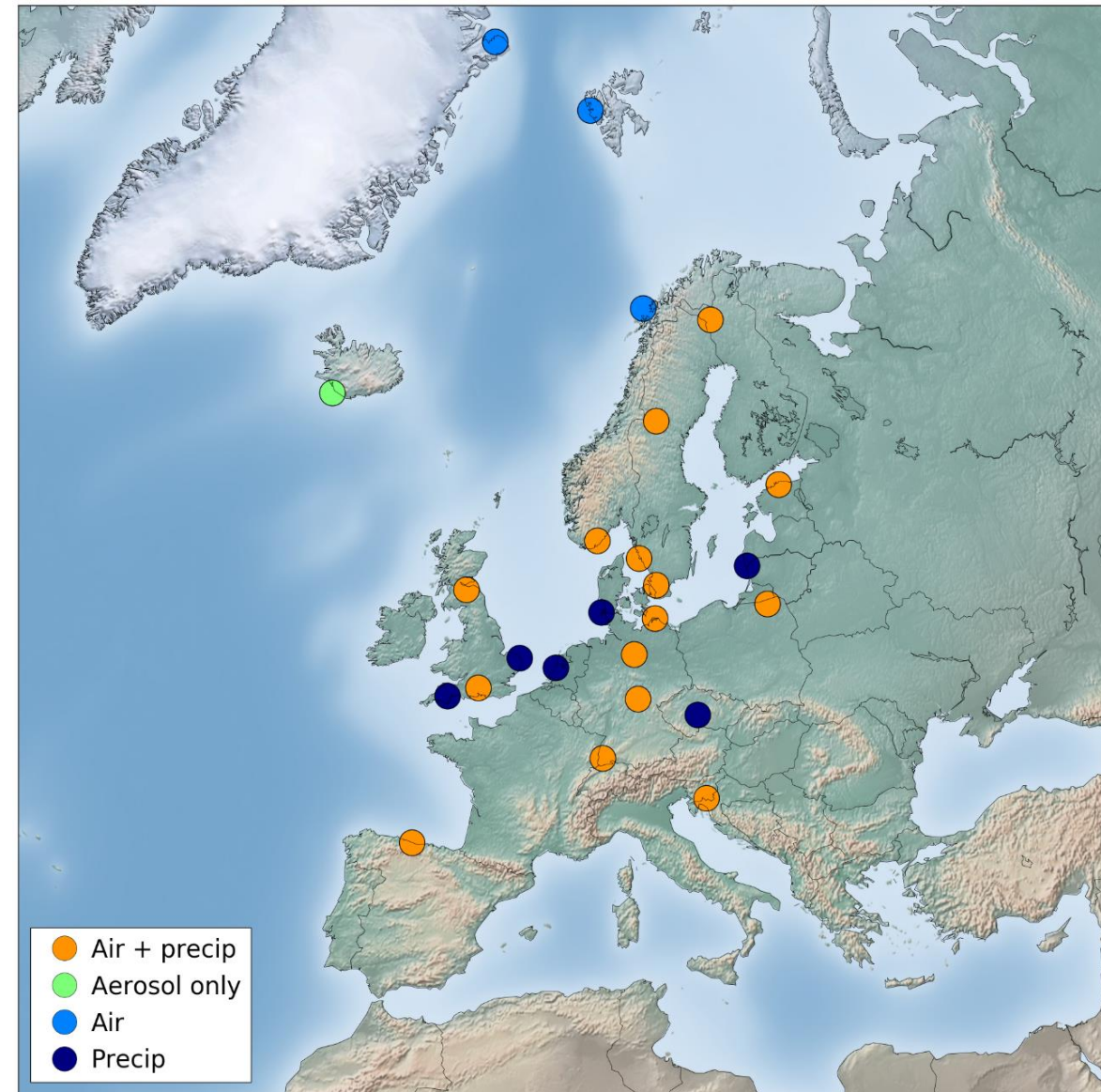


Mercury observations in EMEP

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

EMEP-CCC/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)



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 Directive¹ 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 through initiatives such as the Global Earth Observation System of Systems and the European Union's Earth Observation Programme (COPERNICUS).

