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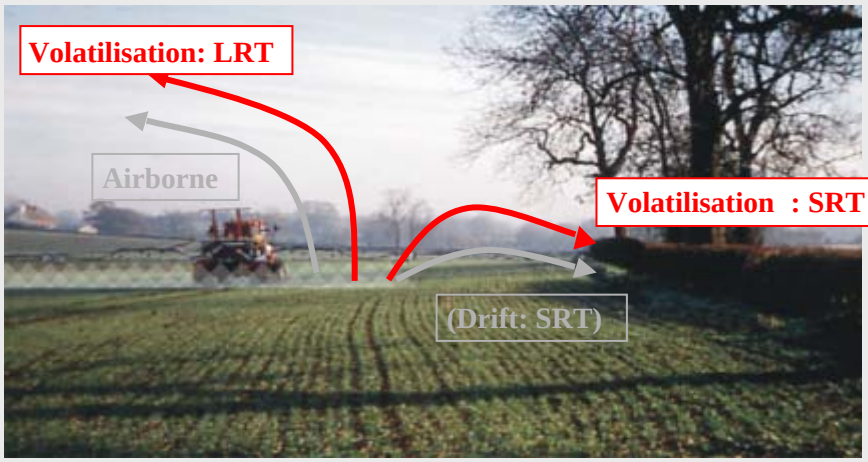
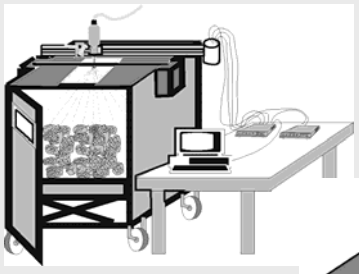
The impact of volatilisation on the environmental distribution and off-crop deposition of pesticides

After application (Volatilisation)

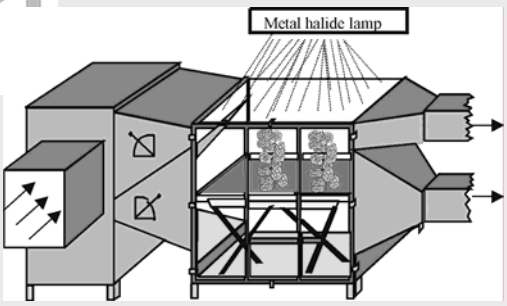
During application



Volatilisation experiments



application

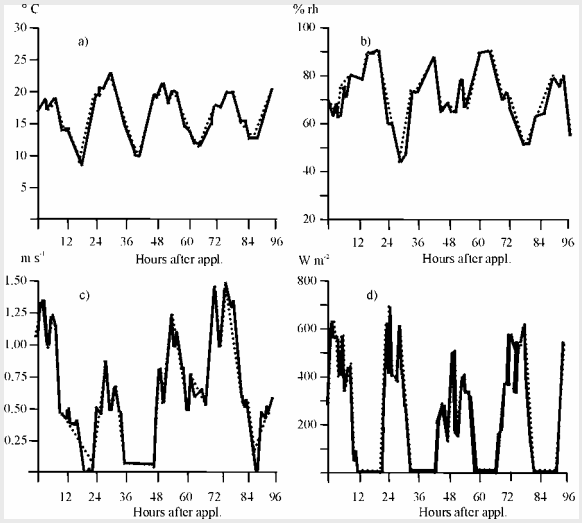


Volatilisation chamber

Volatilisation with the example of Fenpropimorph

	Fenpropimorph
IUPAC-name	(±)-cis-4-[3-4(tert-butyl- phenyl)-2-methylpropyl] -2,6-dimethylmorpholin
Sum formula	$C_{22}H_{33}NO$
Molar mass [g mol^{-1}]	303.5
Vapor pressure [Pa]	3.5×10^{-3}
Water sol. [mg L^{-1}]	4.3
Henry's law constant	1.0×10^{-7}
Log Pow	4.1
^{14}C-labeling position	[U-^{14}C]benzolring
Specific radioactivity [kBq mg^{-1}]	30 - 75
Formulation type	EC
A.I amount [g ha^{-1}]	750

Measured (__) and simulated (--) air temperature (a), humidity (b), wind velocity (c) and irradiation (d) during the experimental period of 4 days.



