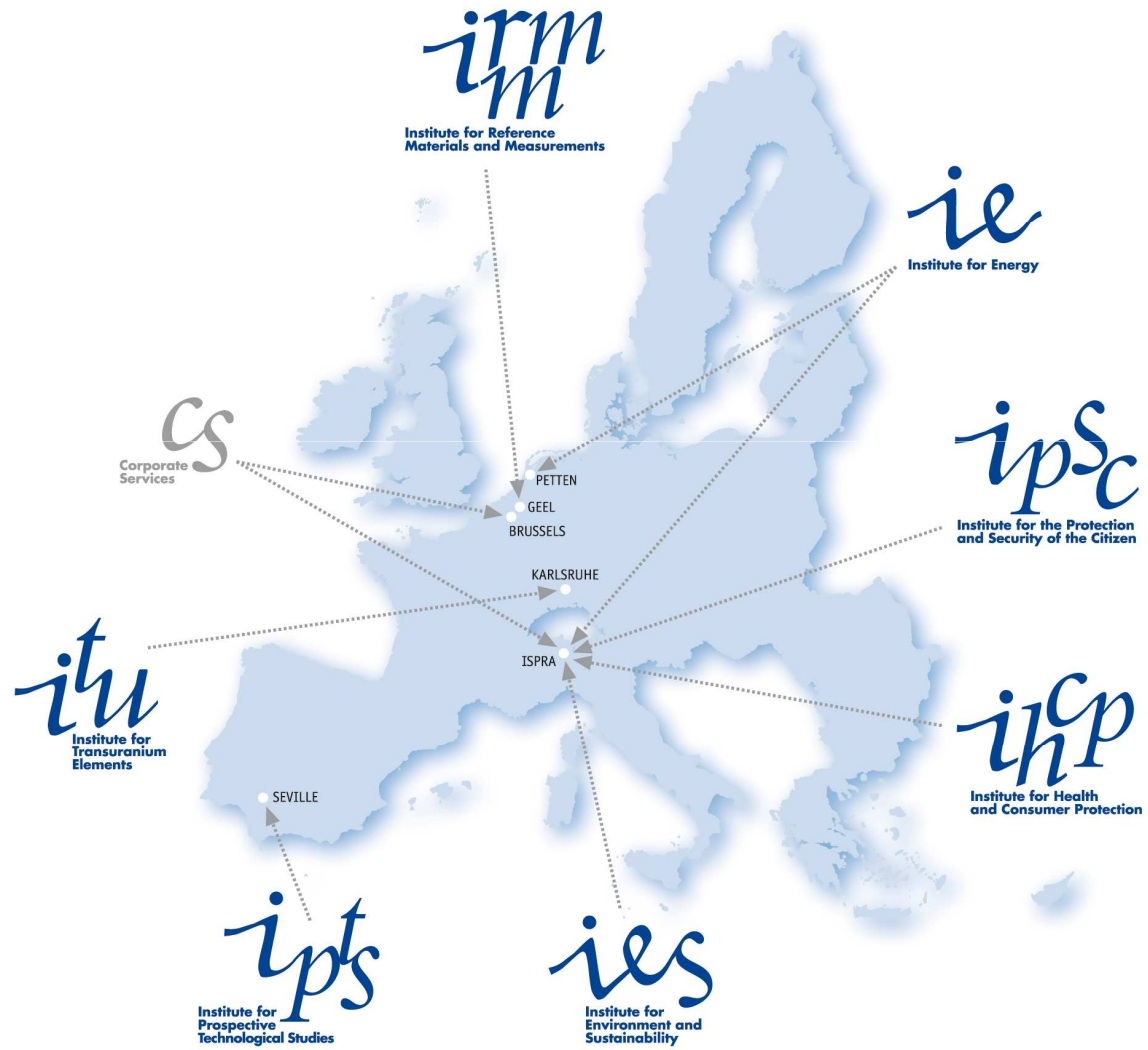


TFMM Workshop

19-20 November 2009

JRC, Ispra



WARNING!

If you hear sirens sounding, do not panic!
It is **NOT** a nuclear accident (hopefully!),
just a nuclear exercise!!