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

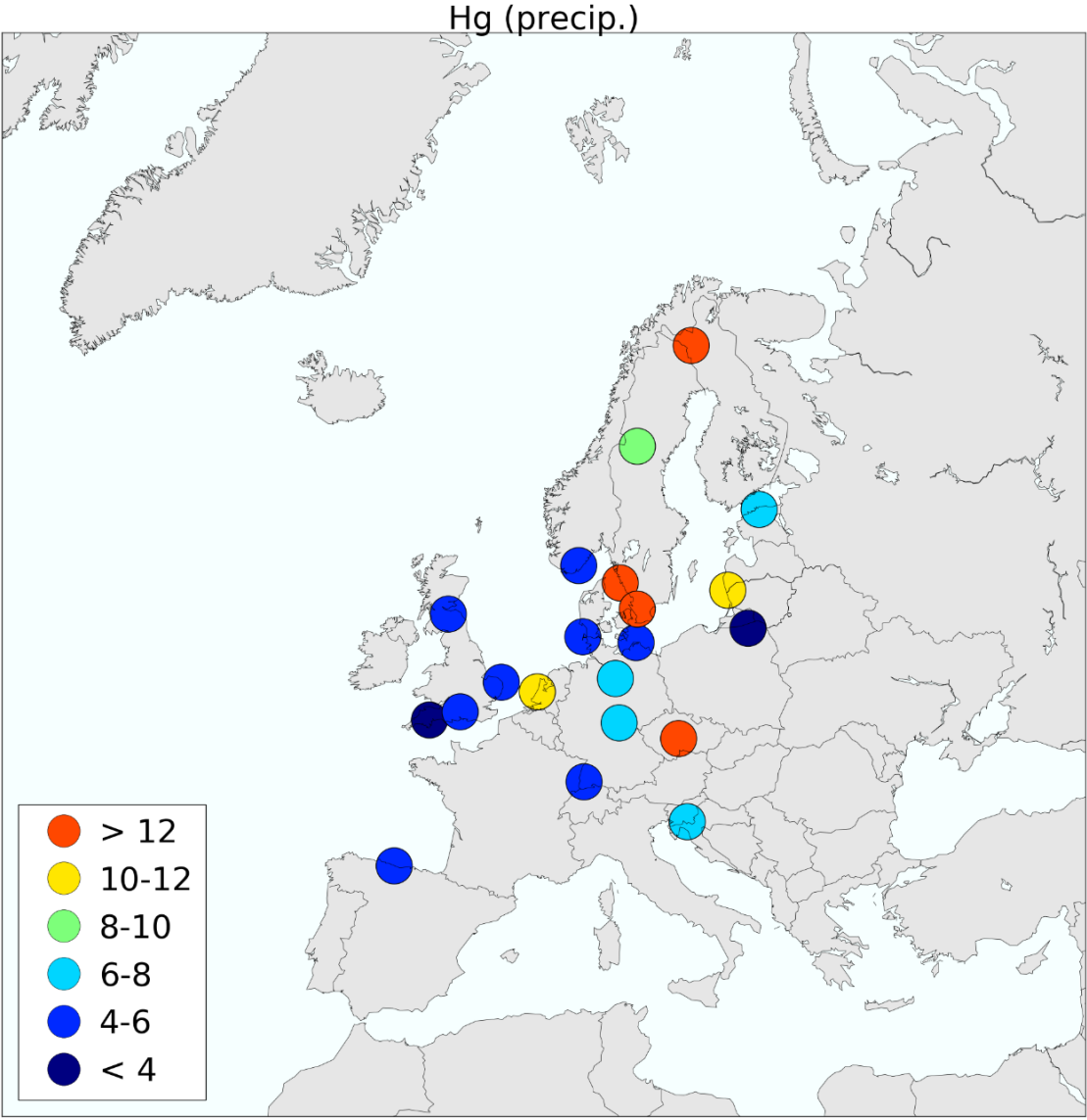
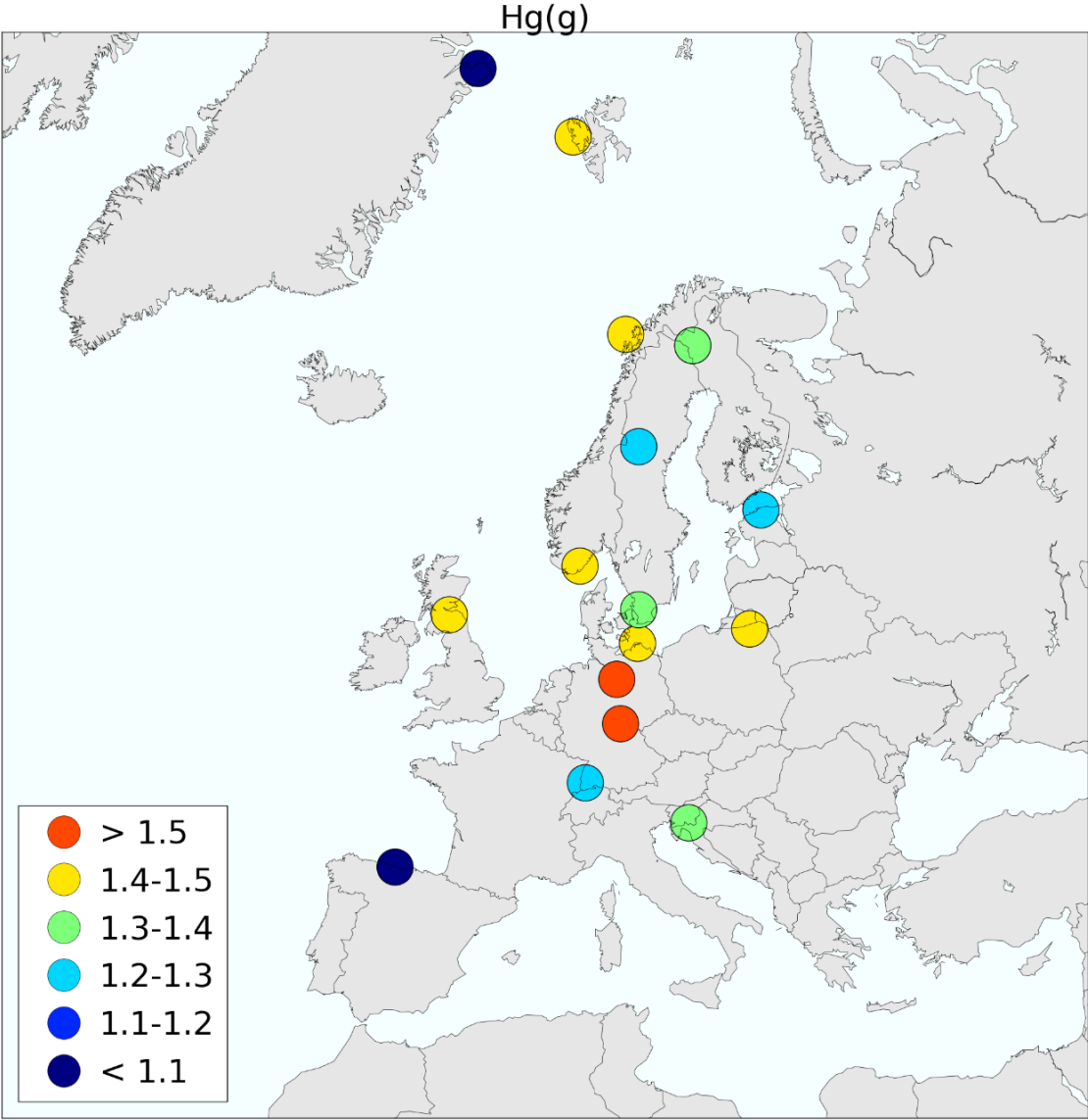
Mercury in precipitation	Hg	7 days
Mercury in air	Hg (TGM)	1 hour/24 hours/7 days

