

Towards an improved harmonization of regional scale air quality monitoring in Europe – the role of EMEP in providing information to support future EU directives

Kjetil Tørseth and Wenche Aas
EMEP Chemical Coordinating Centre (EMEP-CCC)/NILU

Robert Gehrig, EMPA

“The main objective of EMEP is to provide Governments with information of the deposition and concentration of air pollutants, as well as on the quantity and significance of the long-range transmission of air pollutants and fluxes across boundaries”

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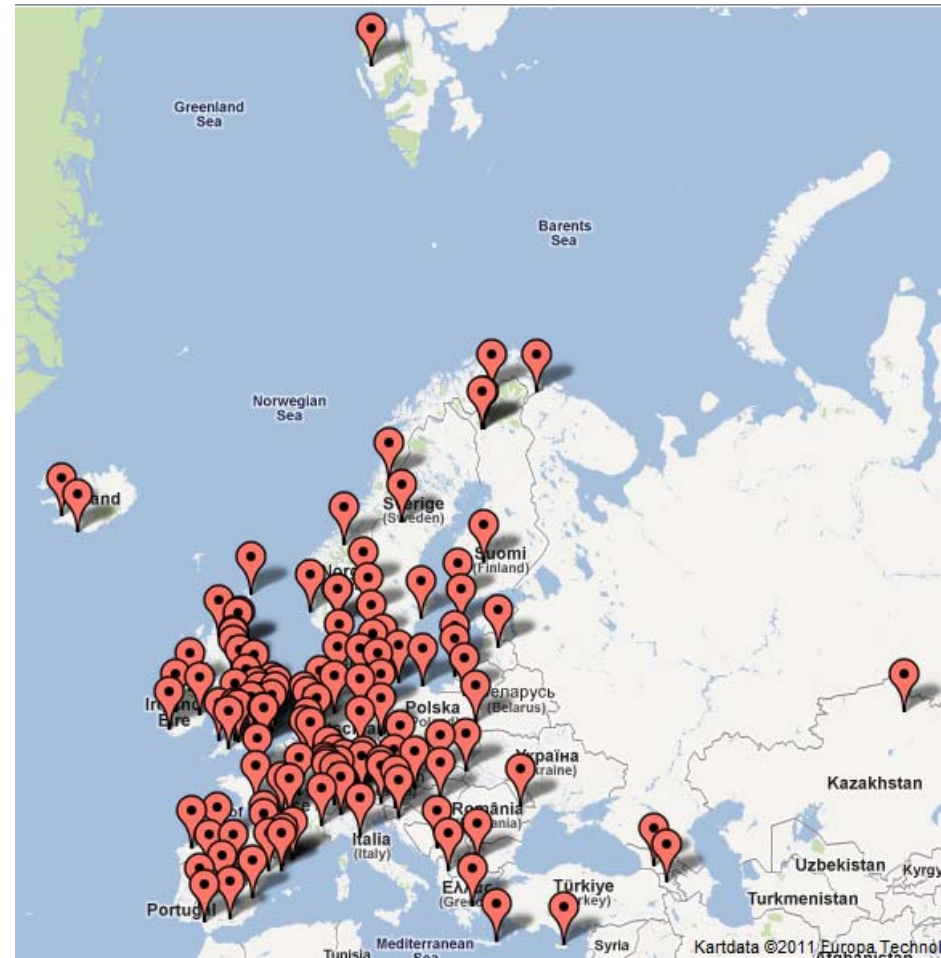
Expert Group on
Particulate Matter