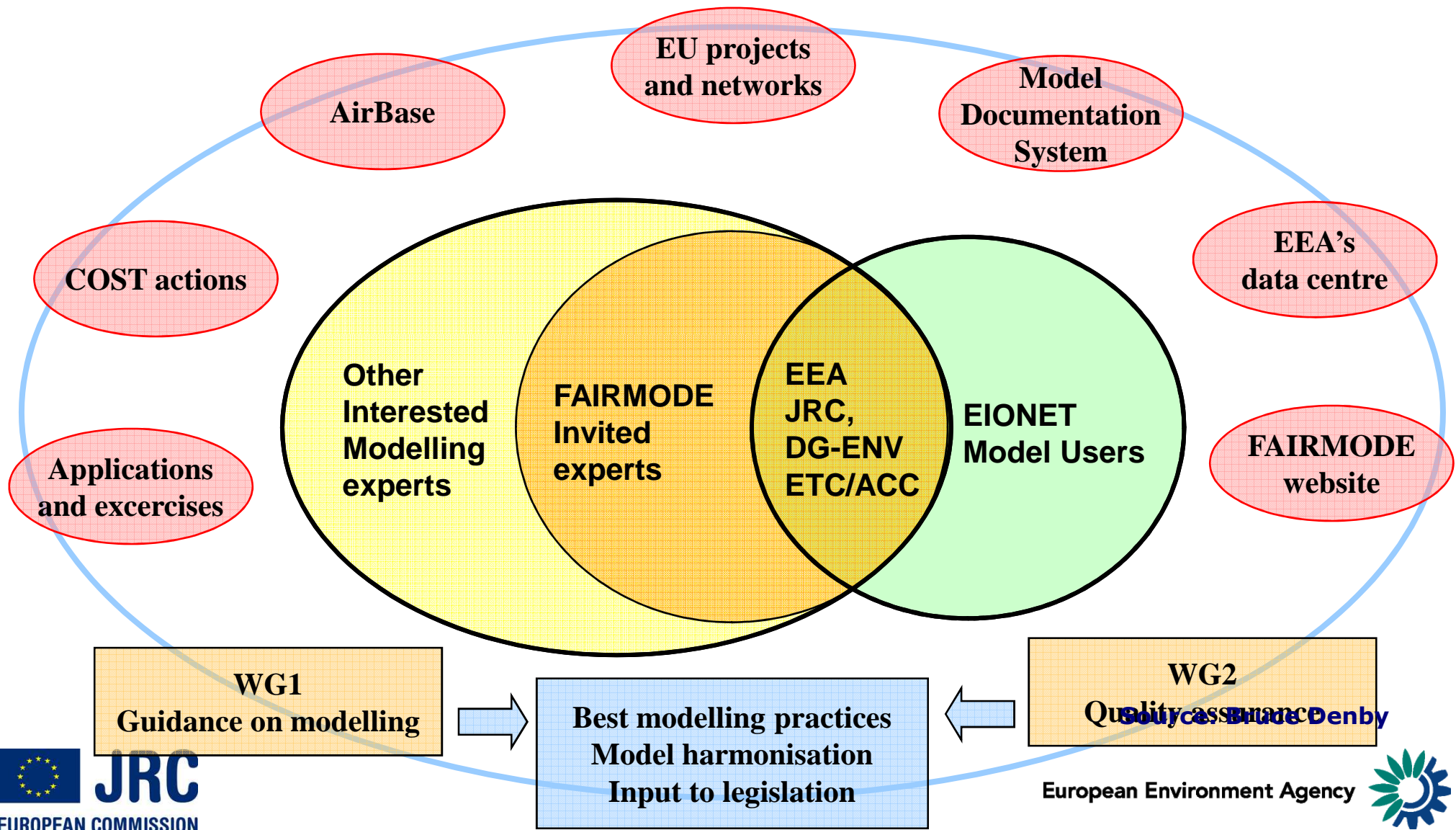
FAIRMODE Update

Anke Luekewille (EEA)

Penny Dilara (JRC)

Philippe Thunis (JRC)





Activities WG1 (lead by EEA -ETC/ACC)

- Provide guidance to present and future model users in EEA's EIONET partnership network (32 Member Countries plus West Balkan countries, cooperating).
- ***FAIRMODE tasks in the ETC/ACC 2009 and 2010 Implementation Plans.***
- ***Presentation of FAIRMODE activities at several international conferences and workshops (HARMO, AQ conf., EGU, ...).***
- ***“Guidance on the use of models for the European Air Quality Directive” report (Version 4.2)***
- ***FAIRMODE web side (hosted by EEA; ETC/ACC)***

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FAIRMODE

Forum for Air Quality Modelling in Europe

John Dorous – ETC/ACC
(Aristotle University of Thessaloniki)

ABOUT THE FORUM TOOLS & SERVICES DATA ARCHIVES CASE STUDIES EU LEGISLATION GUIDANCE PROJECTS INFO

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FORUM FOR AIR QUALITY MODELLING

The main aim of the Forum for AIR quality MODelling (FAIRMODE) is to bring together air quality modellers and users in order to promote and support the harmonised use of modelling practices for the assessment of air quality by EU member countries.

Within this scope, a main aspect of the Forum will focus on scientific research that will establish improved and validated modelling tools on which decision making will be based.

The forum is a joint response action of the European Environment Agency (EEA) and the European Commission Joint Research Centre (JRC) towards the new Air Quality Directive.

Latest news

[Description of activities of the Sub-Groups of WG2: SG2, SG3, SG4, SG5, SG7](#)

[Agenda of the WG2 meeting on Model Evaluation and Intercomparison Exercises](#)

[Invitation and Agenda of the 2nd Plenary Meeting of FAIRMODE](#)

RDF CALENDAR

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30						

UPCOMING EVENTS

[The WG2 meeting on Model Evaluation and Intercomparison Exercises will take place on the 17th of November \(Agenda\)](#)

[The 2nd Plenary Meeting of the Forum for Air Quality Modelling will take place on the 18th of November \(Invitation, Agenda\)](#)

EL ?