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

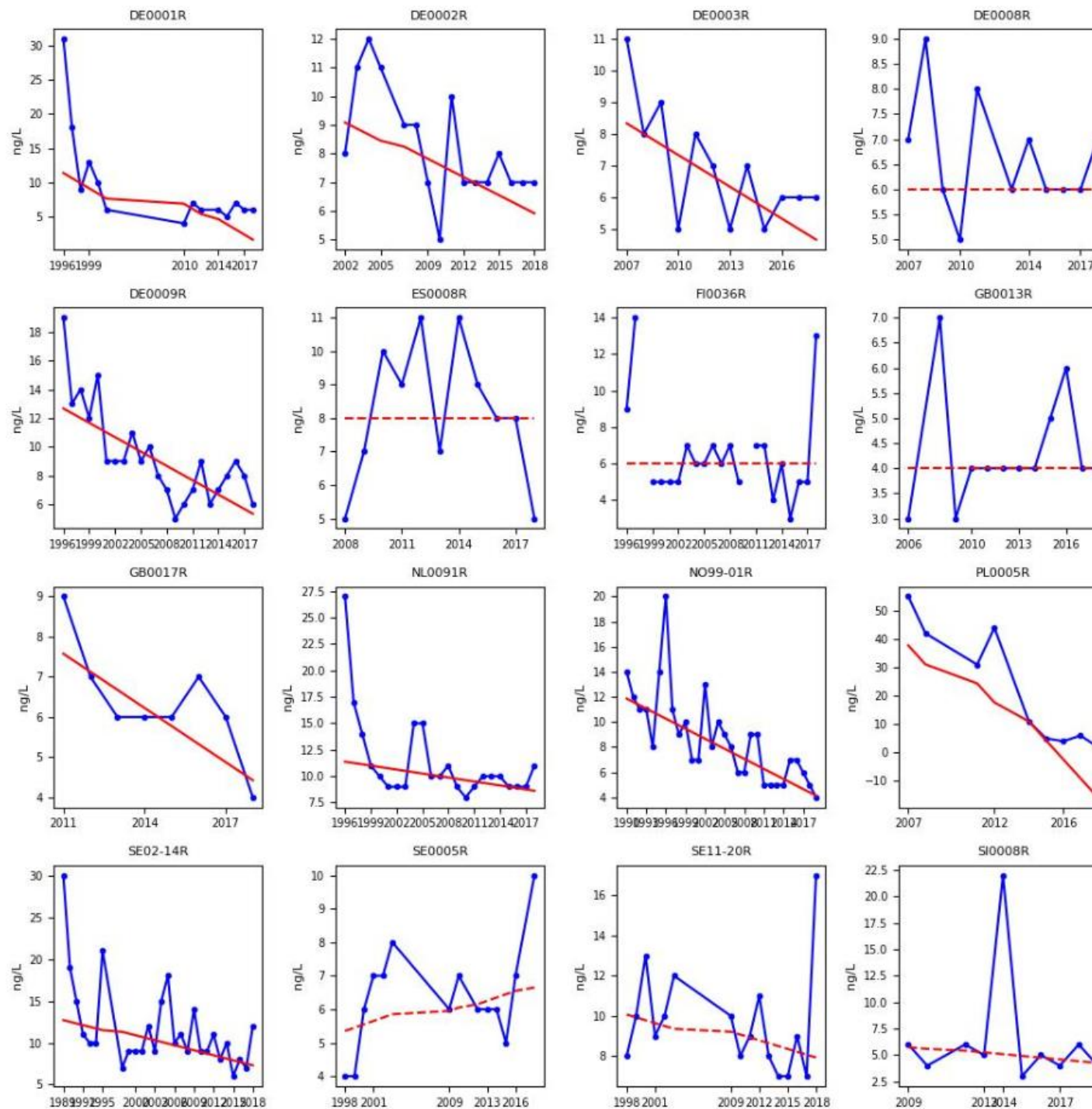
Recommended temporal resolution

Mercury speciation	RGM and TPM	1 hour/24 hours/7 days
--------------------	-------------	------------------------