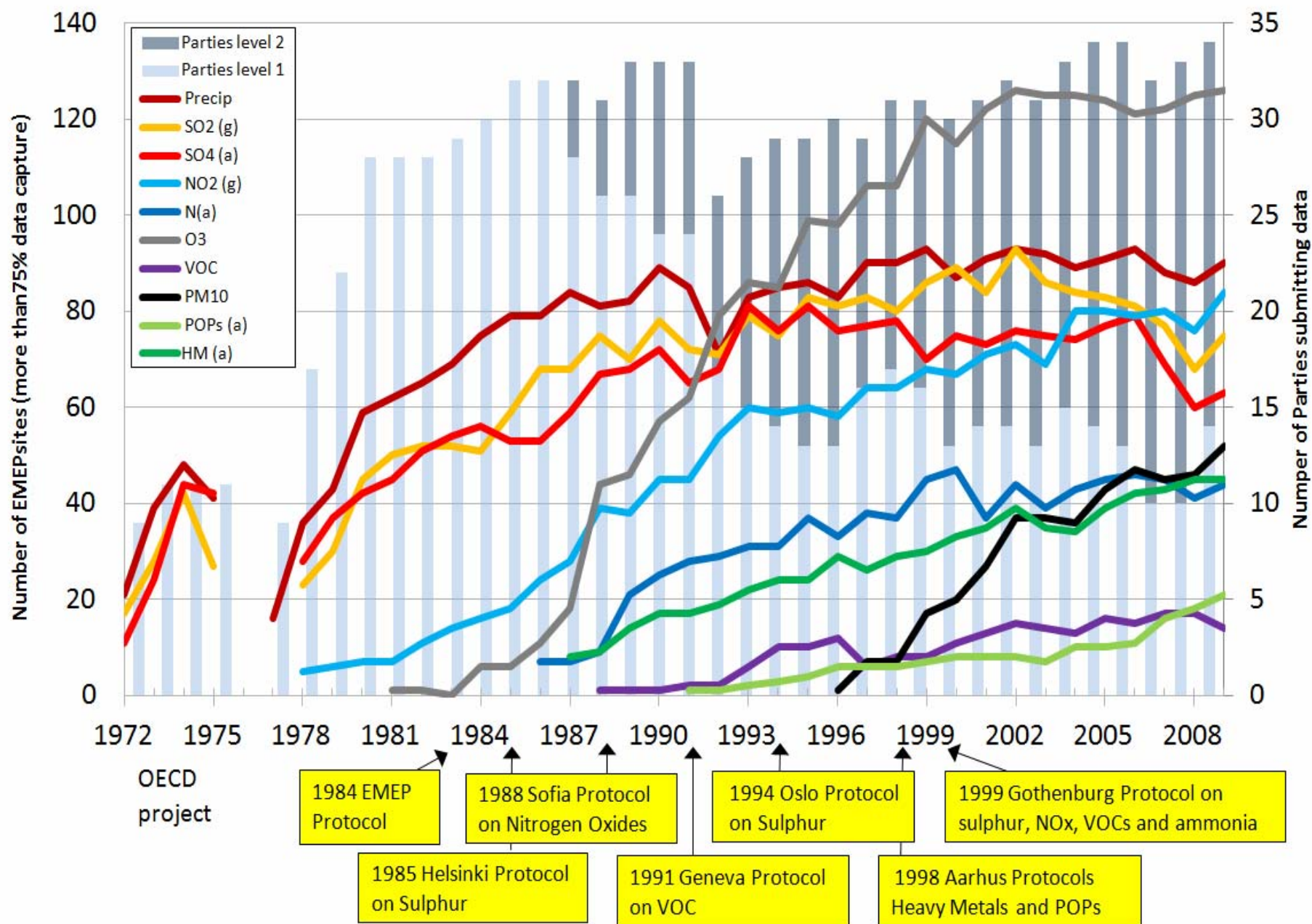
+ eight legally binding protocols



1973

2008





EMEP monitoring strategy 2010-2019

- represents only minor adjustment to the 2004-2009 strategy

Level 1: ~100-150 sites

Level 2: at least one per country (~30 sites)

Level 3: any activity relevant for scientific understanding, including campaigns

Level 1 sites : Observations contribute to the assessment of atmospheric transport and deposition of key parameters relevant for acidification, eutrophication, photochemical oxidants, heavy metals and particulate matter (see also para. 20 (a))

Programme	Parameters	Minimum time resolution	Notes
Inorganic compounds in precipitation	SO_4^{2-} , NO_3^- , NH_4^+ , H^+ (pH), Na^+ , K^+ , Ca^{2+} , Mg^{2+} , Cl^- , (cond)	Daily	Recommended by WMO/GAW and its precipitation network (GAW Report No 158 and GAW report No 172 (Strategic plan 2008-2015))
Heavy metals in precipitation	Cd, Pb (1st priority), Cu, Zn, As, Cr, Ni (2nd priority)	Daily/weekly	Deposition of As, Cd, Ni is required in the Directive 2004/107/EC. CEN method established
Inorganic compounds in air	SO_2 , SO_4^{2-} , NO_3^- , HNO_3 , NH_4^+ , NH_3 , (sNO_3 , sNH_4), HCl , Na^+ , K^+ , Ca^{2+} , Mg^{2+}	Daily	Recommended to be complemented with low cost denuders or passive samplers
NO_2 in air	NO_2	Hourly/Daily	EU Directive 2008/50/EC (note differences in reference methodology)
Ozone in air	O_3	Hourly	EU Directive 2008/50/EC
PM mass in air	$\text{PM}_{2.5}$, PM_{10}	Hourly/Daily	EU Directive 2008/50/EC. Included in WMO/GAW recommendation for the aerosol network, GAW report No. 153
Gas particle ratios of N-species	NH_3 , NH_4^+ , HCl , HNO_3 , NO_3^- (in combination with filter pack sampling)	Monthly	Low-cost methods
Meteorology	Precipitation amount (RR), temperature (T), wind direction (dd), wind speed (ff), relative humidity (rh), atmospheric pressure (pr)	Daily (RR), Hourly	Can be taken from a representative meteorological site

Level 2 sites: Level 2 sites should also measure a majority of parameters required at level 1. (See also para. 20 (b))