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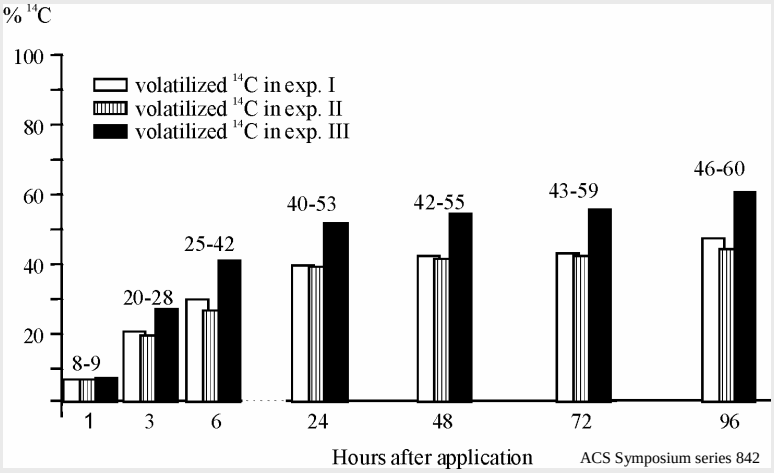
Kinetics of volatile radioactivity after application of 14C-fenpropimorph to barley/soil.



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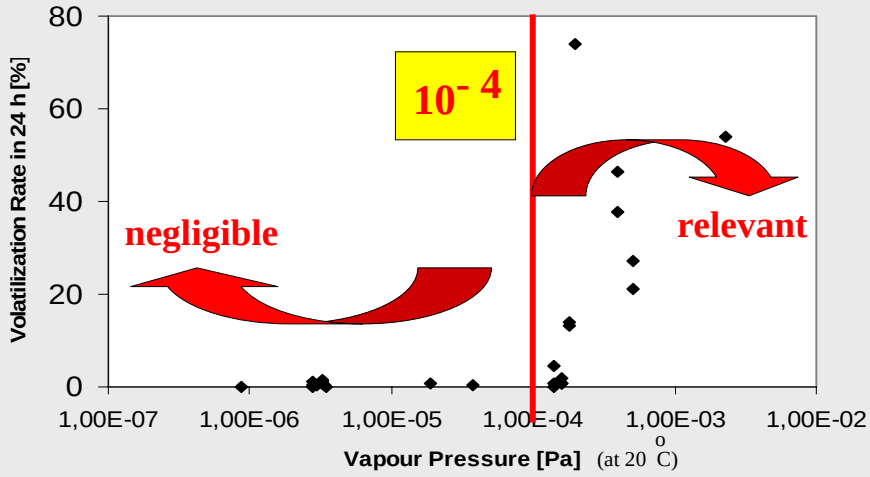
Directly measured volatilisation versus vapour pressure

(From plants during 24 h in wind tunnels)



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Short range transport (< 1 km)

Entrance triggers for SRT Exposure Assessment Proposed by FOCUS - AIR:

10^{-5} Pa for volatilisation from plant (20^{o} C)

10^{-4} Pa for volatilisation from soil (20^{o} C)

