first effectiveness evaluation of the Minamata Convention. In particular, this includes considerations on:

- How monitoring data will be sought from Parties and other relevant organizations
- What procedures will be used to collect, compile, manage, and make available that data to the OESG and its roster of experts, parties, and experts
- Roles and responsibilities of different players to execute specific tasks
- Schedule for the identified tasks

EMEP-CCC actions towards Hg/Minamata

- New EBAS vocabulary for Mercury species
- Offer to the MC by NILU to host any national Hg data not available through open repositories
- Recommended that EMEP data should be used as the European contrbution



Submitter	General / Line specific	Type	Comment	RESPONSES AIR MONITORING GROUP	RESPONSES HUMAN, BIOTA & OTHER	RESPONSE / REVISION
Iran	General	Substantive	I propose that the collection of mercury monitoring data for each Tier (1,2,3) in accordance with the table illustrated in page 15 should be separately presented in the plan of monitoring data. Developing countries will not be able to collect and present all of the data introduced in the plan of monitoring data. Besides, the toolkits and software related to the monitoring of mercury should be introduced in the plan of monitoring data.			The plan for monitorin existing data that can information so that de so wish, along with ca among others, will be future EE cycles. The t presented in the plan
Uganda	General	No action needed (in the monitoring data plan)	The "Plan for Monitoring Data Compilation and Summary" to inform the Effectiveness Evaluation of the Minamata Convention is adequate. However, the quality of data collected may be guaranteed if there is uniformity in data collection tools, sample handling and testing methodologies.			The plan for monitorin existing data that can label data of different efforts to monitor mer data.
Iran	General	Substantive	Developing countries should be equipped with the sophisticated instrumental devices for monitoring mercury in the different media. Therefore, committing developing countries to provide detailed information introduced in the plan without the appropriate instrumental devices isn't possible.			Gaps and capacity nee recommendations rela how to bridge the ider developing countries.
Norway	General	No action needed (in the	To ensure a high level of data, reporting may need support from the Secretariat. This could be arranged in the form of online Q/A session or webinars in advance of the August deadline.			Information sessions a develop a common for

NRT: CAMS-21a (phase 2), WP-3

- Task 3.1 (ACTRIS CiGas & NILU): Report comparing data processing in EMEP, ACTRIS and EEA (existing datasets)

  Report describing procedures for RRT delivery of ozone and NOx data. Overview of sites delivering NRT-ozone and NOx data through EEA, which are also ACTRIS NFs. Engage additional sites currently not engaged in the EEA-NRT data delivery

- Task 3.3 (NILU): Demonstrate capability of QA for EMEP NO2 and O3

  Statistical tests on a RRT schedule for 1-2 stations. Assess the improvements vs less stringent QA.

- Other WPs dealing with ASCM and other data, which also the EMEP community will benefit from

Workshop on field and measurement techniques for chemicals of emerging concern (CECs)

At NILU, Kjeller, Norway, 8-10 November 2023

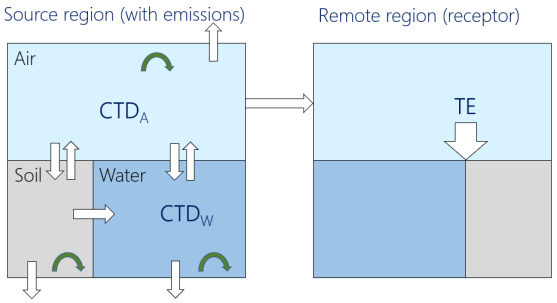
Aim:

- recommend approaches for sampling and analysis of CECs
- which CECs should be monitored?
- give guidelines on sampling protocols and analytical techniques.

Close cooperations with AMAP and the Stockholm Convention

Screening chemicals for persistence and LRT potential

The new "Emissions Fractions Approach" metrics (Breivik et al 2022, https://doi.org/10.1021/acs.est.2c03047) have been implemented into The Tool's code for initial explorations, along with the existing metrics (CTD/TE). However, it is up to the OECD (WPEA) to decide whether the EFA will remain to be included, also in the final version of the "New and updated" OECD Tool.