Observed concentration levels:



Trends:



Ways to access EMEP data (1):

<http://ebas.nilu.no>

The screenshot displays the EMEP EBAS web interface. At the top, there is a header with logos for NILU, EMEP, WMO Global Atmosphere Watch, ACTRIS, AMAP, OSPAR, HELCOM, and the European Union. Below the header, there is a navigation bar with links for Home, Acknowledgment, Data policy, a username input field, and a Login button. The main content area features six filter panels: Framework [52], Country [80], Station [1200], Instrument type [104], Component [685], and Matrix [32]. Each panel has a dropdown menu with a list of options. Below the filters, there are 'From' and 'To' dropdown menus, both set to '>>All'. To the right of these, it says 'Available datasets: 122327' with 'Reset' and 'List datasets' buttons. At the bottom, there is a 'Map (Populate) (Show large)' section showing a world map with numerous red location pins. To the right of the map is an 'Additional resources' section with a list of links and social media icons for Facebook and Twitter.

Framework [52] *i*

- >>All
- ACTRIS
- ACTRIS_NRT
- ACTRIS_preliminary
- AMAP
- AMAP_public
- CAMP
- CAMPAIGN

Country [80]

- >>All
- Algeria
- Argentina
- Armenia
- Australia
- Austria
- Barbados
- Belarus

Station [1200] *i*

- >>All
- Abastumani
- Abisko
- Acadia National Park-McFarland Hill (ME98)
- Achenkirch
- Addison Pinnacle
- Agia Marina Xyliatou / Cyprus Atmospheric Observatory
- Alcala (moss)

Instrument type [104] *i*

- >>All
- abs_solution
- abs_tube
- ads_tube
- aerosol_mass_spectrometer
- aerosol_sampler
- air_UK
- aircraft_system

Component [685] *i*

- >>All
- 1-2-3-4-tetrachlorobenzene
- 1-2-3-4-tetrahydronaphthalene
- 1-2-3-trichlorobenzene
- 1-2-3-trimethylbenzene
- 1-2-4-5-tetrachlorobenzene
- 1-2-4-trichlorobenzene
- 1-2-4-trimethylbenzene

Matrix [32] *i*

- >>All
- aerosol
- aerosol_humidified
- air
- air+aerosol
- air+pm10
- dried_moss
- instrument