FAIRMODE (WG1)

Guidance on the use of models for the European Air Quality Directive

Bruce Denby (ed.)

Contributing authors

Bruce Denby, Steinar Larssen, Cristina Guerreiro, Liu Li, John Douros, Nicolas Moussiopoulos, Lia Fragkou, Michael Gauss, Helge Olesen, Ana Isabel Miranda, Emilia Georgieva, Panagiota Dilara, Sari Lappi, Laurence Rouil, Anke Lükewille, Xavier Querol, Fernando Martin, Martijn Schaap, Dick van den Hout, Andrej Kobe

Contents AQ Modelling Guidance document (WG1)

1. Introduction
2. Summary of the 2008 AQ Directive
3. Interpretation of the AQ Directive in regard to modelling
4. Reporting and public information when using models
5. Model quality assurance and evaluation
6. Applications of models for assessment
7. Application of models for air quality planning
8. Special topics

Annexes 1 - 4

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1. Assessment of the existing air quality

- Models can be used to supplement or even replace monitoring data under specified conditions. These conditions are related to the various categories of pollutant levels and are described in section 3.2 of this document.
- Given adequate quality and resolution a model can be used to reduce the number of measurements by up to 50% (not including ozone, see *Annex IX*), unconditional on the pollutant levels (*Articles 7.3, 10.3 and 14.2*).
- Given adequate quality and resolution of the model it can be used to reduce the number of measurements of ozone by 1/3rd (*Annex IX*).

This topic will be described in more detail, and illustrated with examples, in chapter 6.

2. Management: mitigation and planning for future air quality

When preparing air quality plans and abatement measures, models will need to be used for a thorough analysis of the impact of these measures on the air quality. The use of models is not stated explicitly in the AQ Directive for this management activity, but it is not possible to do this analysis properly without the appropriate models. Such analysis includes short term air quality modelling of hours to days (air quality forecasting) as well as long term planning of several decades (emission scenarios and abatement measures) This topic will be described in more detail, and illustrated with examples, in chapter 7.

3. Source apportionment

Though not directly written into the AQ Directive, source apportionment studies will generally be required to assess the causes of exceedances of air quality thresholds, the contribution from natural sources, neighbouring countries and the contribution from resuspended road sand and salt. Monitoring of these source contributions everywhere in a zone or agglomeration would not be possible so modelling is the most likely methodology that can be used for this application. Though source apportionment is a part of any air quality assessment, this topic is of particular importance and will be described separately in more detail, and illustrated with examples, in chapter 8.

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3.2 When can models be used for the assessment of existing air quality?	15

3.5.1 Spatial resolution of the models

The AQ Directive specifies the placement of measurement sites (Annex III.B.1) related to health protection and points out that if modelling is used then the same type of criteria should apply (Annex III.A.1). From a modelling perspective the following points concerning resolution should be made:

- a) Assessment should occur at sites where the concentrations are highest, e.g. kerside or close to strong sources, as well as in areas representative of the exposure of the general public, i.e. urban background. However, in regard to traffic stations (Annex III.C) the AQ Directive states that concentrations should be assessed no closer than 1 m to the kerbside or 25 m from the edge of major junctions.
- b) For industrial areas concentrations should be representative of a 250 x 250 m area and for traffic emissions an assessment should be representative for a 100 m street segment.
- c) Urban background concentrations should be representative of several square kilometres

Frans Fierens

These statements concerning representativeness place limits on the modelling to be carried out. The following examples help to illustrate this:

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3.6.1 Mathematical formulation of the Directive quality objectives

As in the previous directives the wording of this text remains ambiguous. Since values are to be calculated, a mathematical formulae would have made the meaning much clearer. As such the term 'model uncertainty' remains open to interpretation. Despite this we suggest the following interpretation that we call, for want of another name, the Relative Directive Error (RDE) and define it mathematically at a single station as follows:

$$RDE = \frac{|O_{LV} - M_{LV}|}{LV} \quad (1)$$

where O_{LV} is the closest observed concentration to the limit value concentration (LV) and M_{LV} is the correspondingly ranked modelled concentration. The maximum of this value found at 90% of the available stations is then the Maximum Relative Directive Error (MRDE).

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Exceedance based on modelling			2004	2005	2006	2007
SO₂	Health	Hr	13.0%	12.1%	10.6%	10,3%
		Day	8.0%	8.8%	7.7%	9,7%
	Eco	Yr	21.0%	14.4%	7.2%	6,9%
		Winter	19.0%	19.4%	5.4%	7,1%
NO₂	Health	Hr	10.0%	10.3%	8.5%	6,1%
		Yr	12.0%	10.6%	4.4%	10,8%
NO_x	Veg	Yr	19.0%	2.8%	6.9%	7.0%
PM₁₀	Day		10.0%	9.3%	7.2%	8,1%
	Yr		9.0%	8.0%	6.0%	7,1%
Lead	Yr		15.0%	19.3%	17.9%	30,3%
Benzene	Yr		13.0%	12.5%	13.1%	21,7%
CO	Yr		14.0%	9.6%	11.9%	17,9%
O₃	Health		2.1%	3.3%	2.0%	7,1%
	Veg		2.2%	3.6%	2.9%	6,1%