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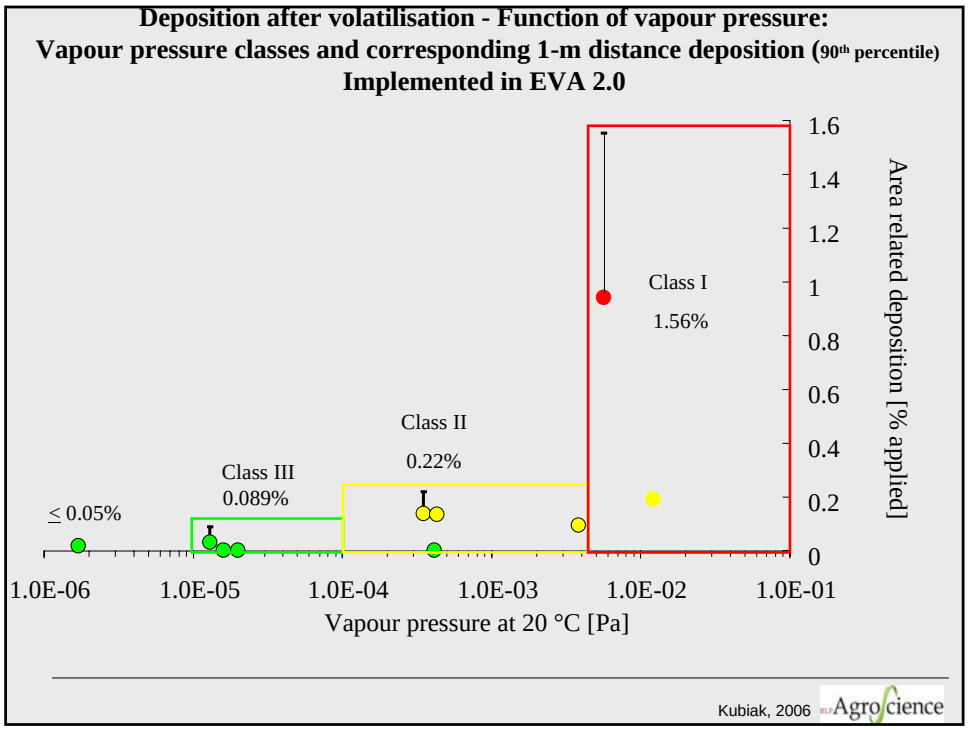
Deposition after volatilisation - Function of vapour pressure:
Vapour pressure classes and corresponding 1-m distance deposition (90th percentile)
Implemented in EVA 2.0
Class I
1.56%
Class II
0.22%
Class III
0.089%
≤ 0.05%
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Area related deposition [% applied]
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
1.0E-01
Vapour pressure at 20 °C [Pa]
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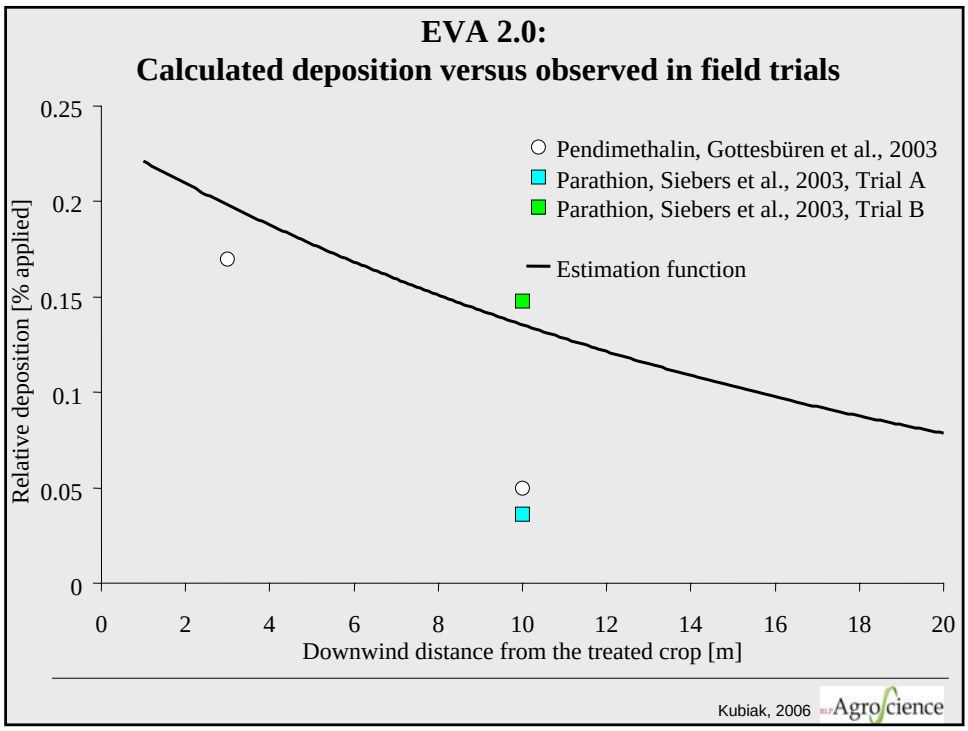