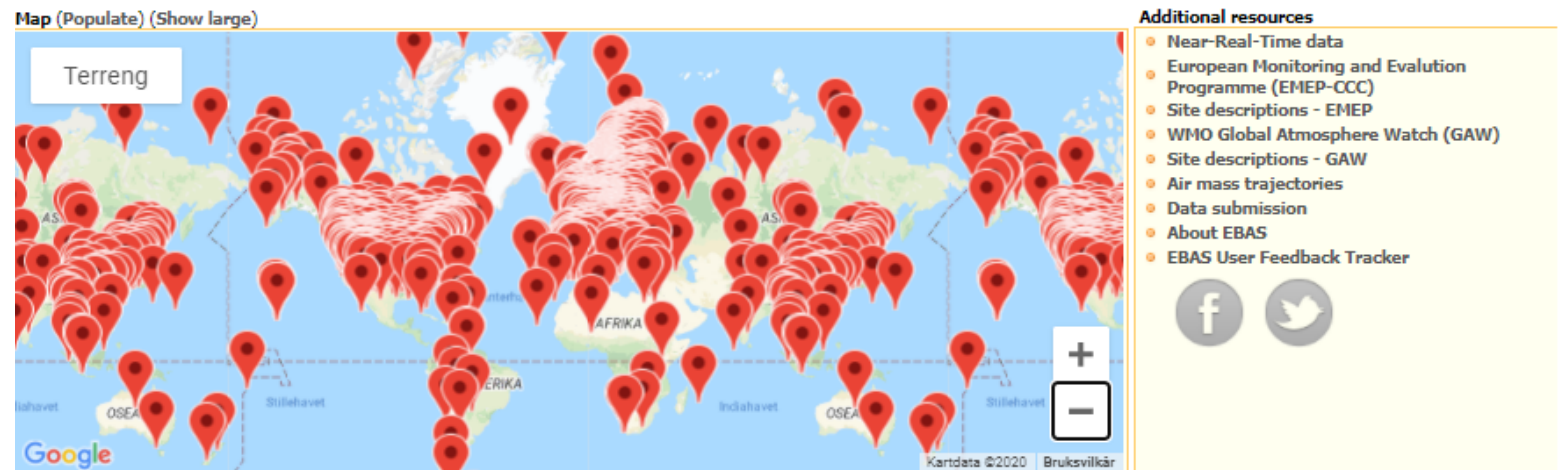
From >>All To >>All


Available datasets: 122327

Reset List datasets

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

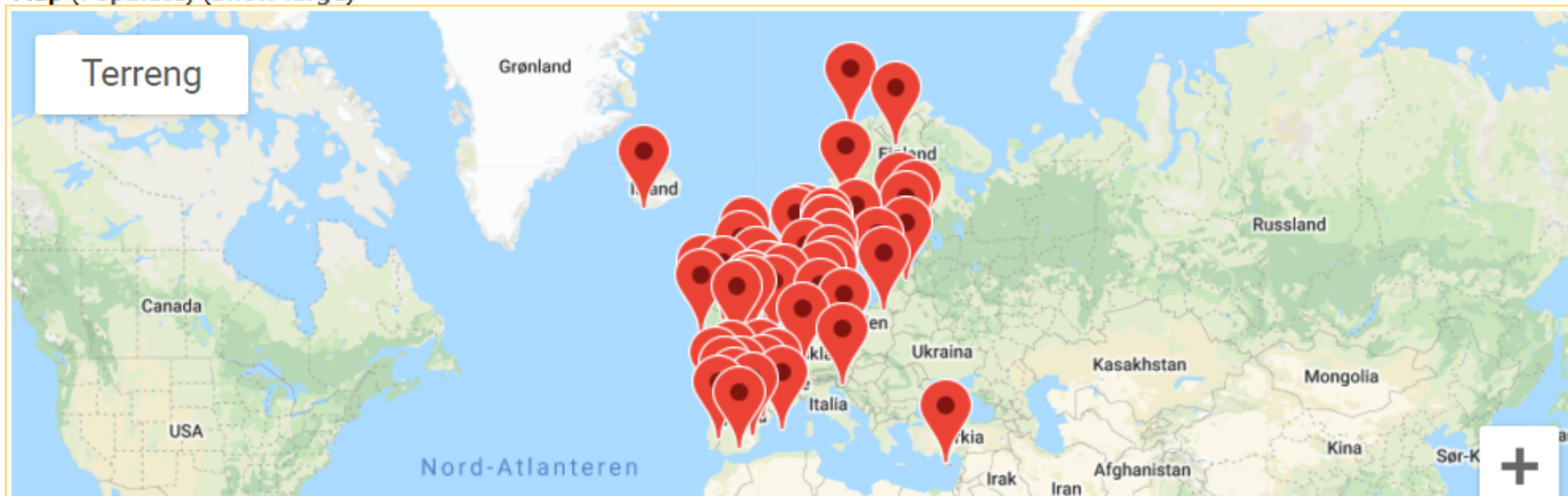
From >>All  To >>All 

Available datasets: 253

Reset

List datasets

Map (Populate) (Show large)



Additional resources

- Near-Real-Time data
- European Monitoring and Evaluation 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



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



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.

