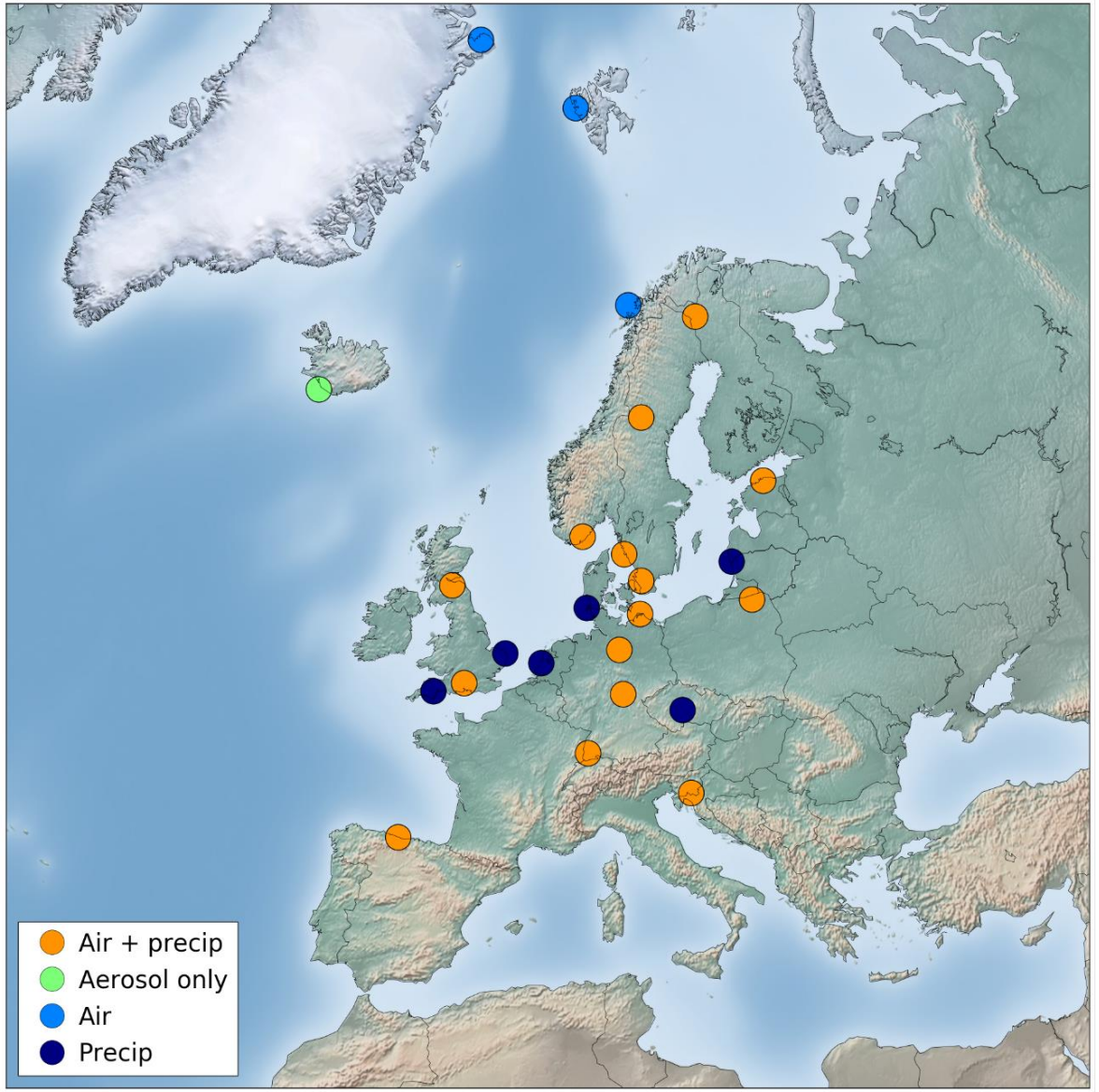
Mercury observations in EMEP

Kjetil Tørseth, Katrine Aspmo Pfaffhuber, Wenche Aas, Richard Olav Rud

EMEP-CCC/NILU



NILU

Convention on Long Range Transboundary Air Pollution

emep

The Convention on long range transboundary air pollution (CLRTAP)

- Convention signed in 1979 mainly as a result of research leading to the discovery of transboundary air pollution as a main cause of acidification in Scandinavia
- The aim of the Convention is to limit long-range transboundary air pollution. Parties develop policies and strategies to combat the discharge of air pollutants through exchanges of information, consultation, research and monitoring
- The Convention has been extended by eight protocols that identify specific measures to be taken by Parties to cut their emissions of air pollutants.

Protocol on Long-term Financing of **the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe** (EMEP)

CEIP
Centre on
Emission Inventories and Projections

CCC
Chemical Coordinating Centre

MSC-W
Meteorological Synthesizing Centre
- West

MSC-E
Meteorological Synthesizing Centre
- East

CIAM
Centre for
Integrated Assessment Modelling

TFEIP
Task Force on
Emission Inventories and Projections

TFMM
Task Force on
Measurements and Modeling

TFIAM
Task Force on
Integrated Assessment Modeling

TFHTAP
Task Force on
Hemispheric Transport of Air Pollution

www.emep.int

Annex

Monitoring strategy for the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe for the period 2020–2029

I. Introduction

1. This document presents the monitoring strategy for the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) for the period 2020–2029. The document was developed through a revision process led by the EMEP Chemical Coordinating Centre in cooperation with the EMEP Task Force on Measurements and Modelling, as mandated by the third joint session of the EMEP

14. Taking into account the complexity and costs of atmospheric composition monitoring, EMEP will, as far as possible, continue to harmonize with, and make use of relevant data compiled under, other conventions and frameworks. In particular, such data would include observations of local air quality, climate change, water quality and biodiversity. As a result, there is a significant overlap in technical infrastructures at national levels, i.e. most EMEP level 2 sites (see below) represent core infrastructures for observations supporting related initiatives. Within the Convention, there is close collaboration with the Working Group on Effects and the International Cooperative Programmes, with EMEP observations being used to derive pollution exposure data to assess impacts and effects.

15. At the European level, EMEP observations are fundamental in relation to the European Union Air Quality Directive[1] and the National Emission Ceilings Directive,[2] and there are close links between EMEP monitoring requirements and the Directives. Furthermore, EMEP observations are used as a part of European Environment Agency assessments of the air quality situation in Europe, and EMEP sites typically also deliver parts of their data to the European Environment Agency database.

16. There is close scientific and technical cooperation between EMEP and the World Meteorological Organization Global Atmosphere Watch Programme in Europe, comprised of harmonization of guidelines, observational practices, data quality control, quality assurance and data exchange. Through the efforts of Global Atmosphere Watch, EMEP observations are also harmonized with efforts in other parts of the world, and EMEP data contribute to Global Atmosphere Watch's services to society.

17. Examples of other initiatives and frameworks related to pollution include international programmes and conventions such as: the Arctic Monitoring and Assessment Programme; the Baltic Marine Environment Protection Commission; the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic; the United Nations Framework Convention on Climate Change; the Stockholm Convention on Persistent Organic Pollutants; and the Minamata Convention on Mercury under the United Nations Environment Programme.