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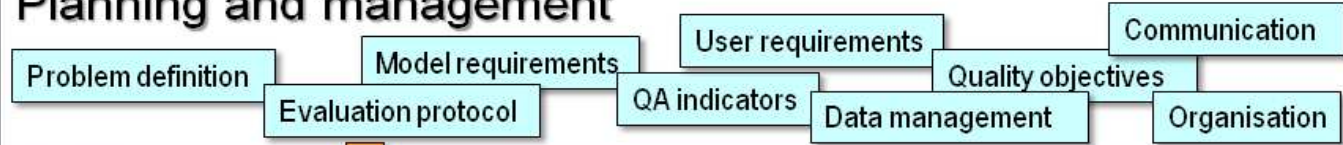
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Chapter 5

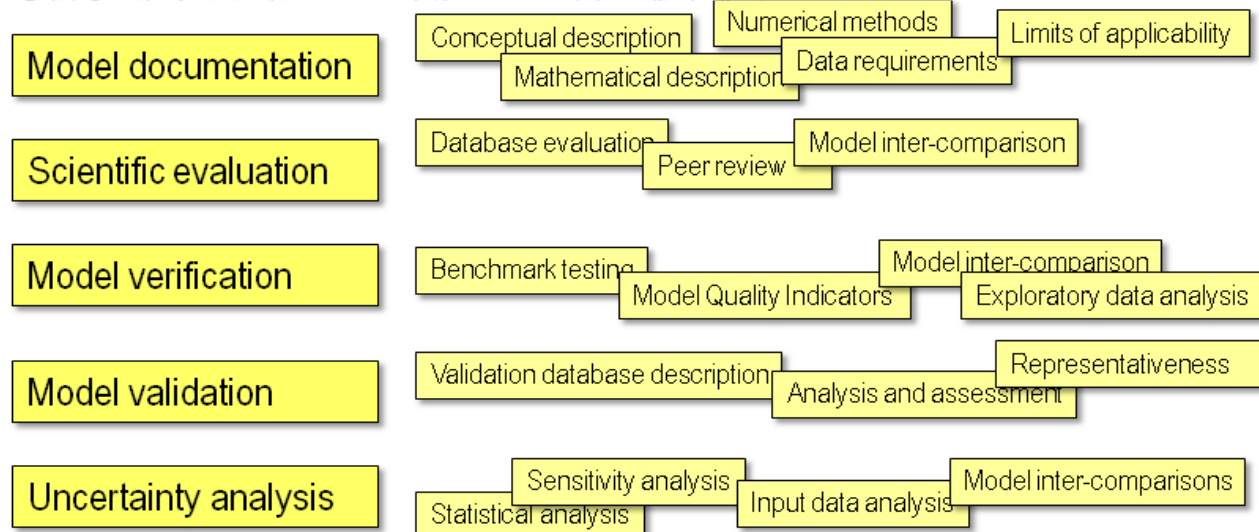
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Model quality assurance

Planning and management



Model evaluation



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8.2 Assessing the contribution of wind-blown and Saharan dust events to PM exceedances

Article 20 states that exceedances caused by natural contributions will not count as exceedances for the purpose of the AQ Directive. In article 2.15 one of the natural sources is described as being the “*atmospheric re-suspension or transport of natural particles from dry regions*”. This is generally understood to refer to Saharan dust events but may include any such event. It does not in principle include wind blown dust events caused by human activities such as agriculture or mining activities. As with road salting and sanding, wind blown dust events are most relevant for the PM₁₀ daily mean target values due to their episodic nature.

The Commission is currently developing a guidance document on natural contributions ‘Guidance on the quantification of the contribution of natural sources under the EU Air Quality Directive’ that will be available in 2010 through the Commission web site (<http://ec.europa.eu/environment/air/quality/>). This guidance document is based on a prior technical document (Marelli et al, 2007). For the particular case of Saharan dust episodes it is recommended in that document to use back trajectory modelling, Saharan dust forecasts, satellite data and ground based measurement data to identify such events. It is not recommended to use modelling alone as a method for *quantifying* Saharan dust outbreaks but rather to use monitoring methods for this, after the events have been identified using both models and monitoring data. A recent document (Querol et al., 2009) describes a comprehensive methodology that combines the above aspects and allows for a quantitative assessment of the contribution of Saharan dust outbreaks to PM₁₀ exceedances. This methodology is summarised in A1.2.6.