EVA 2.0:
Calculated deposition versus observed in field trials
Pendimethalin, Gottesbüren et al., 2003
Parathion, Siebers et al., 2003, Trial A
Parathion, Siebers et al., 2003, Trial B
Estimation function
0.25
0.2
0.15
0.1
0.05
0
Relative deposition [% applied]
0
2
4
6
8
10
12
14
16
18
20
Downwind distance from the treated crop [m]
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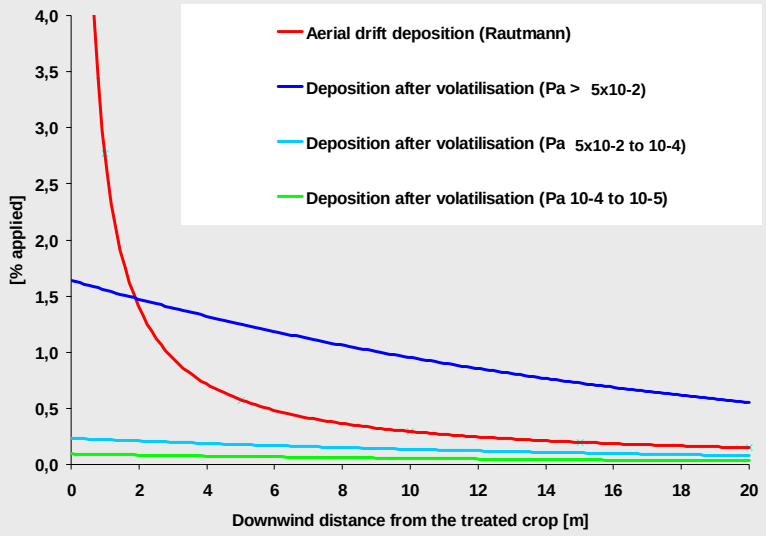
Relevance of deposition after volatilisation
Rautmann tables in comparison with EVA 2.0 calculations