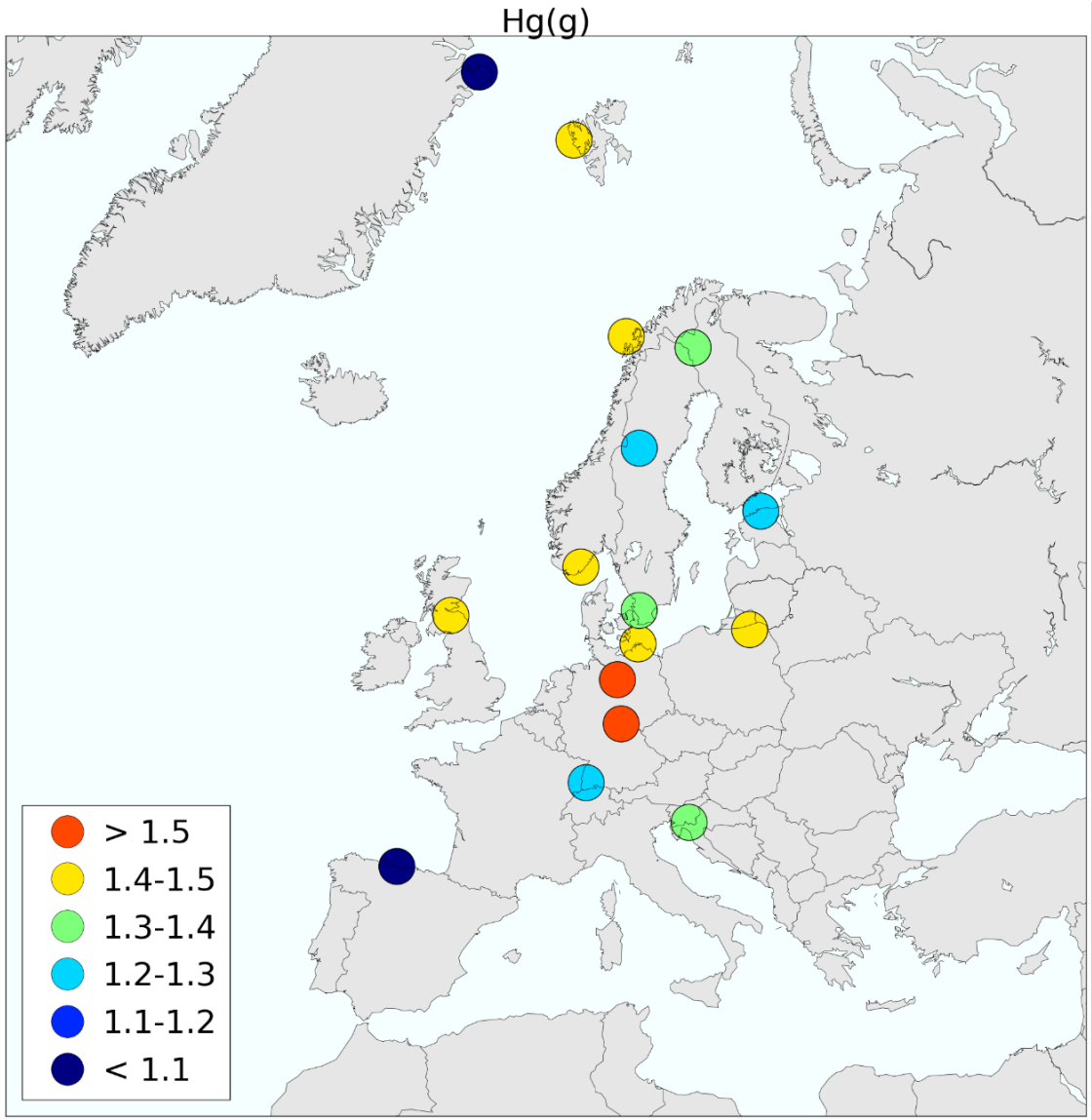
18. EMEP observations are also made available to users and stakeholders though initiatives such as the Global Earth Observation System of Systems and the European Union's Earth Observation Programme (COPERNICUS).

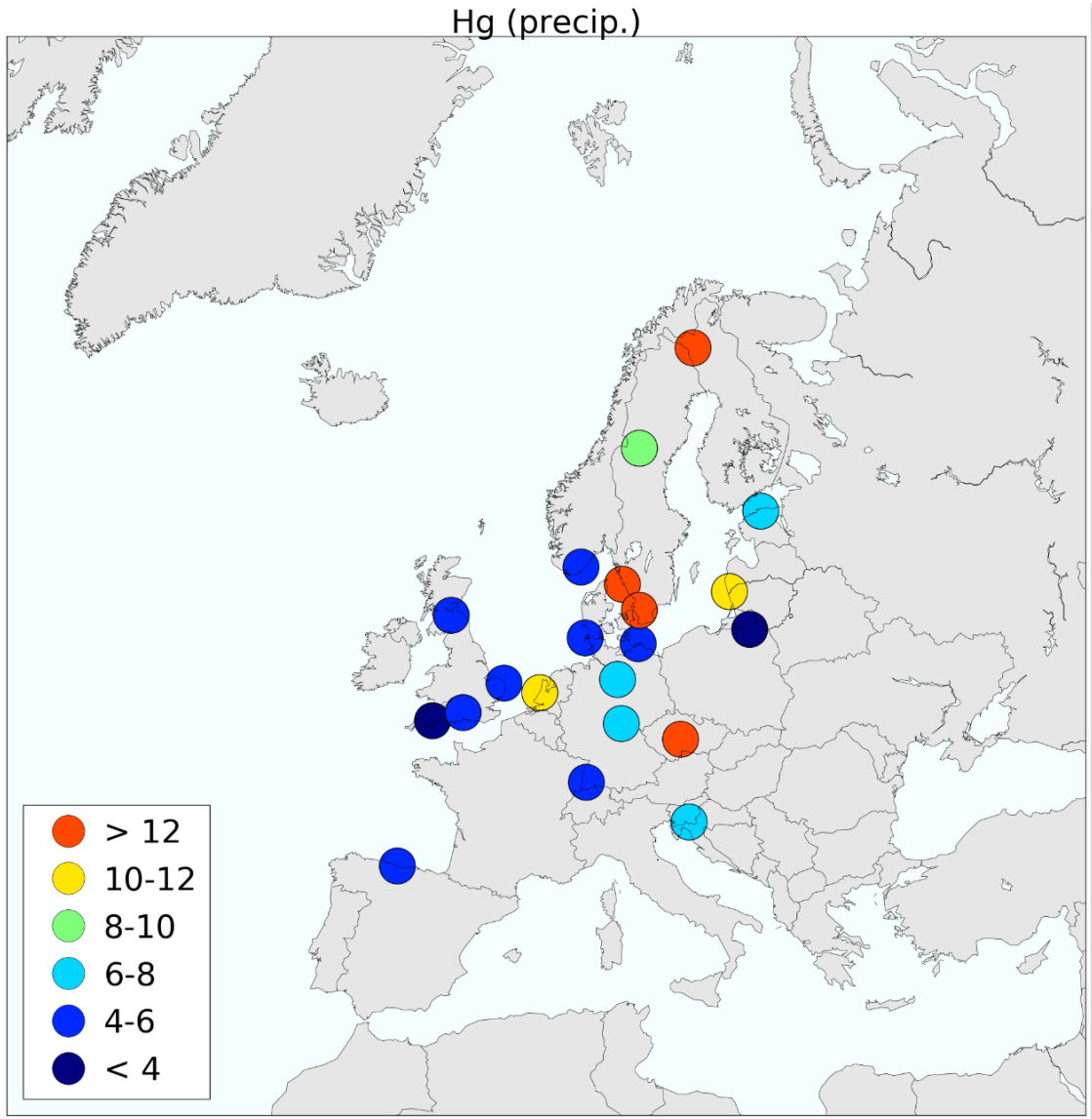
http://www.unece.org/fileadmin/DAM/env/documents/2019/AIR/EB_Decisions/Decision_2019_1.pdf