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Contributions are required for the following applications:

1. Where models are used in combination with measurements for Directive assessments
2. Where only models are used for Directive assessments
3. Where models are used to determine the risk of exceedance of the alert threshold and/or developing short term action plans to prevent this
4. Where models are used for special topics
5. Where models are used for special topics
 - a. Assessing the contribution of winter sanding or salting of roads to PM exceedances
 - b. Assessing the contribution of winter sanding or salting of roads to PM exceedances
 - c. Assessing the contribution of wind blown and Saharan dust events to PM exceedances
 - d. Assessing the contribution of sea salt to PM exceedances
 - e. Assessing the contribution of wild-land fires to PM exceedances
6. Examples of model validation or evaluation exercises and protocols

Contributions are still needed and welcome

Time table in 2009 – 2010 (WG1)

- Final update for 2009
 - Delivery to EEA on 11 December^(*)
- Incorporating and further selecting examples
- Updating in regard to other guidance documents and reporting requirements
- Promoting the document (e.g. Harmo13)
- Inclusion of results and activities of WG2
 - e.g. SG2 recommendations on data assimilation
- Guidance on local scale modelling of NO₂

^(*) *Bruce's birthday.*

For information and contributions contact

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and register at:

<http://fairmode.ew.eea.europa.eu/>

Thank you!

Flowers & berries...



- WG2

WG2 on Quality Assurance of Models

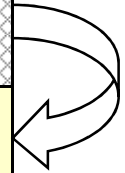
- Its main goal is to develop a user-friendly system (including protocol and tools) to assess the quality of the air quality models used for the implementation of the AQD
- Protocols for Quality Assessment
- Benchmarking Tools
- Dialogue and exchange of experiences

Proposal of SGs in WG2

		Group leader/provocateur
SG1	<i>Representativeness of AQ stations for model validation</i>	<i>W. Spangl, UBA- Austria</i>
SG2	Combination of monitoring and modeling (data assimilation)	B. Denby, NILU
SG3	Emission Inventories and Scenarios	J. Lumbreras and R. Borge, (Spain)
SG4	Protocols and Tool for Benchmarking Air Quality Models	P. Thunis, E. Georgieva (JRC)
SG5	Contribution of natural sources and source apportionment	J. Douros (Greece)
SG6	<i>Model suitability and model documentation</i>	<i>tbd</i>
SG7?	<i>Integrated Assessment Modelling in relation to the AQ Directives</i>	<i>M. Volta (Italy)</i>
	Coordination	L. Tarrason (NILU)

Established SGs in WG2 for 2010

		Group leader/provocateur
SG1	<i>Representativeness of AQ stations for model validation</i>	<i>W. Spangl, UBA- Austria</i>
SG1+2	Combination of monitoring and modeling (including data assimilation and representativeness of AQ measurements)	B. Denby, (NILU)
SG3	Emission Inventories and Scenarios	J. Lumbreras and R. Borge, (Spain)
SG4	Protocols and Tool for Benchmarking Air Quality Models	P. Thunis, E. Georgieva (JRC)
SG5	Contribution of natural sources and source apportionment	J. Douros (Greece)
SG6	<i>Model suitability and model documentation</i>	??
SG7?	<i>Integrated Assessment Modelling in relation to the AQ Directives</i>	<i>M. Volta (Italy)</i>
	Coordination	L. Tarrason (NILU)



Overview of AQD applications & scale in on-going projects

Applications for the AQD	Local-Hot spot (dx ~ m)	Urban/Agglom (dx ~ 1- 5 km)	Regional (dx ~ 10 – 50 km)
Compliance / Assessment	<p>TRANSPHORM</p> <p>COST 602</p>		<p>EURODELTA</p> <p>AQMEII</p>
Data Assimilation			<p>CITYZEN</p>
Fusion		<p>MEGAPOLI</p> <p>PASODOBLE</p>	<p>MACC</p>
Mitigation & Planning	<p>TRANSPHORM</p>		<p>MEGAPOLI</p> <p>EC4MACS</p> <p>EURODELTA</p> <p>CITYZEN</p>
Emission scenarios			
Source Apportionment		<p>PASODOBLE</p> <p>TRANSPHORM</p>	<p>MEGAPOLI</p>
Public information		<p>PASODOBLE</p>	
AQ near real time forecast			<p>MACC</p> <p>COST 602 Chemical Weather</p>



WG2 2010 - Main activities – SG(1+2)

SG(1+2) Combining monitoring and modelling

- Collecting information about groups and their methods and applications (data assimilation)
- Provide an assessment concerning the ‘fitness for purpose’.
Identify objectives and indicators.
- Provide basic recommendations for applications relevant to the directive (forecasting and compliance assessment)
- Evaluation of nesting procedures and capabilities
 - **will be carried out by the work in PASODOBLE,**

➤ **Links to Air4EU, MACC, PASODOBLE, COST 602**

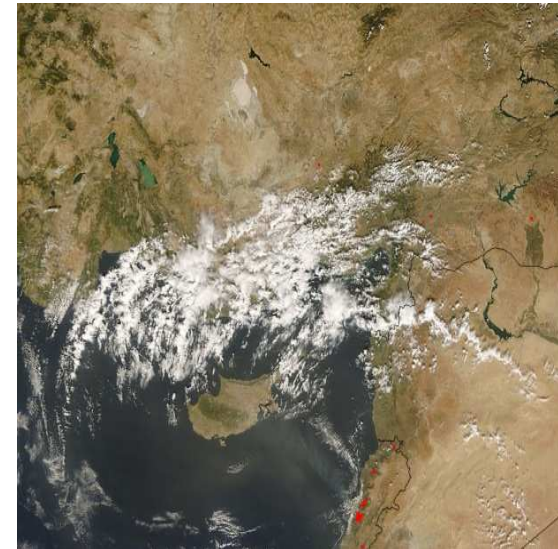
SG(1+2) Combining monitoring and modelling