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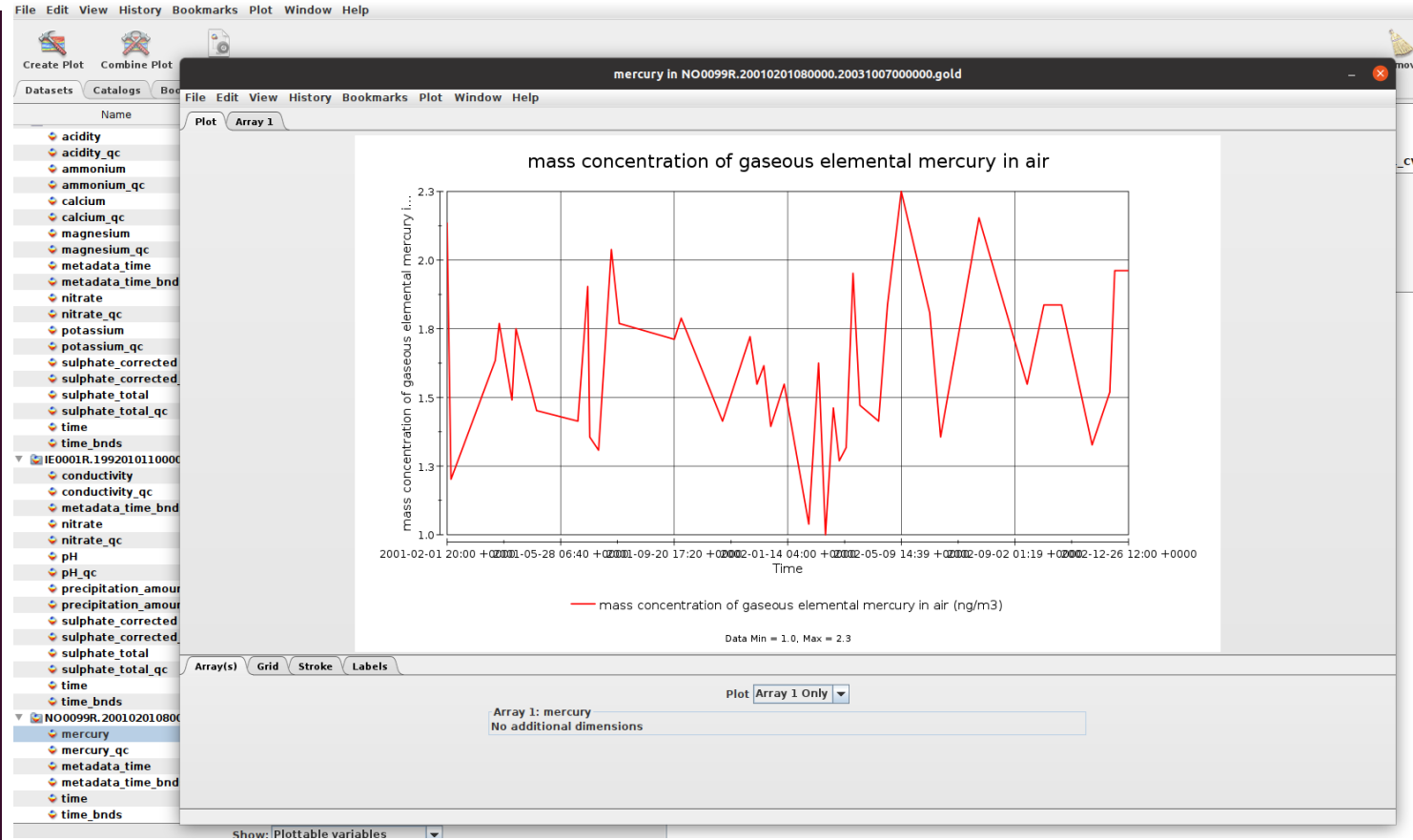
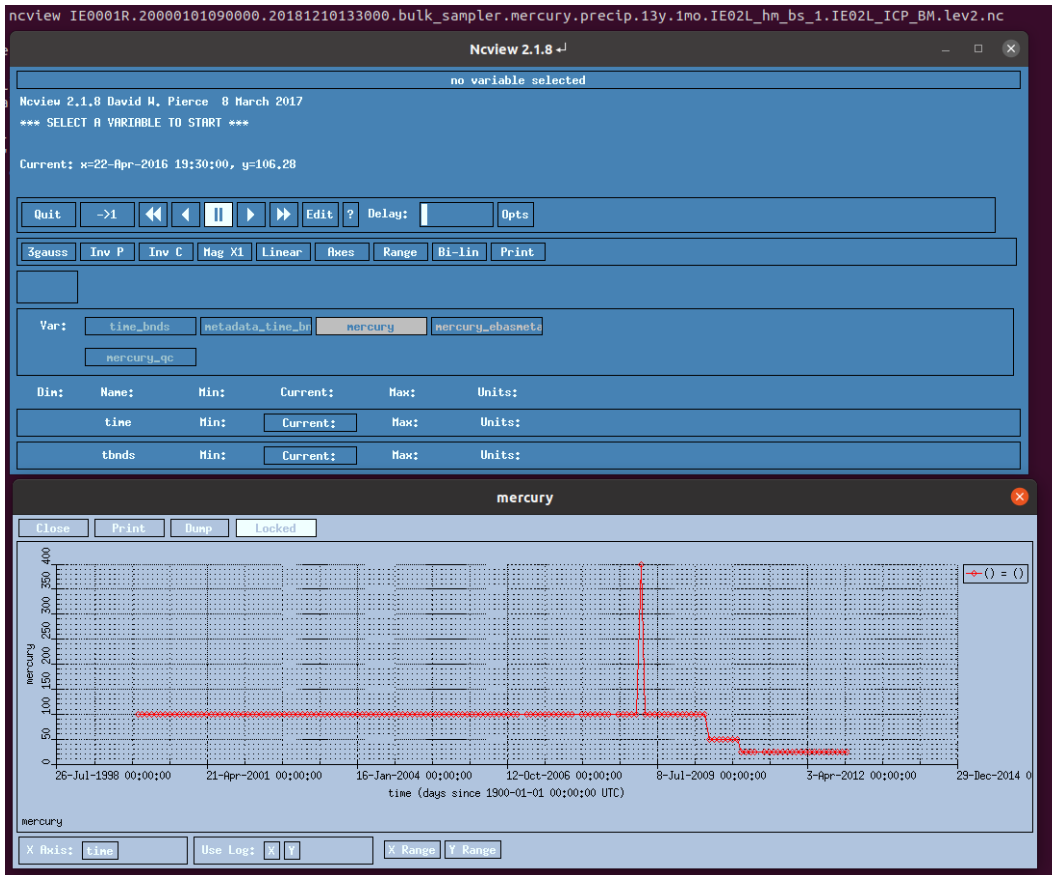
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    </header>
    <header>
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```

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 initiatives are underway:
 - EOSC through ENVRI-FAIR
 - World Meteorological Organisation Integrated Global Observing System – WIGOS
- Some services are already up and running
 - NextGEOSS
 - SIOS
 - EMEP data also available through the ACTRIS data portal



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

The screenshot shows the NextGEOSS search interface. On the left is a sidebar with icons for Search, Catalogue your data, and Send us feedback. The main area has a search bar with 'mercury' entered. Below the search bar are filters for 'Draw Rectangle', 'Input Coordinates', 'Start date', 'End date', 'Select a data acquisition type', and 'Select a collection'. A map shows the search area. Below the map, it says '1,000 results found' and 'Results in OpenSearch API'. Three results are displayed, each with a title, provider, collection, and description. The first result is 'ie0001r_20000101090000_20181210133000_bulk_120' from 'EBAS - NILU' and 'EBAS NILU Data Archive'. The second is 'lv0010r_20111226000000_20181210133000_wet_360' from 'EBAS - NILU' and 'EBAS NILU Data Archive'. The third is 'no0099r_19900101000000_20181210133000_bulk_358' from 'EBAS - NILU' and 'EBAS NILU Data Archive'. At the bottom, it says 'Items per page: 20' and '1 - 20 of 1000'.