Level 2 - "additional variables to be measured at a subset of sites - EMEP level 2 sites"		*Recommended temporal resolution*
Heavy metals observations contribute to the assessment of mercury and heavy metals fluxes		
Mercury in precipitation	Hg	7 days
Mercury in air	Hg (TGM)	1 hour/24 hours/7 days

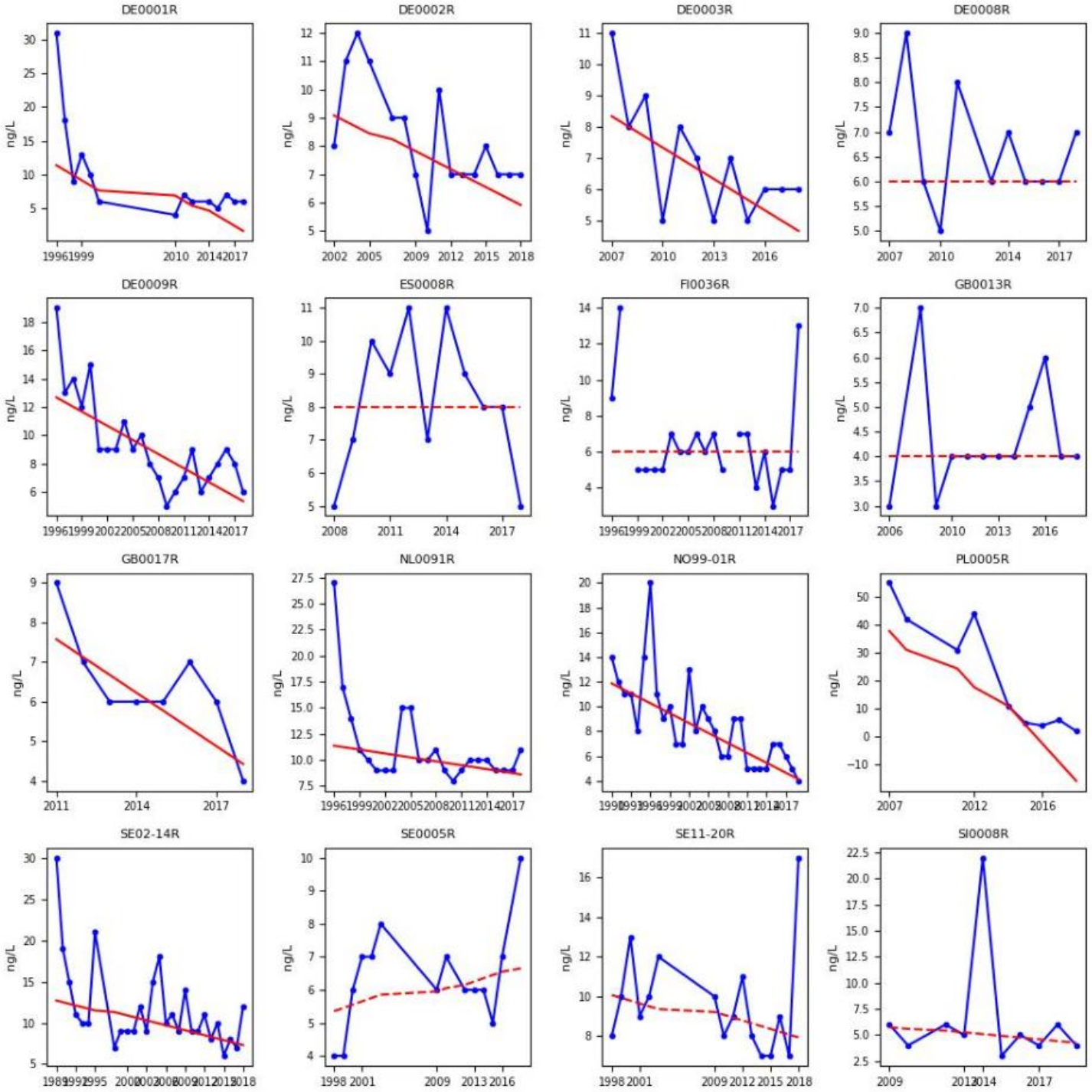
Level 3 – Research-based and voluntary measurements, preferably, but not limited to, EMEP level 1/2 sites. May also include both campaign and long-term observations. Observations contribute to the understanding of processes relevant to long-range transport of air pollutants and support model development and validation		*Recommended temporal resolution*
Mercury speciation	RGM and TPM	1 hour/24 hours/7 days

Observed concentration levels:



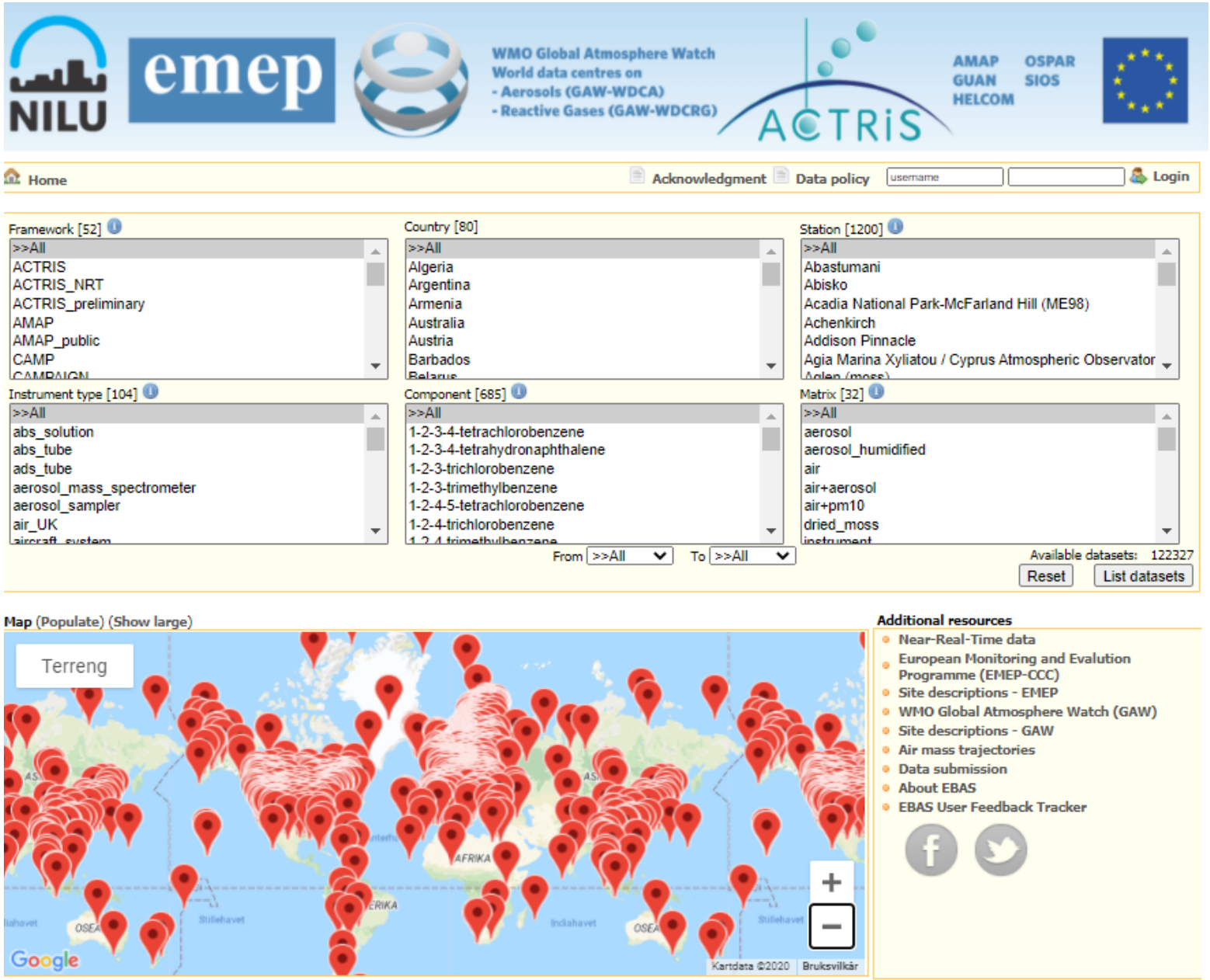


Trends:


DE0001R
DE0002R
DE0003R
DE0008R
DE0009R
ES0008R
FI0036R
GB0013R
GB0017R
NL0091R
NO99-01R
PL0005R
SE02-14R
SE0005R
SE11-20R
SI0008R
ng/L

Ways to access EMEP data (1):

http://ebas.nilu.no



Web interface

(search, display, download)

- *Gaseous_Elemental_Mercury*
- *Mercury*
- *Reactive_Gaseous_Mercury*
- *Total_Gaseous_Mercury*

Framework [12]

>>All
AMAP
AMAP_public
CAMP
CAMPAIGN
EMEP
EMEP_preliminary
GAW-WDCRG

Country [18]

>>All
Belgium
Cyprus
Czech Rep.
Denmark
Estonia
Finland
France

Station [56]

>>All
Agia Marina Xyliatou / Cyprus Atmospheric Observatory
Andøya
Aspvreten
Auchencorth Moss
Banchory
Barcarrota
Birkenes

Instrument type [13]

>>All
amalg_tube
ann_denuder
bulk_sampler
filter_1pack
gold_trap
Hg_mon
high_vol_sampler

Component [4]

>>All
gaseous_elemental_mercury
mercury
reactive_gaseous_mercury
total_gaseous_mercury

Matrix [7]

>>All
aerosol
air
air+aerosol
pm10
pm25
precip
precip+dry_dep

From >>All To >>All

Available datasets: 253

Reset | List datasets

Map (Populate) (Show large)

Additional resources

- Near-Real-Time data
- European Monitoring and Evalution Programme (EMEP-CCC)
- Site descriptions - EMEP
- WMO Global Atmosphere Watch (GAW)
- Site descriptions - GAW
- Air mass trajectories
- Data submission
- About EBAS
- EBAS User Feedback Tracker

Month Dec 2020 Year 2020 From/To date 2020-08-30 14:02 2020-09-30 14:02 Download Plot

Group	Station	Station name	Instrument ty...	Instrument re...	Component	Matrix	Resolution	Data level	Start time	End time
1	BE0014R	Koksijde	wet_only_sampler	BE01L_06KK01024	mercury	precip	1w	2	2016-01-04	2018-01-02
1	CY0002R	Agia Marina Xyliat...	high_vol_sampler	CY01L_hvs_pm10...	mercury	pm10	1d	2	2007-01-02	2013-12-31
1	CZ0003R	Kosetice (NOAK)	amalg_tube	CZ01L_amalg_3	mercury	air	1w	2	2007-01-09	2013-12-31
1	CZ0003R	Kosetice (NOAK)	bulk_sampler	CZ01L_preci_sam...	mercury	precip	1w	2	2012-01-10	2012-12-25
1	CZ0003R	Kosetice (NOAK)	bulk_sampler	CZ01L_hg_bs_03	mercury	precip	1w	2	2013-01-08	2013-12-31
1	CZ0003R	Kosetice (NOAK)	bulk_sampler	CZ01L_hg_bs_03	mercury	precip	1w	2	2014-01-14	2014-12-30
1	CZ0003R	Kosetice (NOAK)	bulk_sampler	CZ01L_wo_cz03e	mercury	precip	1w	2	2015-01-13	2018-12-25
1	CZ0003R	Kosetice (NOAK)	filter_1pack	CZ01L_f1p_3_hg	mercury	pm10	1w	2	2007-01-09	2013-12-31
1	CZ0003R	Kosetice (NOAK)	Hg_mon	CZ05L_air_monitor	mercury	air	1h		2013-01-01	2015-12-31
1	DE0001R	Westerland	wet_only_sampler	DE03L_NSA_HM_1	mercury	precip	1mo	2	1990-02-01	1993-12-01
1	DE0001R	Westerland	wet_only_sampler	DE03L_ARS_Hg	mercury	precip	1mo	2	1996-02-01	2012-12-04
1	DE0001R	Westerland	wet_only_sampler	DE03L_hg_wados...	mercury	precip	1w	2	1999-01-11	2001-12-25
1	DE0001R	Westerland	wet_only_sampler	DE03L_ARS_Hg	mercury	precip	1w	2	2010-01-04	2010-12-21
1	DE0001R	Westerland	wet_only_sampler	DE03L_ARS_Hg_1	mercury	precip	1w	2	2011-01-04	2011-12-27
1	DE0001R	Westerland	wet_only_sampler	DE03L_UBA_We_...	mercury	precip	1w	2	2014-01-07	2019-01-02
1	DE0002R	Waldhof	gold_trap	DE03L_gold_trap_...	mercury	air	1d		2002-01-02	2002-12-31
1	DE0002R	Waldhof	gold_trap	DE03L_gold_trap_2	total_gaseous_mer...	air	1d		2003-01-02	2004-12-31
1	DE0002R	Waldhof	Hg_mon	DE03L_lvs_quarz_...	mercury	pm25	1d		2009-01-01	2012-01-01
1	DE0002R	Waldhof	Hg_mon	DE03L_TK_02	mercury	pm25	1h		2012-01-01	2014-01-01
1	DE0002R	Waldhof	Hg_mon	DE03L_TK_02	mercury	pm25	265mn		2013-01-02	2014-01-01
1	DE0002R	Waldhof	Hg_mon	DE03L_TK_02	reactive_gaseous_...	air	1d		2009-01-01	2012-01-01
1	DE0002R	Waldhof	Hg_mon	DE03L_TK_02	reactive_gaseous_...	air	1h		2012-01-02	2013-01-01
1	DE0002R	Waldhof	Hg_mon	DE03L_TK	total_gaseous_mer...	air	1d		2005-01-02	2013-12-31
1	DE0002R	Waldhof	Hg_mon	DE03L_TK_02	total_gaseous_mer...	air	1h		2009-01-01	2010-12-31
1	DE0002R	Waldhof	Hg_mon	DE03L_UBA_Wa_...	total_gaseous_mer...	air	1d	2	2014-01-01	2018-12-31
1	DE0002R	Waldhof	wet_only_sampler	DE03L_NSA_Hg_2	mercury	precip	1w	2	2002-01-08	2005-12-27
1	DE0002R	Waldhof	wet_only_sampler	DE03L_ARS_Hg	mercury	precip	1w	2	2007-01-09	2012-12-27
1	DE0002R	Waldhof	wet_only_sampler	DE03L_UBA_Wa_...	mercury	precip	1w	2	2013-01-08	2019-01-02
1	DE0003R	Schauinsland	Hg_mon	DE03L_TK	total_gaseous_mer...	air	1d		2010-01-02	2013-12-31
1	DE0003R	Schauinsland	Hg_mon	DE03L_UBA_Sc_M...	total_gaseous_mer...	air	1d	2	2014-01-01	2018-12-31
1	DE0003R	Schauinsland	wet_only_sampler	DE03L_ARS_Hg_03	mercury	precip	1w	2	2007-01-09	2010-12-21
1	DE0003R	Schauinsland	wet_only_sampler	DE03L_NSA_Hg_03	mercury	precip	1w	2	2011-01-04	2013-12-24
1	DE0003R	Schauinsland	wet_only_sampler	DE03L_UBA_Sc_N...	mercury	precip	1w	2	2014-01-07	2019-01-02
1	DE0007R	Neuglobsow	gold_trap	DE03L_gold_trap_7	total_gaseous_mer...	air	1d		2004-01-02	2004-12-31