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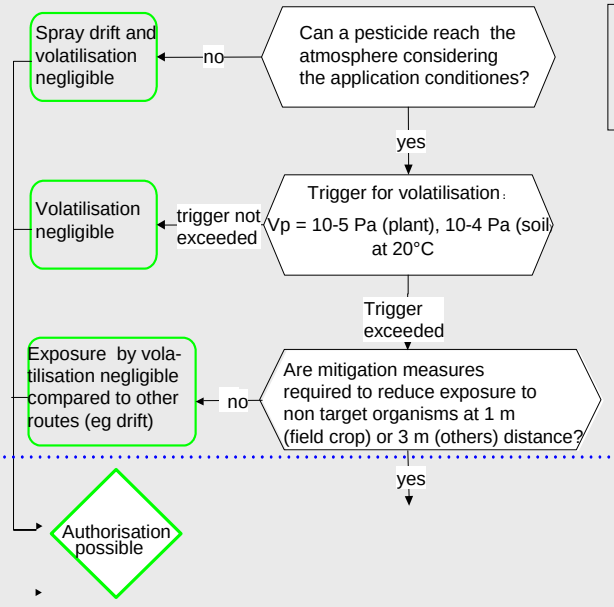
Terrestric Exposure Assessment proposed by FOCUS



Tier 1
Entry
Trigger

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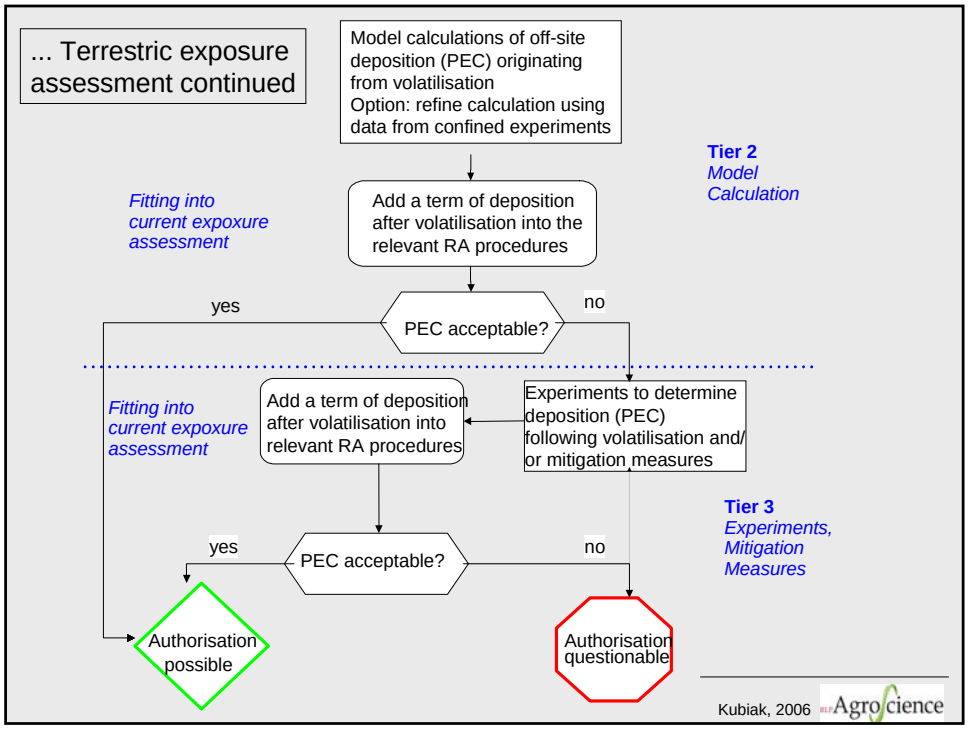
... Terrestric exposure assessment continued
Model calculations of off-site deposition (PEC) originating from volatilisation
Option: refine calculation using data from confined experiments
Tier 2
Model Calculation
Fitting into current expoxure assessment
Add a term of deposition after volatilisation into the relevant RA procedures
yes
PEC acceptable?
no
Fitting into current expoxure assessment
Add a term of deposition after volatilisation into relevant RA procedures
Experiments to determine deposition (PEC) following volatilisation and/ or mitigation measures
Tier 3
Experiments, Mitigation Measures
yes
PEC acceptable?
no
Authorisation possible
Authorisation questionable
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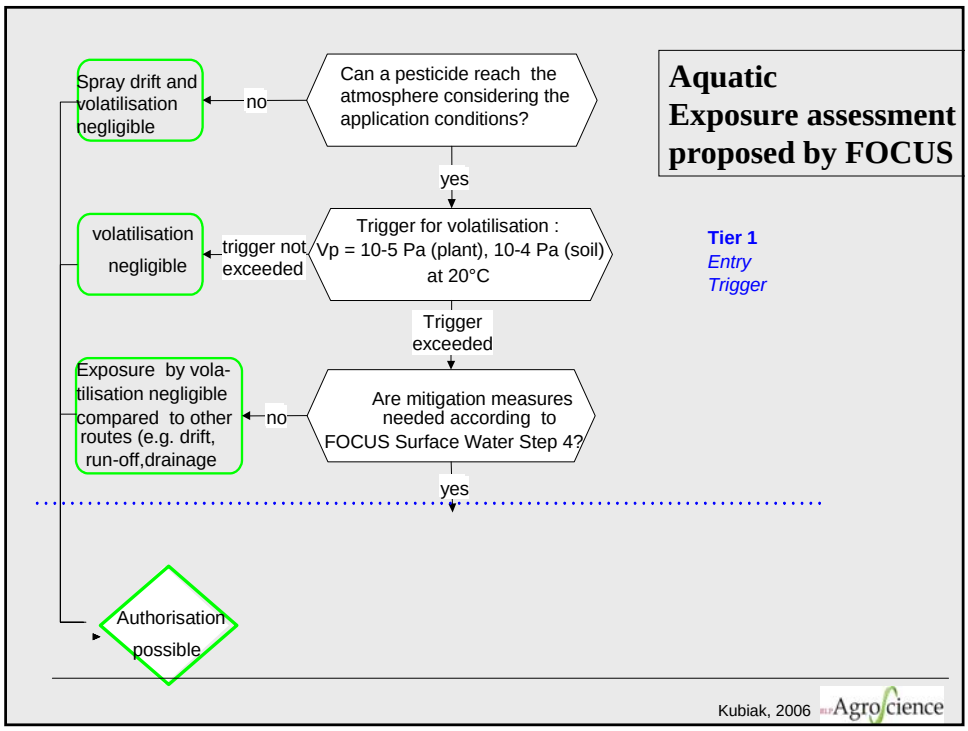
Aquatic Exposure assessment proposed by FOCUS
Spray drift and volatilisation negligible
no
Can a pesticide reach the atmosphere considering the application conditions?
yes
volatilisation negligible
trigger not exceeded
Trigger for volatilisation : Vp = 10-5 Pa (plant), 10-4 Pa (soil) at 20°C
Tier 1
Entry Trigger
Trigger exceeded
Exposure by vola-tilisation negligible compared to other routes (e.g. drift, run-off,drainage
no
Are mitigation measures needed according to FOCUS Surface Water Step 4?
yes
Authorisation possible
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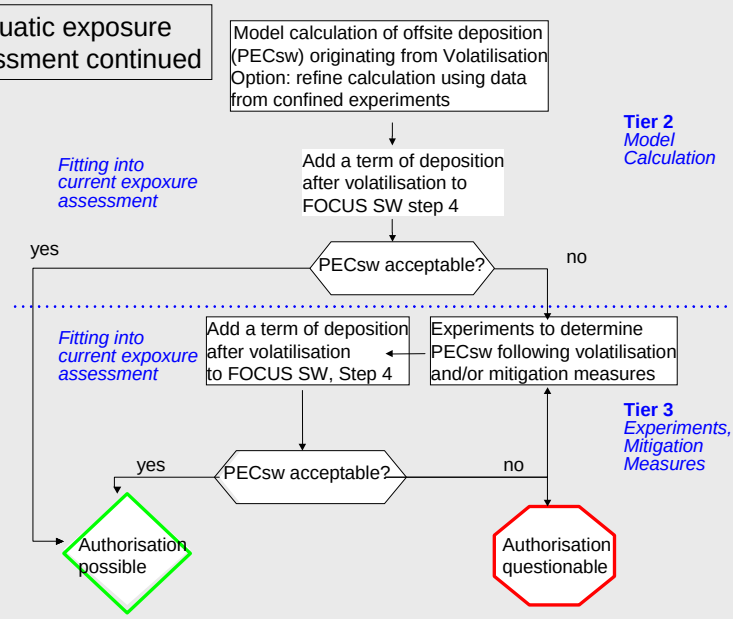
... Aquatic exposure assessment continued



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Long range transport (> 1000 km)

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Long Range Transport

FOCUS AIR Proposal:

Trigger: Half life in air: 2 d

to identify substances NOT of potential concern for LRT

Exceedance of the trigger indicates not a risk but the need of further evaluation on a case by case basis considering:

- **Substance amount entering the atmosphere**
- **likely behaviour of the substance as it is transported in and deposited from air (use of models)**
- **potential impact on and behaviour in remote environments**
- **monitoring data**

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Conclusions

Long Range Transport:
Trigger is the DT-50 of 2 days in air
Exceedance of the trigger indicates the need for further evaluation on a case by case basis

Short Range Transport:
VP triggers of 10^{-5} Pa for plants and 10^{-4} Pa for soils.

Exposure assessment schemes for aquatic and terrestric TER calculation.

The empirical model EVA 2.0 is proposed for a SRT - RA

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Members of FOCUS AIR

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Ian Cousins (SE)
Ada Hourdakis (GR)
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Wolfgang Koch (DE)
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Erik Van den Berg (NL)

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Wolfgang Reinert (SANCO)

Oriol Magrans (EFSA)

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