Programme	Parameters	Minimum time resolution	Notes
Acidification and eutrophication Observations contributes to the assessment of nitrogen chemistry, influence by local emissions and dry deposition fluxes (see also para. 18b)			
Gas particle ratio	$\text{NH}_3/\text{NH}_4^+$, $\text{HNO}_3/\text{NO}_3^-$ (artifact-free methods)	Hourly/Daily	
Ammonia in emission areas (optional)	NH_3	Monthly	Optional low cost alternative to provide high spatial resolution information in emission areas, where desired.
Photochemical oxidants observations contributes to the assessment of oxidant precursors (see also paragraph 18b)			
NO_x	NO , NO_2	Hourly	In the EU Directive 2008/50/EC, WMO GAW
Light hydrocarbons	$\text{C}_2\text{-C}_7$	Hourly	In the EU Directive 2002/3/EC and benzene in 2008/50/EC, WMO GAW
Carbonyls	Aldehydes and ketones	8hourly twice a week	In the EU Directive 2002/3/EC,
CH_4	Methane	hourly	WMO GAW

www.emep.int

← → ↻ ⬆ www.nilu.no/projects/ccc/index.html ☆

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

msc-



msc-e



ccc



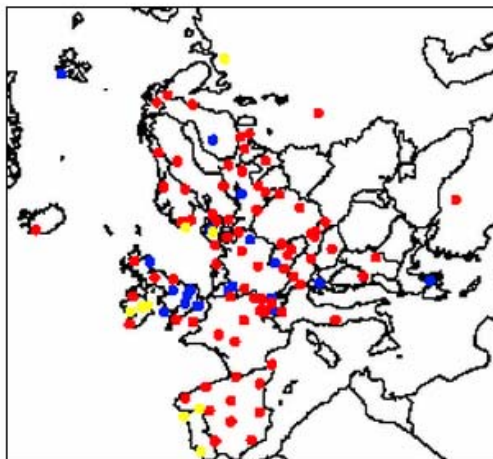
ciam



cein

umweltbundesamt

Chemical Co-ordinating Centre of EMEP (CCC)



[Contact persons](#)

[EMEP Monitoring Strategy \(2010-2019\)](#) (pdf)

[Relevant links](#)



[Measurement network](#)

[Site descriptions](#)

[Trajectories](#)



[Measurement data](#) (incl 2009)

[Ebas database online](#)

[EMEP near-real time](#)

[Data submission](#)



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[TFMM](#)

[TFMM - EMEP monitoring and relevance to Air Quality](#)

[Directive obligations](#)

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Directive 2008/50/EC
of 21 May 2008
on ambient air quality and cleaner air for Europe

These slides do not provide a complete description of the requirements given in the
Directive!

It contains however an extract of the sections of particular relevance for EMEP
monitoring obligations (monitoring at rural and background scale).

General requirements:

(8) Detailed measurements of particulate matter at rural background locations should be made in order to understand better the impacts of this pollutant and to develop appropriate politics. **Such measurements should be made in a manner consistent with CLRTAP/EMEP** approved with the council decision 81/462/EEC (June 81)

Section 1 (SO₂, NO_x, PM, Pb, Benzene and CO)

Article 6 – Assessment criteria

5. In addition to the assessments referred to in para 2, 3 and 4, measurements shall be made, at rural background locations away from significant sources of air pollution, for the purpose of providing, as a minimum, information on the total mass concentrations and the chemical speciation concentrations of fine particulate matter (PM_{2,5}) on an annual average basis and shall be conducted using the following criteria:

a) one sampling point shall be installed every 100 000 km²

b) each Member State shall set up at least one measurement station, or may, by agreement with adjoining Member States, set up one or several common measuring stations, covering the relevant neighbouring zones, to achieve the necessary spatial resolution

c) **where appropriate, monitoring shall be coordinated with the monitoring strategy and measurement programme of CLRTAP/EMEP**

Annex IV: Measurements at rural background locations irrespective of concentration

A.Objectives

The main objectives of such measurements are to ensure that adequate information is made available on levels in the background. This information is essential to judge the enhanced levels in more polluted areas (such as urban background, industry related locations, traffic related locations), assess the possible contribution from long-range transport of air pollutants, source apportionment analysis and for the understanding of specific pollutants such as particulate matter. It is also essential for the increased use of modelling also in urban areas.

B.Substances

Measurements of PM_{2,5} must include at least the total mass concentration and concentrations of appropriate compounds to characterize its chemical composition. At least the list of chemical species below shall be included: SO_4^{2-} , NO_3^- , NH_4^+ , Na^+ , Cl^- , Mg^{2+} , Ca^{2+} , K^+ , elemental C, organic C

C.Siting

Measurements should be taken in particular in rural background areas in accordance with parts A, B and C of Annex III

(Annex III, B. 1.d: Where the objective is to assess rural background levels, the sampling point shall not be influenced by agglomerations or industrial sites in its vicinity, i.e. closer than five kilometers)

(Annex III, B. 2: Sampling points targeted at the protection of vegetation and natural ecosystems shall be sited more than 20km away from agglomerations or more than 5km away from other built up areas, industrial installations or motorways or major roads with traffic counts more than 50.000 vehicles per day, which means that the sampling point must be sited in such a way that the air sampled is representative of air quality in a surrounding area of at least 1.000 km²

Section 2 (O₃)

Article 10 – Sampling points

1. The siting of sampling points for the measurements of ozone shall be determined using the criteria set out in Annex VIII:
4. Exceptions exist for measurements of NO_x at rural background stations
6. **Each member state shall ensure that at least one sampling point is installed and operated in its territory to supply data on concentrations of the ozone precursor substances listed in Annex X. Each Member State shall choose the number and siting of the stations at which ozone precursor substances are to be measured, taking into account the objectives and methods laid down in Annex X.**

Annex VIII (O₃): Macroscale siting - Rural background: **objectives** are protection of vegetation and human health (to assess exposure to regional scale concentrations). **Representativeness** – regional/national/continental (1000-10000 km²).