Ways to access EMEP data (2):

Bulk download on request to EBAS@nilu.no:

Data, statistics, aggregates, plots, maps..

supporting the following formats: NASA-Ames, NetCDF,

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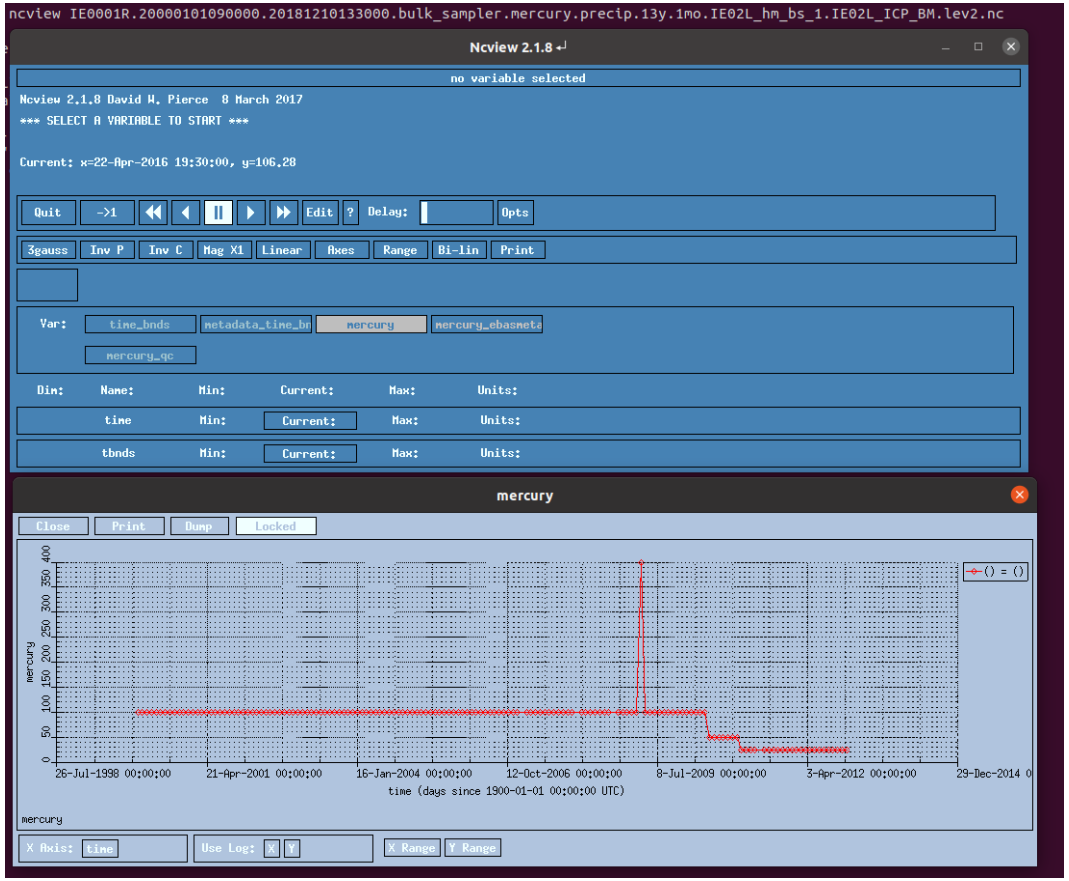
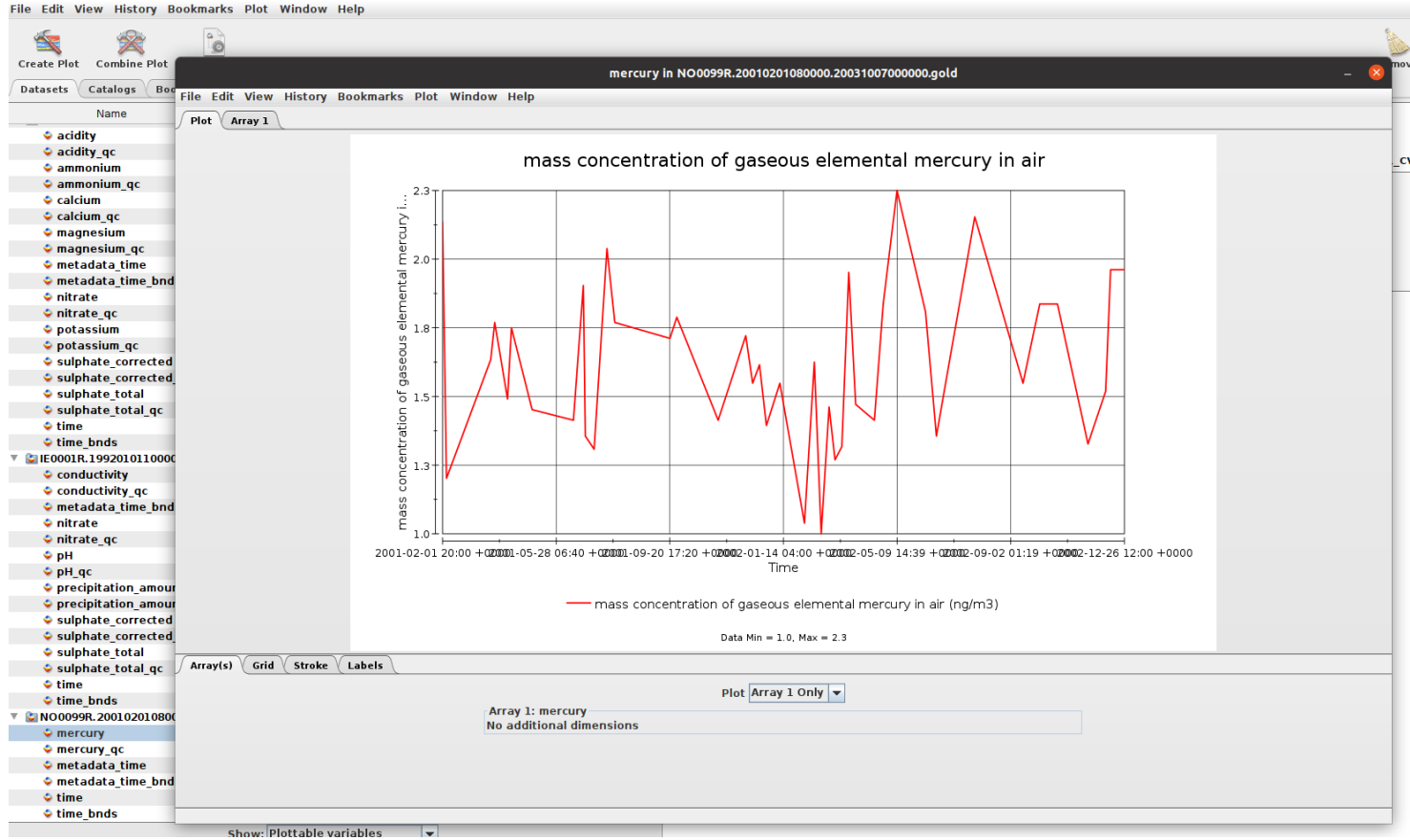
Ways to access EMEP data: Thredds Data Server

- If you want to extract large amounts of data, you can use the EBAS thredds server, https://thredds.nilu.no/thredds/catalog.html.
- This way you can download all datasets as NetCDF or use the Opendap protocol for accessing the data.
- The Thredds server is a flat archive of data, so it is common to use an external Thredds client in python, R etc.
- There is also the possibility to access the thredds server via our oai-pmh server
  - https://ebas-oai-pmh.nilu.no/oai/provider?verb=ListIdentifiers&set=ebas-db&metadataPrefix=iso19115
  - This way you can use a harvester, and also do some more advance filtering on the metadata.