- Representativeness of observations (**SG1**). The relevant work of this subgroup is now to be included in SG(2).
 - Need to evaluate station evaluation criteria
 - Recommendations on position of monitoring stations
 - Needs for new monitoring data

SG (5) Contribution of natural sources and source allocation

- ***Extended review of the guidance from the WG on Implementation (Requested by DG-ENV)***
 - Review of experiences from the members states reporting under Art.20 and 21
 - Protocol for best practice for model uses beyond receptor modelling for
 - Winter sanding
 - Wind-blown dust
 - Sea salt
 - Wild open fires

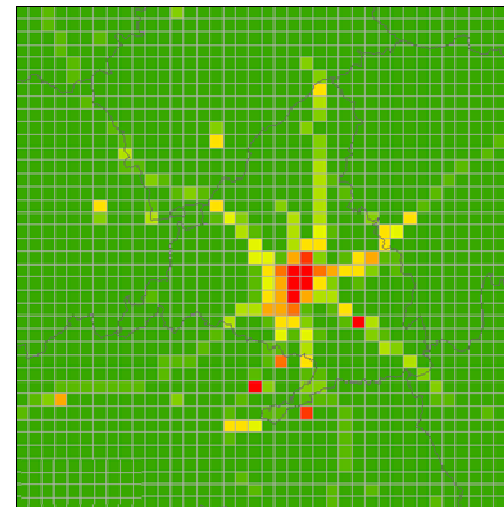
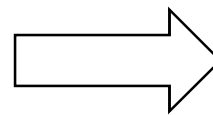
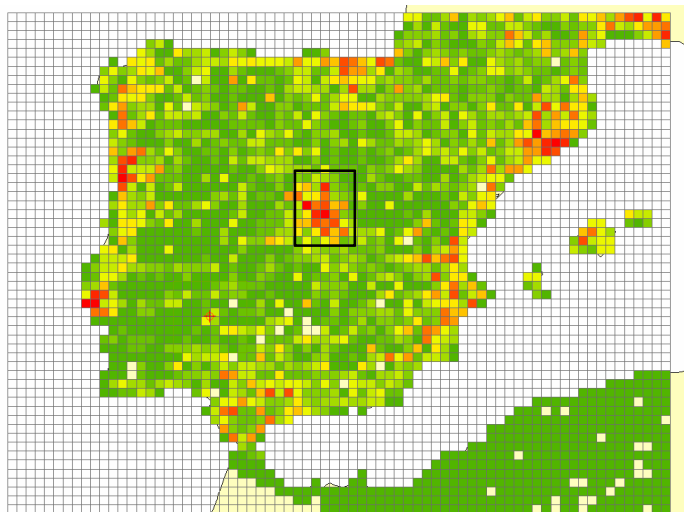
- **Links to MACC, PASODOBLE ,MEGACITIES**
- **And TFMM**



European Environment Agency

SG(3) on urban emissions and projections

- Needs for guidance on emission compilation at urban level
- Consistency with national inventories
- Top down vs bottom up approaches
- Use of GIS and GMES tools



WG2 2010 - Main activities – SG(3)