Macroscale siting criteria – Stations located in areas with lower population density, e.g. with natural ecosystems, forests, at a distance of at least 20 km from urban and industrial areas and away from local emissions; avoid locations which are subject to locally enhanced formation of ground-near inversion conditions, also summits of higher mountains; coastal sites with pronounced diurnal wind cycles of local character are not recommended. (location coordinated also with Forest Focus where appropriate)

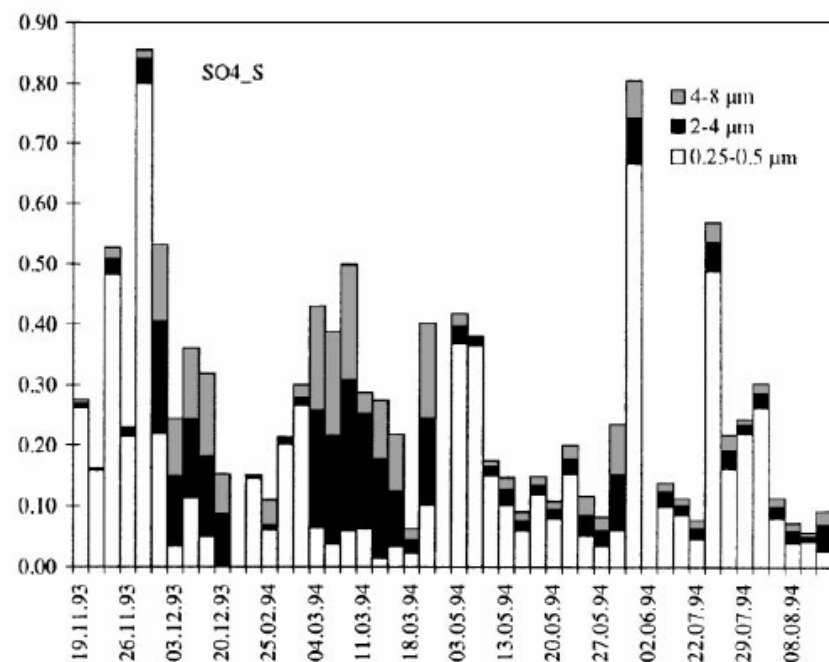
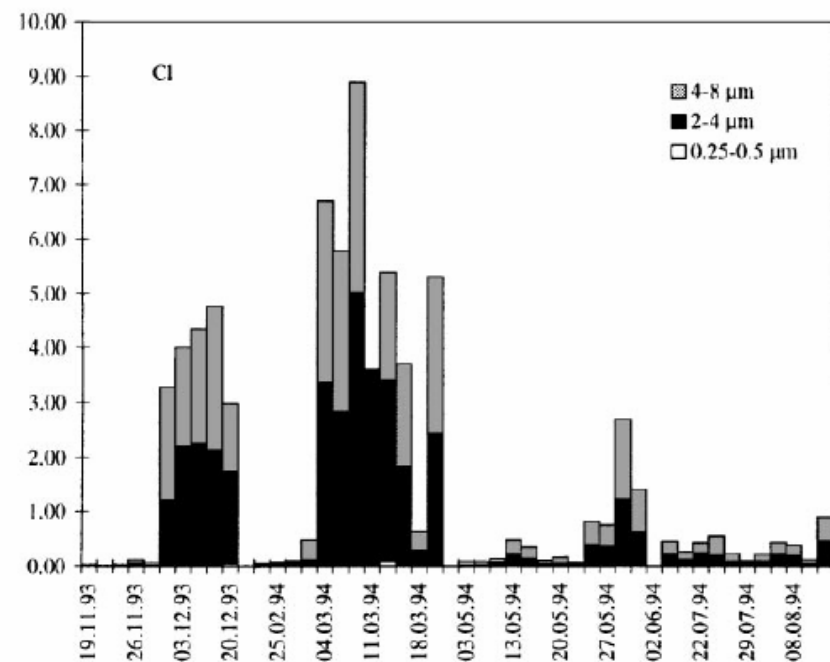
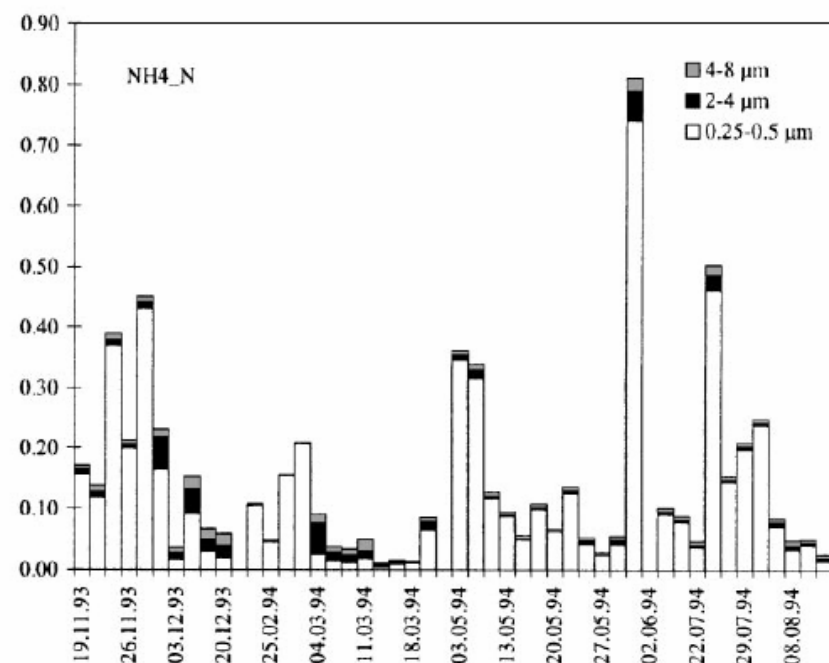
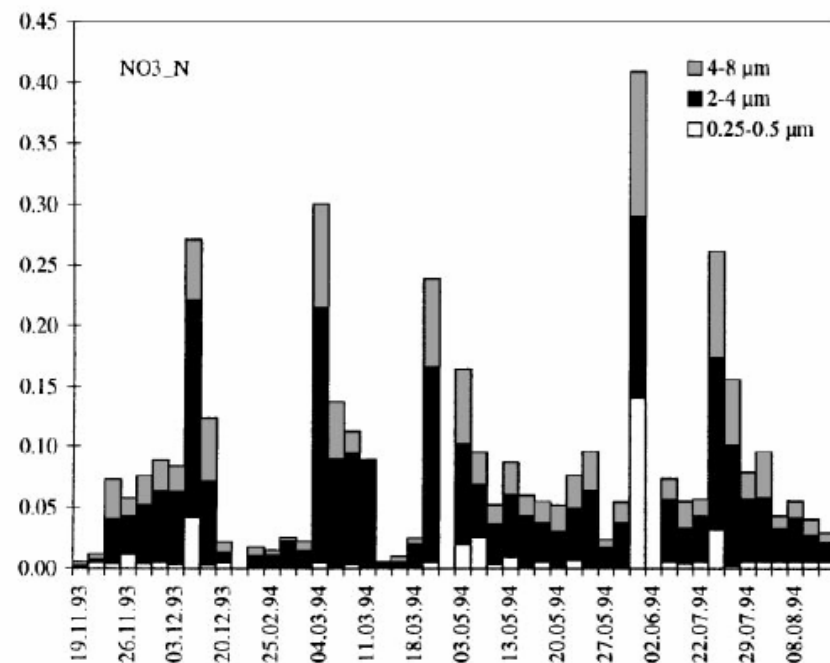
Annex IX (O₃): Minimum number of sampling points for fixed continuous measurements to assess compliance with target values...A: where such measurements are sole source of information: Rural background: 1 station/50000km² as an average density over all zones per country. B: Long-term objectives: The number of rural background stations shall be one per 100.000 km².