Ways to access EMEP data: Thredds Data Server

- It is also possible to use tools like **Panoply** and **ncview** to access the data on the Thredds Server





Ways to access EMEP data: Third party services

- EBAS metadata is often indexed by third-party services
- Some initatives are underway:
  - EOSC through ENVRI-FAIR
  - World Meteorological Organisation Integrated Global Observing System – WIGOS
- Some services are already up and runnning
  - NextGEOSS
  - SIOS
  - EMEP data also available through the ACTRIS data portal

WIGOS
WMO Integrated Global Observing System

ENVRI
FAIR

EOSC-hub

SIOS
SVALBARD INTEGRATED ARCTIC EARTH OBSERVING SYSTEM

ACTRiS

NEXTGEOSS
European Data Hub and Platform

Ways to access EMEP data: Third party services - SIOS

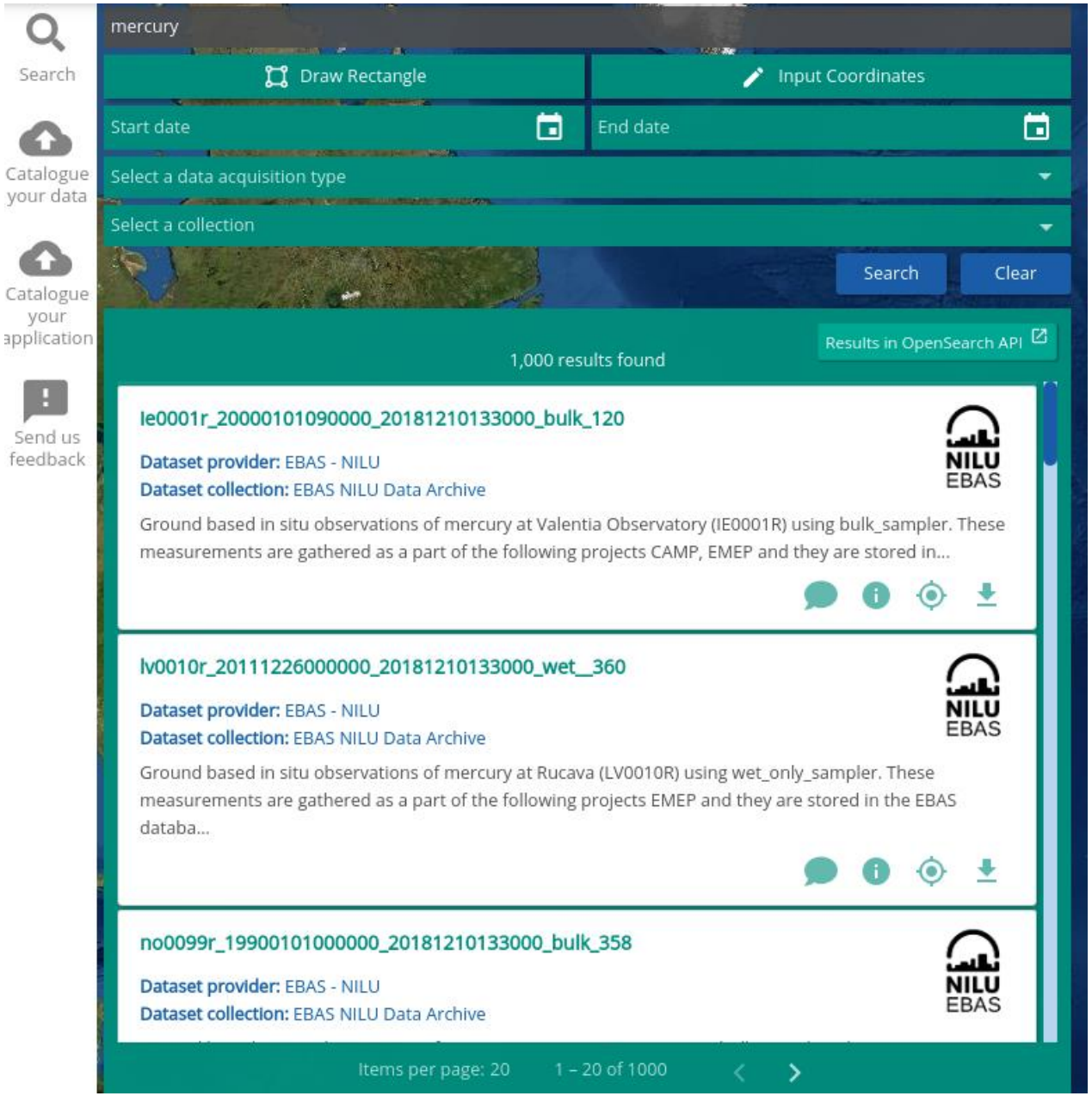
HOME | ABOUT SIOS | SERVICES | ACCESS | OPTIMISATION | INTRANET

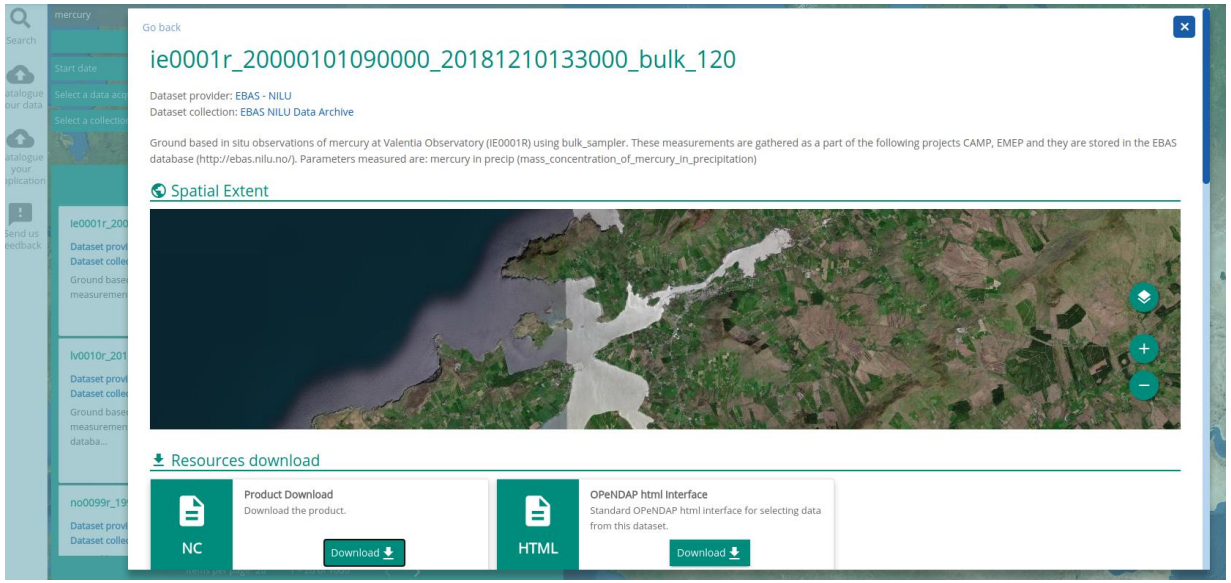
Home /

Available Metadata

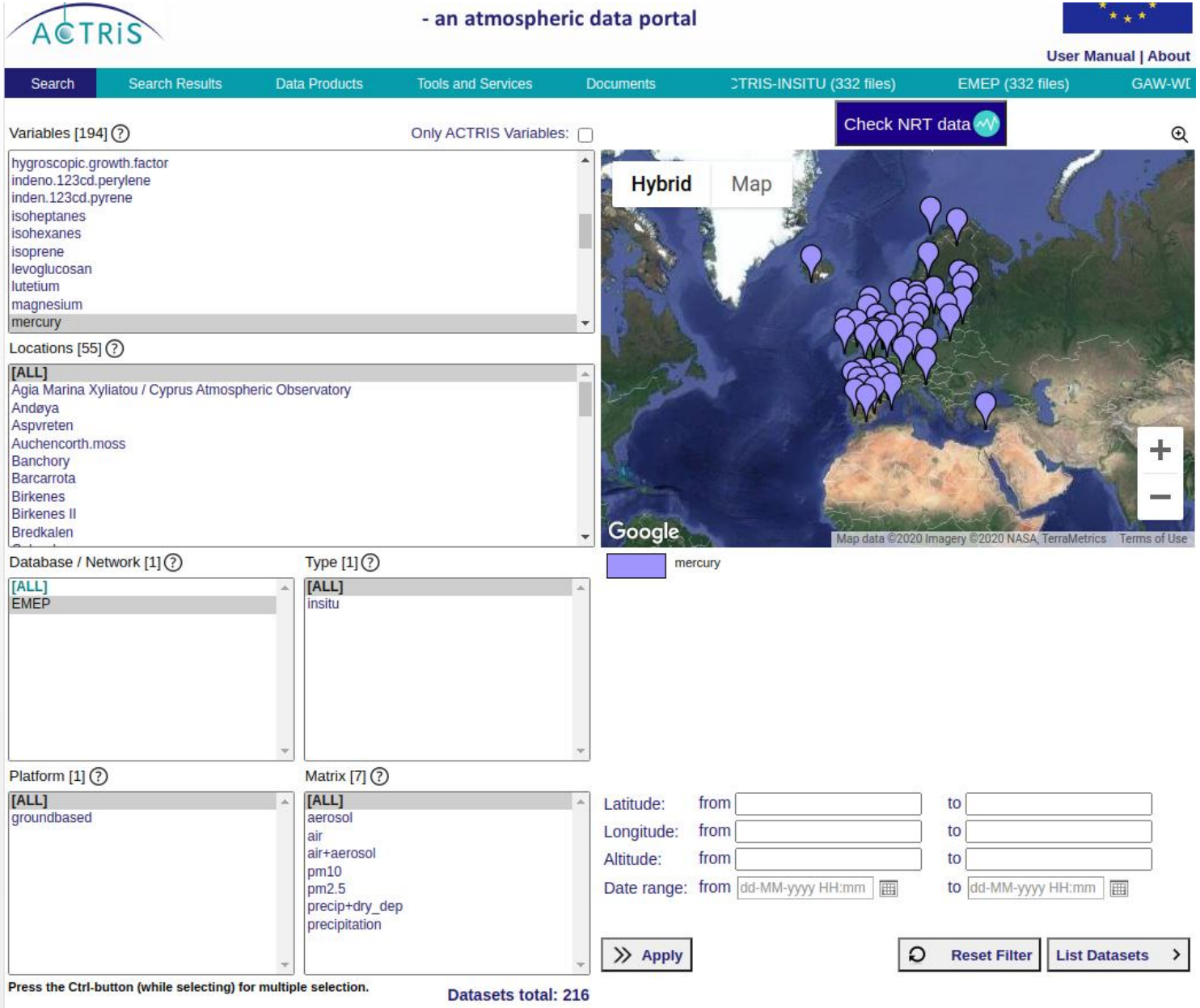
Metadata key	Metadata value
TITLE	Ground based in situ observations of mercury at Villum Research Station, Station Nord (DK0010G) using Hg_mon