SG(3) on urban emissions and projections

Urban emission compilation is a key issue at European level

Both guidance and relevant exchange fora are needed

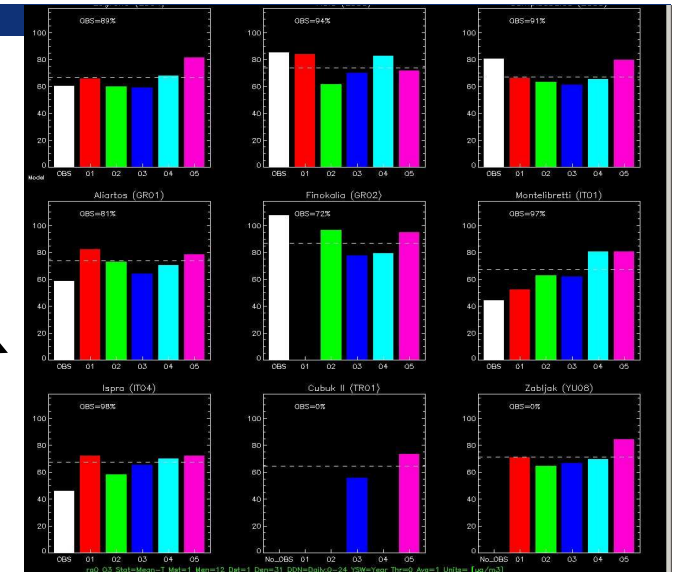
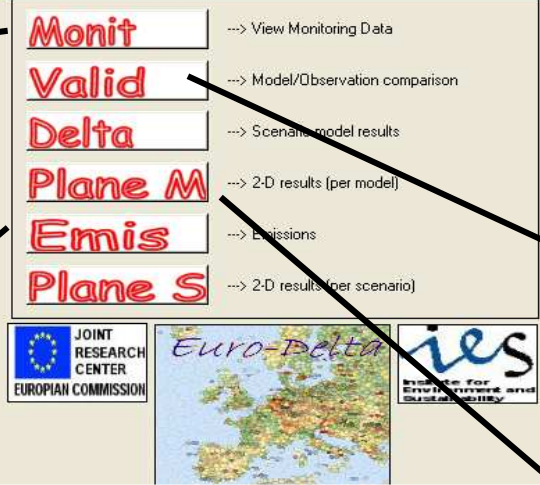
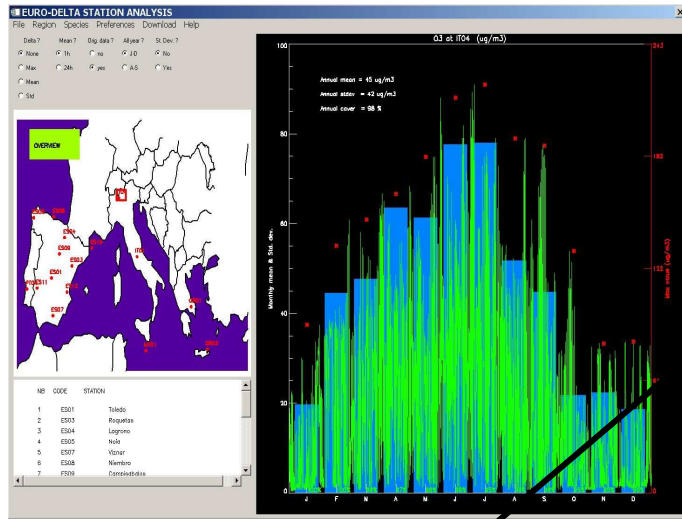
- Workshop with local authorities in 2010
- Draft guidance and prioritisation for long-term activities
 - data collections,
 - missing spatial and temporal patterns,
 - uncertainties,
 - Checklists and benchmarks
- **Links to TFEIP/EIONET, GEIA**
- **Funding will be needed!**

Benchmarking?

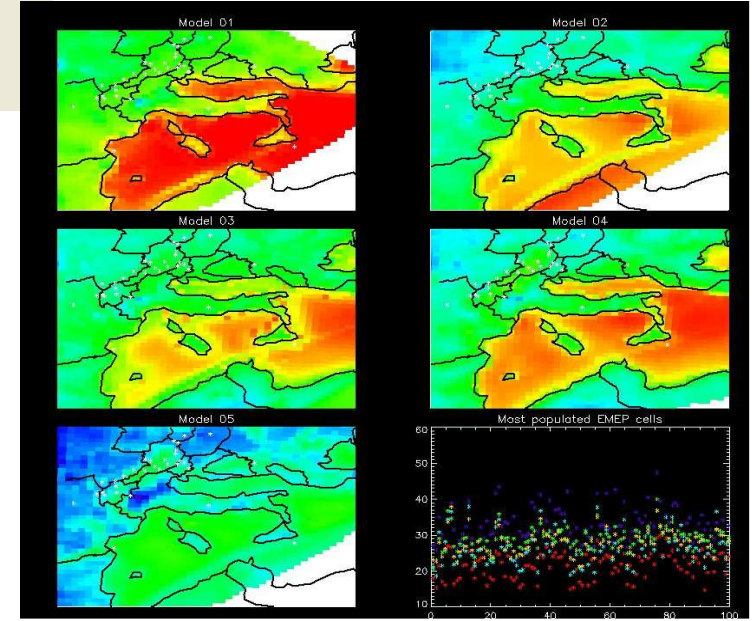
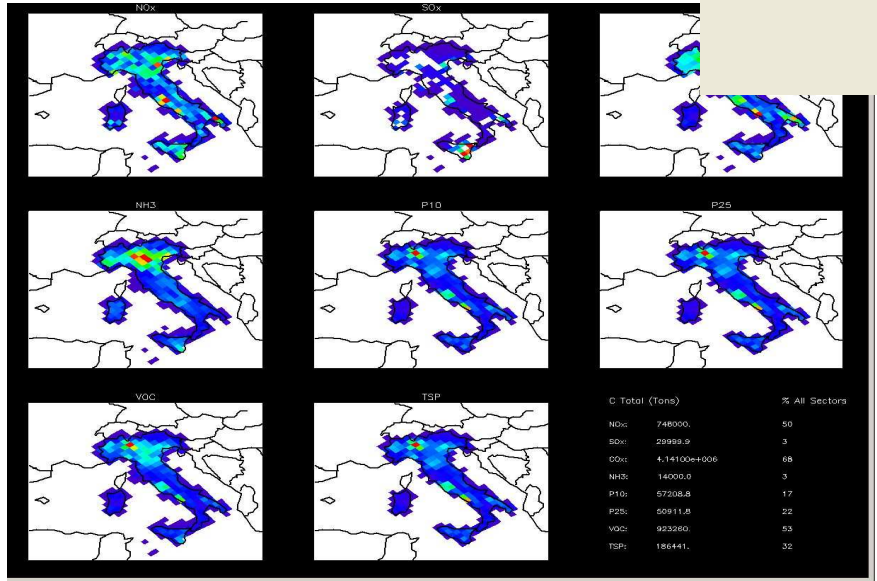
- **a standardized method** for collecting and reporting model outputs in a way that enables relevant comparisons, with a view to establishing good practice, diagnosing problems in performance, and identifying areas of strength;
- **a self-improvement tool** allowing model validation and model inter-comparison regarding some aspects of performance, with a view to finding ways to improve current performance;
- an on-going, systematically oriented process of continuously comparing and measuring models performance provides modelers with an **external reference and best practices** on which to base evaluation of the results and future developments.
- Benchmarking can be seen as a **diagnostic instrument**, an aid to judgments on quality.