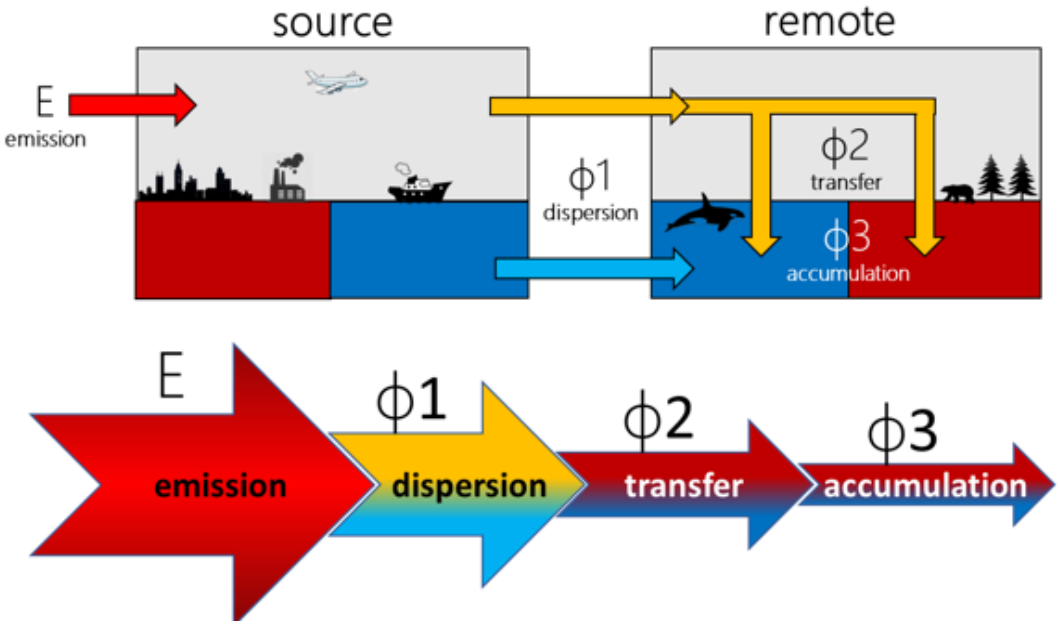


A set of three, additive and coherent LRTP metrics formulated to address the following three questions:

To what relative extent can a chemical reach remote regions?
-> The environmentally **dispersed** fraction **(ϕ1)**

To what relative extent can a chemical be transferred to surface media in remote regions?
-> The remotely **transferred** fraction **(ϕ2)**

To what relative extent can a chemical accumulate in surface media in remote regions?
-> The remotely **accumulated** fraction **(ϕ3)**



Workplan 2024-2026

Improving tools to assess air pollution and its effects

- Assess contribution of VOCs on high O_3 pollution episodes
  Follow up on results from intensive measurement period as well as use of regular EMEP data
  Peer-reviewed publication describing campaign and key results
- Investigate monitoring of chemicals of emerging concern (CECs).
  Follow up conclusions and guidelines from workshop in autumn 2023
- Aerosol chemical speciation, assess importance of different sources

Cooperation with other projects and bodies (outreach activities)

- CAMS, Near real time data services
- Support Stockholm Convention in relation to atmospheric observations and data management
- Support Minamata Convention in relation to atmospheric observations and data management

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Summary

- The monitoring programme is stable with few changes from year to year
- Improvements in the timeliness and quality of the data reporting
- FAIRness in data stream implemented
- EMEP intensive measurement periods on VOCs and ozone episodes
  - Successful campaign and most data submitted and available
  - Results to be published in the months to come
  - Assess methods used for different compunds
  - Possibly an additional targeted VOC campaign in winter 2024
- Workshop in nov 2023 about chemicals of emerging concern (CECs)

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