ABSTRACT	Ground based in situ observations of mercury at Villum Research Station, Station Nord (DK0010G) using Hg_mon. These measurements are gathered as a part of the following projects AMAP, CAMP, EMEP, GAW-WDCRG and they are stored in the EBAS database (http://ebas.nilu.no/). Parameters measured are: mercury in air (mass_concentration_of_gaseous_elemental_mercury_in_air)
PERSONNEL NAME	Kaare Kemp, Rune Keller
PERSONNEL ROLE	Technical contact
PERSONNEL ORGANISATION	DK01L, National Environmental Research Institute, NERI, P.O.Box 358, Fredriksborgvei 399, DK-4000 Roskilde, Denmark
TEMPORAL EXTENT START DATE	2001-01-01T00:30:01Z
TEMPORAL EXTENT END DATE	2018-12-31T23:30:00Z
DATA ACCESS RESOURCE	OPeNDAP: "http://thredds.nilu.no/thredds/dodsC/ebas/DK0010G.20010101000000.20200513000000.Hg_mon.mercury.air.18y.1h.DK01L_Tekran1.DK01L_Tekran.lev2.nc" HTTP: "http://thredds.nilu.no/thredds/fileServer/ebas/DK0010G.20010101000000.20200513000000.Hg_mon.mercury.air.18y.1h.DK01L_Tekran1.DK01L_Tekran.lev2.nc"
BBOX	ENVELOPE(-16.67,-16.67,81.6,81.6)
DATA CENTER	NILU - Norwegian Institute for Air Research, ATMOS, EBAS