Search

mercury

Draw Rectangle

Input Coordinates

Start date

End date

Select a data acquisition type

Select a collection

Search

Clear

1,000 results found

Results in OpenSearch API

ie0001r_20000101090000_20181210133000_bulk_120

Dataset provider: EBAS - NILU
Dataset collection: EBAS NILU Data Archive

Ground based in situ observations of mercury at Valentia Observatory (IE0001R) using bulk_sampler. These measurements are gathered as a part of the following projects CAMP, EMEP and they are stored in...

lv0010r_20111226000000_20181210133000_wet_360

Dataset provider: EBAS - NILU
Dataset collection: EBAS NILU Data Archive

Ground based in situ observations of mercury at Rucava (LV0010R) using wet_only_sampler. These measurements are gathered as a part of the following projects EMEP and they are stored in the EBAS databa...

no0099r_19900101000000_20181210133000_bulk_358

Dataset provider: EBAS - NILU
Dataset collection: EBAS NILU Data Archive

Items per page: 20 1 - 20 of 1000

The screenshot shows the NextGEOSS search results page for the dataset 'ie0001r_20000101090000_20181210133000_bulk_120'. The page has a sidebar with icons for Search, Catalogue your data, and Send us feedback. The main area shows the dataset details, including the title, provider, collection, and description. Below the description is a map showing the spatial extent of the data. At the bottom, there are download options for 'NC' (NetCDF) and 'HTML' (OpenDAP html interface).

Go back

ie0001r_20000101090000_20181210133000_bulk_120

Dataset provider: EBAS - NILU
Dataset collection: EBAS NILU Data Archive

Ground based in situ observations of mercury at Valentia Observatory (IE0001R) using bulk_sampler. These measurements are gathered as a part of the following projects CAMP, EMEP and they are stored in the EBAS database (<http://ebas.nilu.no/>). Parameters measured are: mercury in precip (mass_concentration_of_mercury_in_precipitation)

Spatial Extent

Resources download

NC Product Download
Download the product.

HTML OPeNDAP html interface
Standard OPeNDAP html interface for selecting data from this dataset.

Ways to access EMEP data: Third party services - ACTRIS

ACTRIS

- an atmospheric data portal

User Manual | About

Search

Search Results

Data Products

Tools and Services

Documents

CTRIS-INSITU (332 files)

EMEP (332 files)

GAW-WI

Variables [194] ?

Only ACTRIS Variables: ☐

hygroscopic.growth.factor

indeno.123cd.perylene

inden.123cd.pyrene

isoheptanes

isohexanes

isoprene

levoglucosan

lutetium

magnesium

mercury

Locations [55] ?

[ALL]

Agia Marina Xyliatou / Cyprus Atmospheric Observatory

Andøya

Aspvreten

Auchencorth.moss

Banchory

Barcarrota

Birkenes

Birkenes II

Bredkalen

Database / Network [1] ?

[ALL]

EMEP

Type [1] ?

[ALL]

insitu

Platform [1] ?

[ALL]

groundbased

Matrix [7] ?

[ALL]

aerosol

air

air+aerosol

pm10

pm2.5


precip+dry_dep

precipitation

Check NRT data

Hybrid

Map



Google

Map data ©2020 Imagery ©2020 NASA, TerraMetrics Terms of Use

+

-

mercury

Latitude: from to

Longitude: from to

Altitude: from to

Date range: from dd-MM-yyyy HH:mm to dd-MM-yyyy HH:mm

>> Apply

Reset Filter

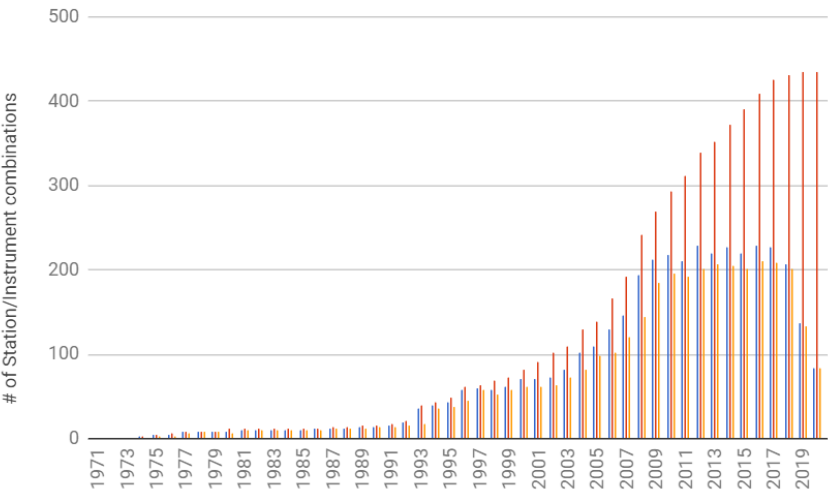
List Datasets >

Press the Ctrl-button (while selecting) for multiple selection.