Annex X (VOCs): A:

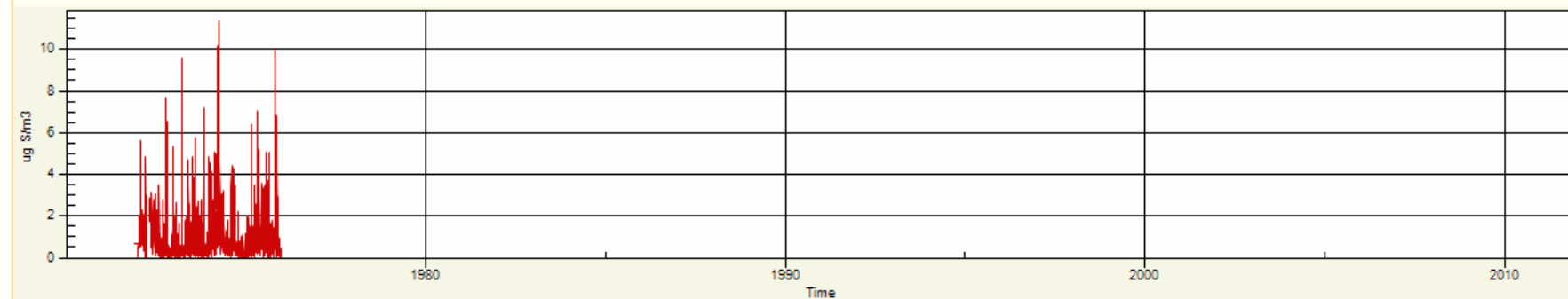
B: **Substances:** NO, NO₂, list of 31 VOCs Main **objectives** of such measurements are to analyse any trend in ozone precursors, to check the efficiency of emission reduction strategies, to check the consistency of emission inventories and to help attribute emission sources to observed pollution concentrations. An additional aim is to support the **understanding of ozone formation and precursor dispersion processes, as well as the application of photochemical models.**

C: **Siting:** Measurements shall be taken in particular in urban or suburban areas at any monitoring site set up in accordance with the requirements of this Directive and considered appropriate with regard to the monitoring objectives referred to in Section A