Ways to access EMEP data: Third party services - NextGEOSS

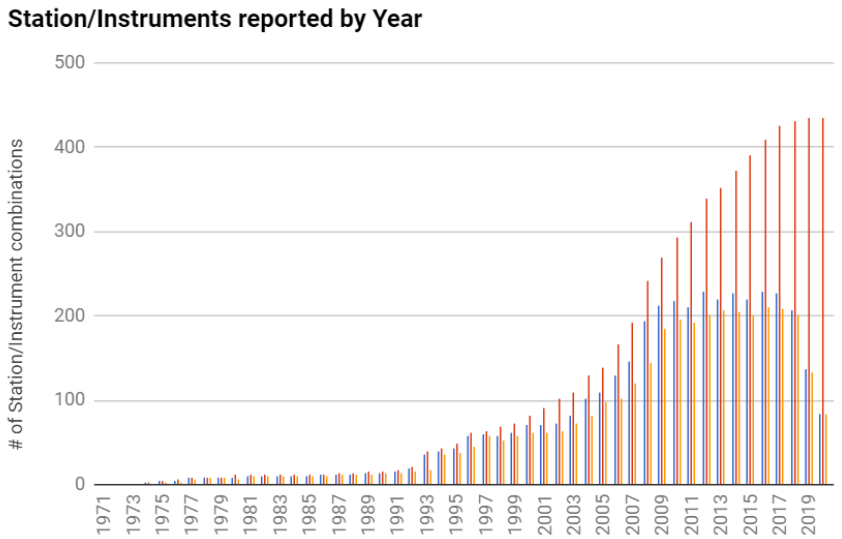


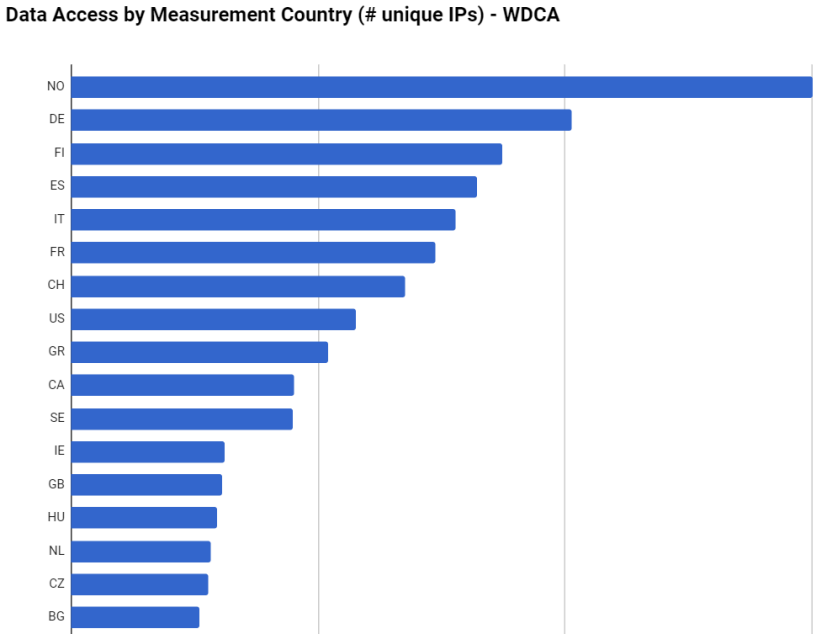


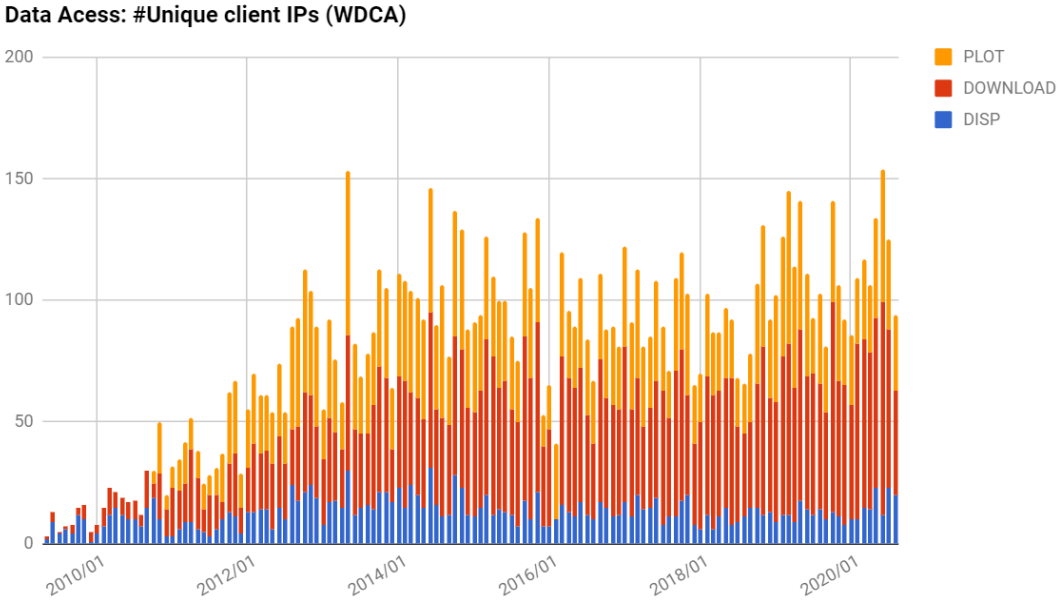
Ways to access EMEP data: Third party services - ACTRIS

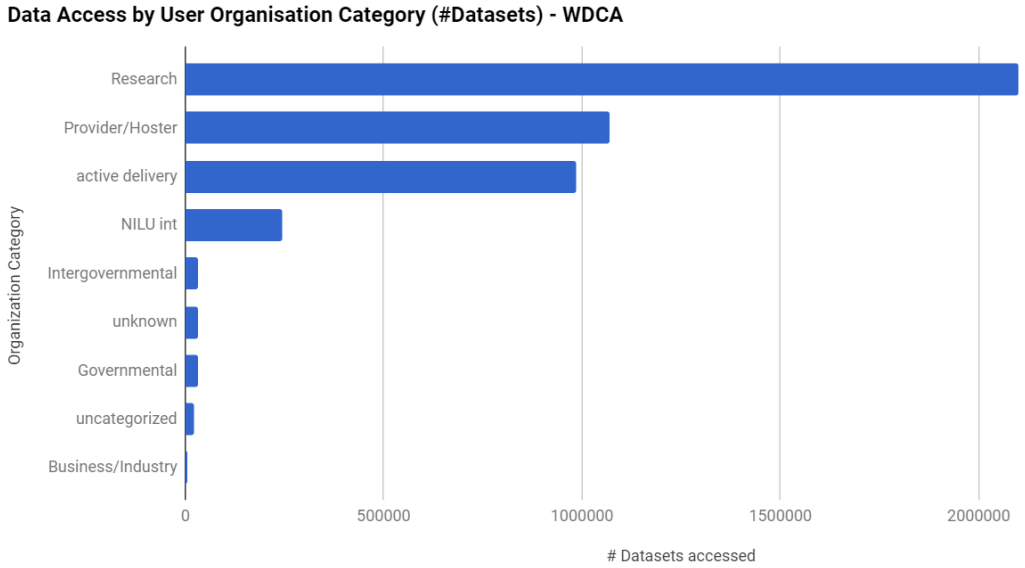


Tracking use of data:





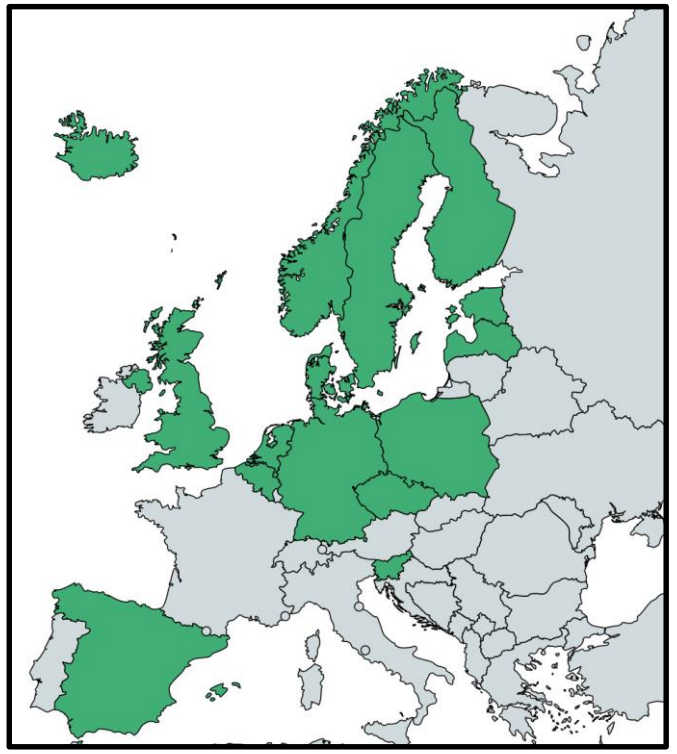




Final remarks

- 18 Parties have delivered Hg data to EMEP, but several European countries are not compliance with the expected monitoring capacity (ref EMEP Monitoring Strategy)
- EMEP observations are openly available for use (i.e. in the Minamata effectiveness evalution, or any other assessments) but should be acknowledged as EMEP data
- EMEP data are easily accessed in many ways through existing and planned data services
- EMEP as such cannot be a member to GOS4M, but we encourage exploring the establishement of an MoU between CLRTAP and the Minamata Convention on information sharing

Data 2017->



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