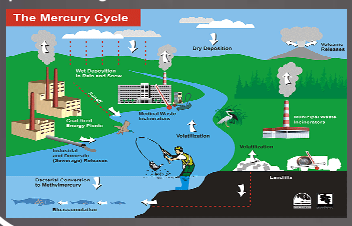
Traceability for mercury measurements

JRP v11 "MeTra"

Need for the JRP

Mercury's ability to accumulate in terrestrial and aquatic bio systems, its long environmental lifetimes and ability to be transported in air over long distances mean that this toxic element is ubiquitous to all environmental compartments and is a pollutant of global concern.



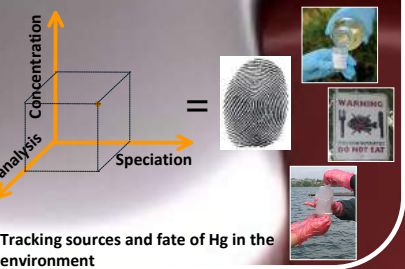
The new "Minamata Convention on Mercury" was adopted at the UNEP Conference in October 2013. The objective of the Convention is to protect human health and the environment from anthropogenic emissions and releases of mercury. The Convention also calls for additional research on issues related to mercury.
According to the 2013 UNEP "Global Mercury Assessment", mercury emissions from industrial sectors have increased since 2005. Global emissions to air from anthropogenic sources were estimated as 1960 tonnes in 2010. These emissions estimates still have large uncertainties (giving a range between 1010 and 4070 tonnes).



Aims

This JRP provides an underpinning metrological infrastructure to measure key mercury species and isotope ratios in all relevant environmental matrices. It will traceably and defensibly meet current legislation, support Europe's international obligations, and provide the scientific basis to support more complex mercury monitoring in science and regulation.





Why ? → Tracking sources and fate of Hg in the environment

Scientific and technical objectives

Coordination and management (WP5)

Traceability for mercury measurements in air (WP1)

- A **primary calibration infrastructure** enabling the robust assessment of mercury **concentrations and emissions rates**
- **In-line continuous and semi-continuous Hg(0) and Hg(II)** measurement methods in harsh matrices like **stationary source emissions**
- Evaluation of mercury concentrations in **indoor air** from the use of mercury containing **compact fluorescent lamps**

Dissolved Gaseous & Oxidised Hg

Traceability for speciation of mercury in water and biota (WP2)

- Primary measurement procedures for **Hg(II), MeHg and Hg(0) in fresh and sea waters** at sub-ng levels in presence of **suspended particular matter** and/or **colloidal fractions**
- Evaluation of possible **artefacts** associated with **sample collection and preparation**, preserving speciation and/or correcting for possible **post-sampling interconversions**
- Primary measurement procedures for **Hg(II) and MeHg in biota** and evaluation of **effects of sample treatments**

Biota samples from Specimen Banks

Traceability for mercury isotopic measurements (WP3)

- Traceable methodology for **bulk and compound specific mercury isotope ratio measurements in biota**
- Overcome remaining **metrological challenges in the evaluation of mass discrimination** for mercury **isotope ratios** and identification of potential **sources**
- Methodologies for **compound-specific light isotope ratio measurements in biota**
- Application of developed methods to **samples** from **Environmental Specimen Bank**

Creating Impact (WP4)

- 6 Procedures and reference methods
- 4 Measurement devices and software
- E-learning modules and training courses
- 4 Workshops
- At least 12 peer-reviewed papers
- At least 10 presentations
- Dissemination via standardisation working groups
- Stakeholder committee
- JRP website

"EN 15852 standard"
"EN 15853 standard"
"EN 13211 standard"
"EN 14884 standard"
"Primary realisation of the mole"

"The Fourth Air Quality Daughter Directive" (2004/107/EC)
"Industrials Emissions Directive" (2010/75/EU)
"Water Framework Directive" (2000/60/ EC)
"EQS Directive" (2013/39/EC)
"Marine Strategy Framework Directive" (2008/56/EC)

"Minamata Convention on mercury"
"GEO Work Plan 2007-2009"
"Human Biomonitoring programmes"
"UNEP Mercury Air Transport and Fate Research"

Main stakeholders and collaborators

26 letters of support in total

Instrument manufacturers
TEKRAN
PSA
LUMEX

Energy and gas Industry
CHEVRON
AirLiquide
PRAXAIR
LINDE
Philips

Policy makers and regulators
UNEP
CEN/TC 264
CEN/TC 230
ISO/TC 158
AQUILA network
USEPA

Developing metrology capacity

The JRP will develop metrology capability in a number of scientific areas where it currently does not exist, allowing Europe and the NMIs involved in this JRP to take a leading role in the future of metrology for mercury measurement.

LNE (coordination)
Traceable speciation measurements in water and biota

VSL (WP1 leader)
Traceable measurements in air

PTB (WP2 leader)
Traceable speciation measurements in water and isotopic measurements in biota

LGC (WP3 leader)
Isotopic measurements in biota and samples from Environmental Specimen Banks

NPL
Traceable measurements in air

IJS (WP impact leader)
Simultaneous determination of species in air and water
Link with stakeholders

CNR-IIA (REG)
Continuous and semi-continuous measurements
Link with the GMO

BAM
Preparation and provision of biota samples and speciation analysis

SYKE
Collection and provision of water samples and mercury analysis in water

UBA
Provision of samples from Environmental Specimen Banks

TUBITAK
Light isotope measurements in biota

CNRS-UPPA (REG)
Isotopic measurements in samples from Environmental Specimen Banks

Metrology impact

The outcome of this JRP will provide the community with the underpinning infrastructure for producing primary calibration standards and traceable measurement results. Quantitative determination of Hg is of the utmost importance of a variety of applications.

Health and Social impact

Traceable measurements will help to better understand human and environmental exposure to mercury, thereby working towards improving environmental sustainability and the health of the EU citizen, especially those more susceptible to mercury (pregnant women and children).

Environment impact

Traceable measurements with defensible uncertainties will help to demonstrate trends in mercury concentrations, its speciation in different media, and its movement between environmental compartments. This JRP will support mercury risk management and chemical policy.

Economic impact

Traceable measurement with lower uncertainties will help European industry meet the requirements of mercury abatement and emissions legislations with greater confidence and at low cost, resulting in huge overall savings across the EU, and making EU industry clearer and more competitive globally.