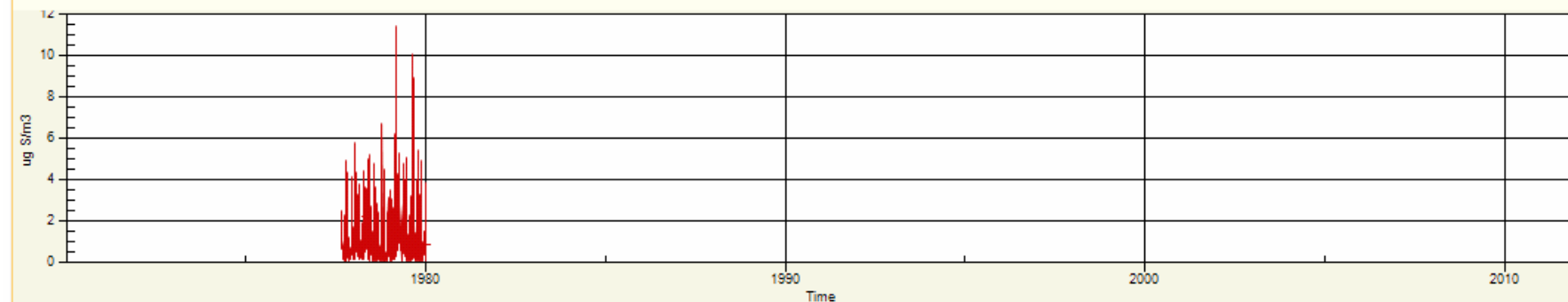
Size distributed measurements of inorganic ion concentrations