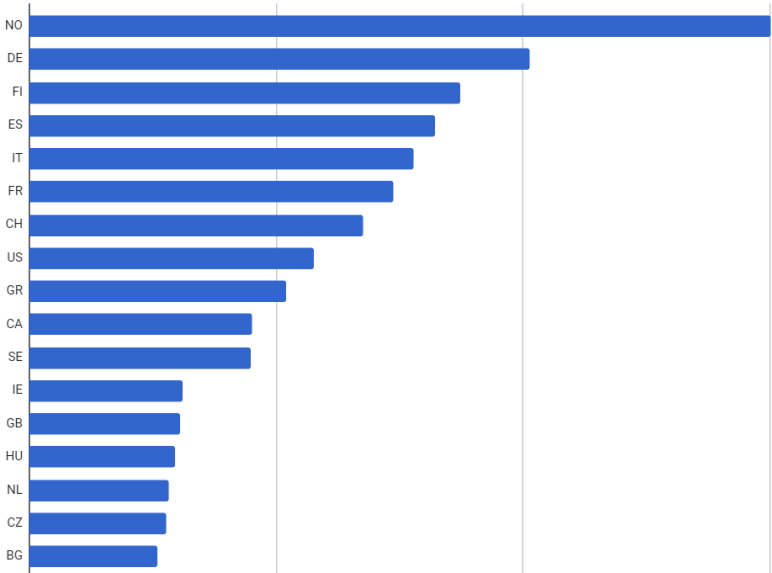
Datasets total: 216

Tracking use of data:

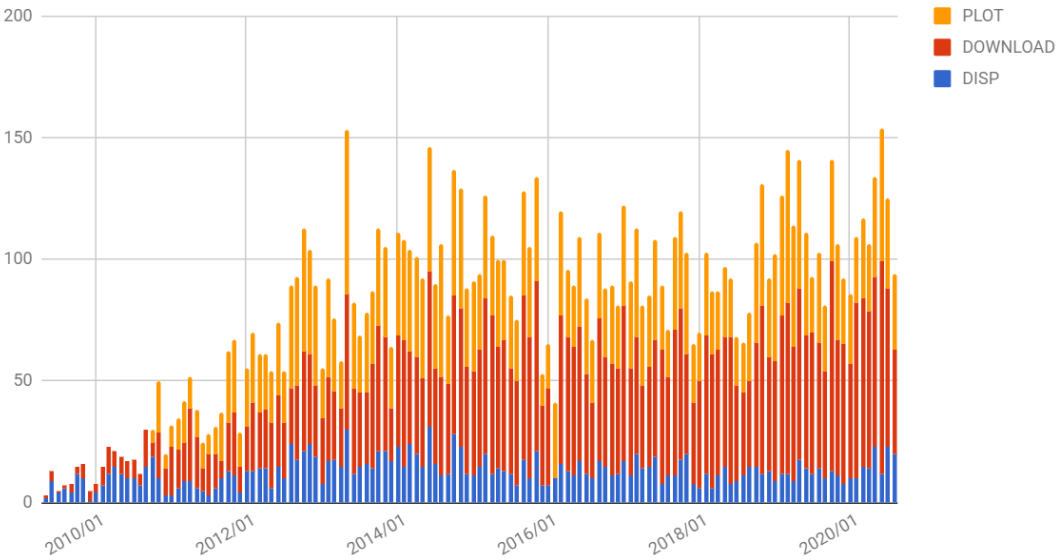
Station/Instruments reported by Year



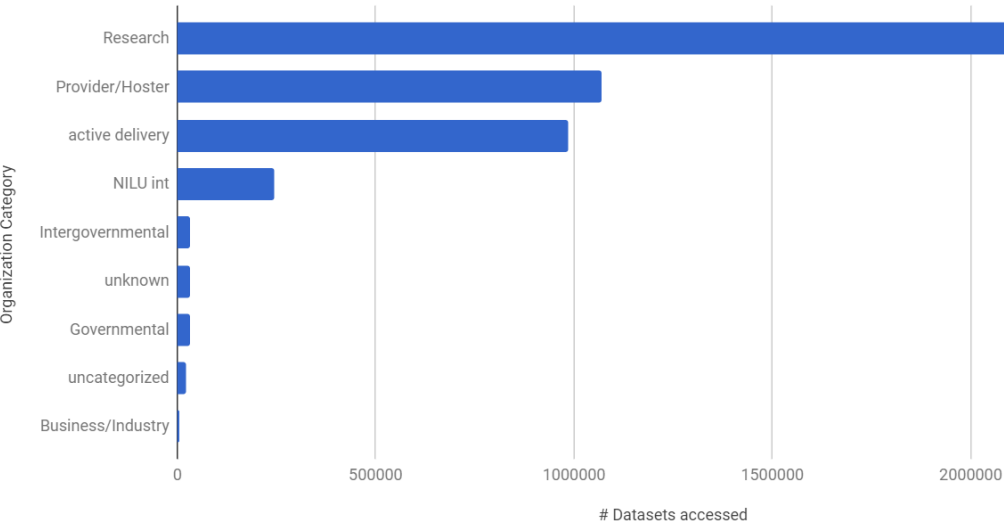
Data Access by Measurement Country (# unique IPs) - WDCA



Data Access: #Unique client IPs (WDCA)



Data Access by User Organisation Category (#Datasets) - WDCA



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 evaluation, 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 establishment of an MoU between CLRTAP and the Minamata Convention on information sharing

Data 2017->