The JRC visualization tool

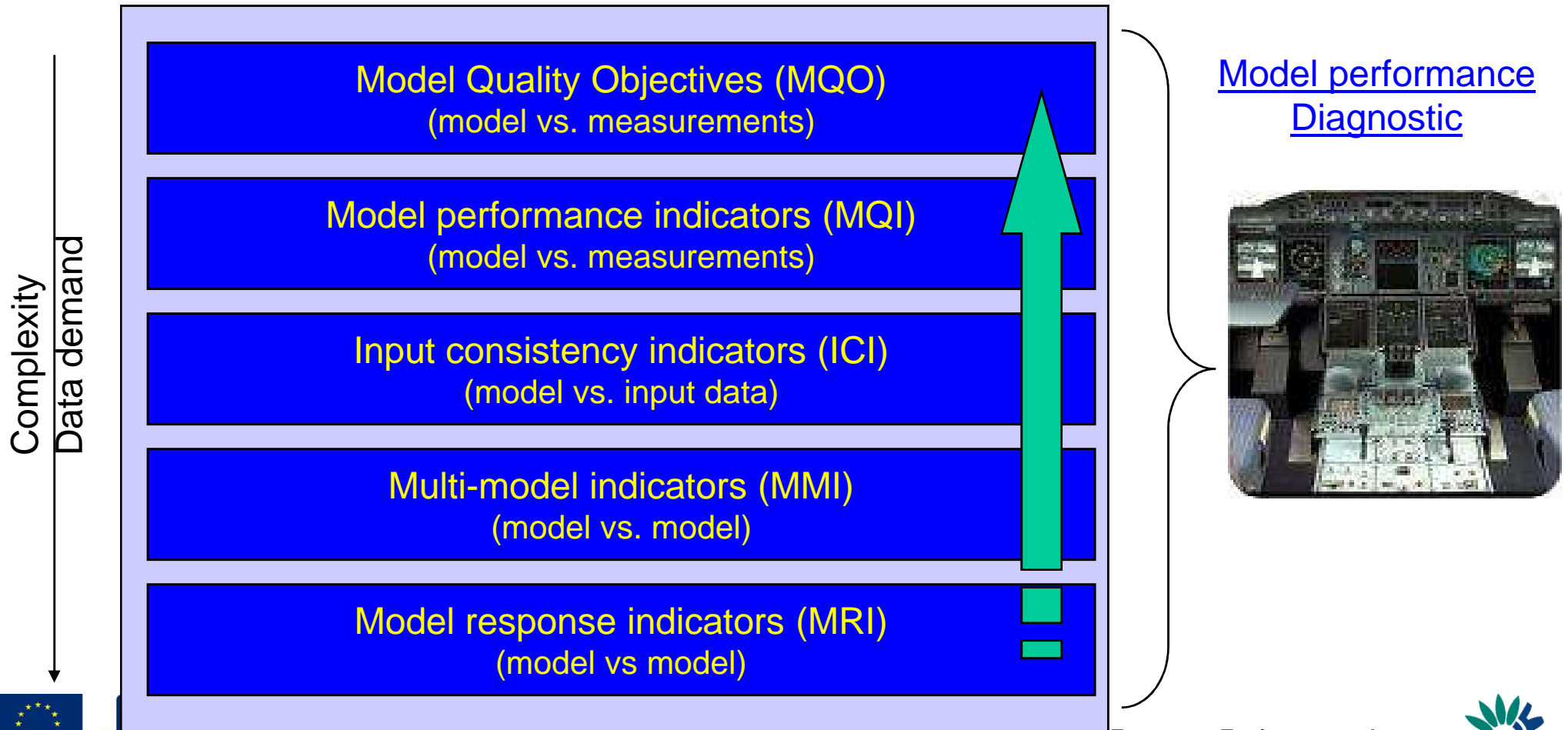
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Version 25
Expiration: 30/6/2005



Different levels of test complexity



- FAIRMODE focus is on the Urban/agglomerate scale (dx: 1-5 km)
- Development of a prototype based on the experience gained in previous inter-comparison projects and existing datasets (ED, CD, POMI...) → 2010
- Benchmarking on urban target area as well as on European scale (ED new phase)
- Benchmarks are intended to be “permanent”