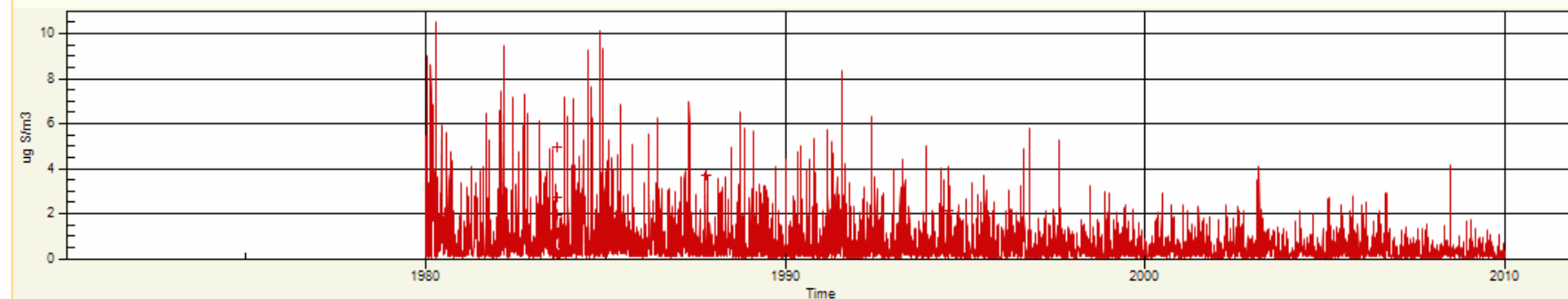
Plot Values Meta Transport

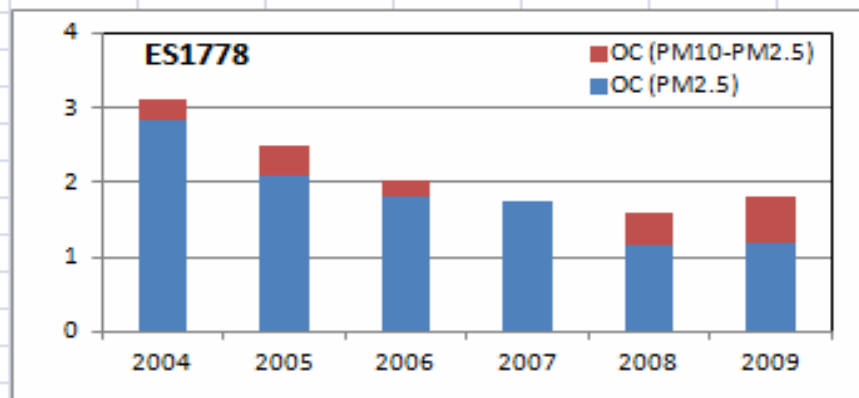
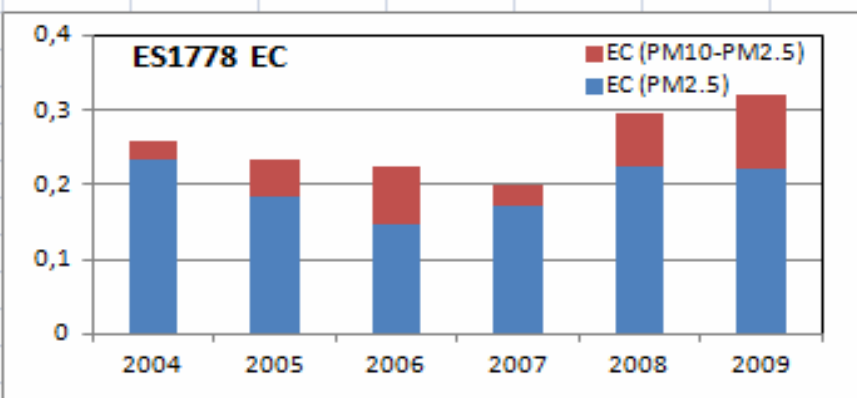
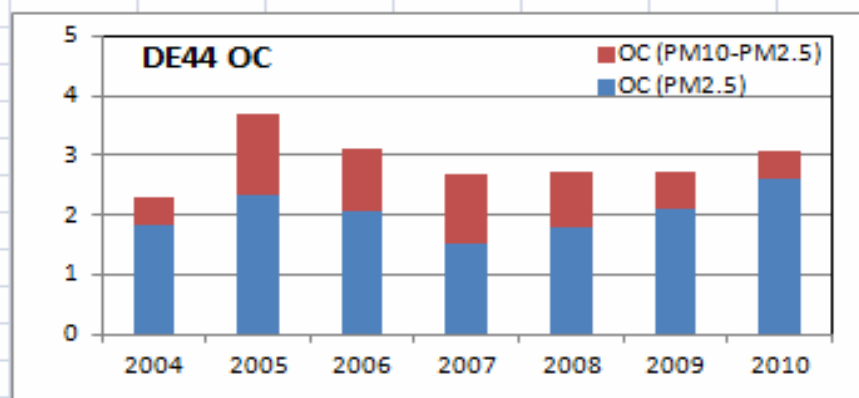
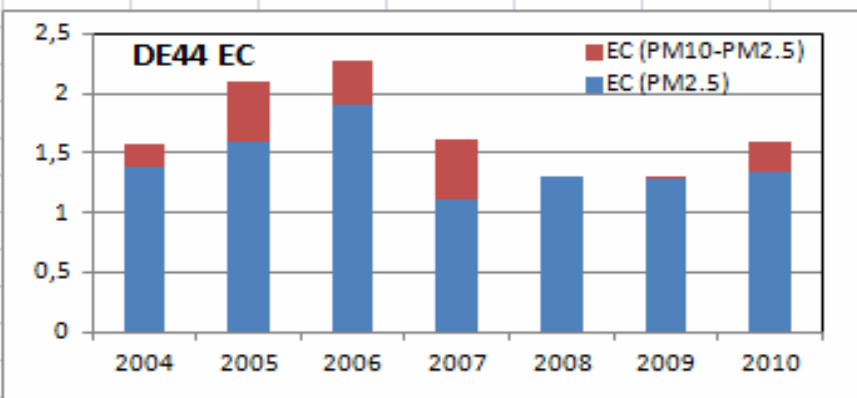
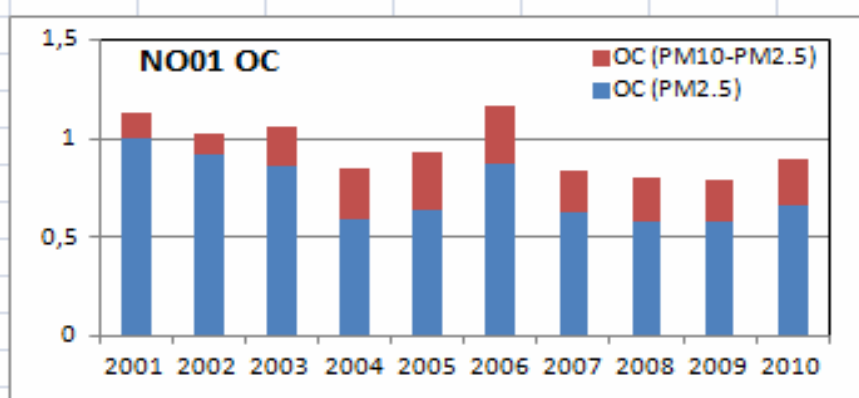
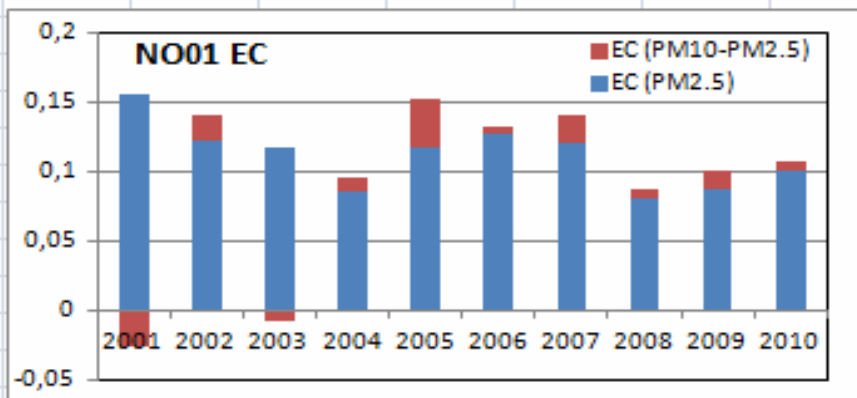
☒ Linear ☐ Logarithmic

Plot Values Meta Transport

☒ Linear ☐ Logarithmic

Plot Values Meta Transport

☒ Linear ☐ Logarithmic



EMEP monitoring and the relevance to the Air Quality Directive obligations

Introduction: EMEP monitoring represents the major source of information to assess regional scale air pollution across Europe. The EC Air Quality directive makes reference to the EMEP monitoring strategy, and measures have been made to strengthen the harmonization of monitoring requirements to secure long-term data series, and to secure efficient use of resources. This page provides an overview of the process within EMEP to strengthen the position of EMEP monitoring (sorted chronologically, most recent first).

The 13th TFMM annual meeting will be held from 17th to 19th April 2012.

This meeting will discuss and adopt the final version of the "Condensed booklet" requested at TFMM12.

EMEP ACP Special Issue: The EMEP CCC is preparing an overview publication which will introduce the EMEP monitoring programme and major findings.

AAMG-meeting "Towards the 2013 Revision of the Ambient Air Quality Directive Issues and Solutions conference" (London Dec 12-13, 2011)

- [Programme](#)
- [Abstract of EMEP CCC presentation](#)
- Presentation by CCC (in prep)

[Draft 2012-2013 Workplan](#) for the implementation of the Convention on Long-range Transboundary Air Pollution

Main activities by the Task Force on Measurements and Modelling: Ongoing activities: The Task Force, supported by CCC, will: (a) Build up the appropriate framework and support for the implementation of the updated EMEP monitoring strategy, including: (i) Considering possible synergies with the monitoring requirements of the EU Air Quality Directive;

Contribution by EMPA, EMEP-CCC and JRC (representing the AirMonTech project) to the discussions within AQUILA in response to the EU Air Quality Directive revision process:

- [Recommendations related to the monitoring of aerosol chemistry](#)

Response to the Stakeholder Review Group for the EC Directive revision (EB, SB, WGSR)

CLRTAP represented by the Executive Body, the EMEP Steering Body and Working Group on Strategies and Review provided the following response to the EU Stakeholder Review Group:

- [AQD for Stakeholder Review Group_CLRTAP](#)

Minutes from the 35th session of the EMEP SB ([ECE/EB.AIR/GE.1/2011/2](#)):

"19. At the request of the Task Force, CCC had prepared a note on compatibility of EMEP methods/measurements with requirements of the Air Quality Directives ([see information document No. 6](#)). That was done with a view to informing the process of revision of the Air Quality Directives started in June 2011 - a process in which the Convention was a stakeholder".

The importance of harmonization with EU efforts was further highlighted by the following amendments to the EMEP Workplan:

41. The Steering Body considered the [draft 2012-2013 workplan](#) for the implementation of the Convention, and agreed to recommend to the Executive Body to approve it with the following amendments:

(d) Activities area 2.2, under Main activities by the Chemical Coordinating Centre, Ongoing activities, add a new subparagraph (h): Participate as far as possible in the discussions that are held at the European Commission level within the future revision process of the Air Quality Directive to ensure further harmonization of measured parameters and measurement techniques between the EMEP Monitoring strategy and the EU Directive monitoring requirements;

(f) Activities area 2.2, under Main activities by the Chemical Coordinating Centre, New activities, add new subparagraphs (g) and (h): (g) Actively engage with the AQUILA network of National Reference Laboratories for air pollution set up by the European Commission, in order to foster a harmonized monitoring approach between the Convention and the EU air policies;

TFMM Task Force Meeting, EMPA May 2011 ([TFMM Report to the SB](#)):

Draft:

AQUILA: Input to revision of AQD

In Annex IV, the AQD specifies that the analysis should be made of the PM_{2.5} size fraction, and there are no requirements for measurements of the composition of larger aerosol. Unfortunately this request is inconsistent with the method requirements of EMEP, where these analyses are performed using open faced filter pack samplers.

To address the objectives of EMEP, information on the chemical composition is required also for aerosols having a mean aerodynamic diameter larger than 2.5 micrometer.

- * a significant part of the transboundary fluxes by coarse fraction (between 2.5 and 10 µm).
- * NO₃⁻ (mainly originating from anthropogenic NO_x emissions), OC, Ca²⁺ and K⁺ (originating from both anthropogenic and natural sources) and Mg²⁺ and Na⁺ (originating mainly from natural sources) are significantly associated with the coarse fraction.
- * NH₄⁺ and EC are insignificantly present ion the coarse fraction (i.e. analysis results are equal independent of whether measurements are made using a PM_{2.5} or PM₁₀ size cutoff).
- * SO₄²⁻ aerosols are present both in the fine and coarse fractions. While secondary sulphate originating from antropogenic emissions of SO₂ is largely present in the PM_{2.5} mode, primary sulphate (from sea-salt or anthropogenic emissions) occurs predominantly in the coarse fraction.

Based on the considerations outlined above, AQUILA **proposes** the following modifications in Annex IV Part B on the occasion of the revision of the AQD:

B. Substances

The measurement must include at least the total PM_{2.5} mass concentration and concentrations of EC in PM_{2.5}. In addition appropriate information to characterize the chemical composition of the aerosol should be provided, measured consistent to the methods used in the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP).

To be discussed at TFMM13

from Draft Agenda:

- **EMEP monitoring strategy:** During the last meeting we raised strong issues related to the status and the sustainability of the EMEP monitoring sites with the perspective of mandatory observations and different constraints for the implementation of monitoring networks according to the EU Air quality Directive.
- The Convention and several parties bore the message to the European Commission that the EMEP monitoring sites should be considered as “AQD compliant” for monitoring rural areas. This issue must be followed up with the revision of the Directive.

Conclusion

- The intentions of AQD monitoring at background sites is identical to EMEP objectives
 - The EC is a Party to the CLRTAP and uses EMEP infrastructure for its policy making
 - Monitoring is costly and long-term data series are at risk
 - Parties have limited resources
- > it makes sense that the EC requirements take benefit from existing EMEP monitoring