Atmospheric Ammonia: detecting emission changes and environmental impacts

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Background

- Acidification
- Eutrophication
- Secondary particulate matter
- Transboundary and local impacts

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Challenges

- Diffuse source
- Difficult to quantify
- Difficult to control
- Biogeochemical cycle is complex

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Current policy climate

- UN/ECE Gothenburg Protocol
- National Emissions Ceiling Directive
- Air Quality Framework Directive and Daughter Directives
- Integrated Pollution Prevention and Control Directive
- Other indirect legislation

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Scope of workshop

WG 1: Detecting changes in atmospheric NH_3

WG 2: Critical thresholds for atmospheric NH_3

Temporal trends

Approaches for local assessment & NH_3 bioindicators

Results of transect studies

CCG A: Reliability of NH_3 emissions & abatement efficiencies

WG 3: Dealing with NH_3 in "hot-spot" areas

Treating sub-grid variability

Explaining model differences

Model import

WG 4: Regional modelling of atmospheric NH_3

CCG B: Ammonia policy context & future challenges

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WG1

- Do existing critical thresholds for ammonia reflect current scientific understanding and, if not, what are suitable values according to current knowledge?

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Conclusions

- There is a need to not rely solely on critical loads
- New critical levels have been defined based on scientific evidence
- Two critical levels have been defined based on different vegetation types
- Critical level is based on a long term average
- This will result in practical application which will be simpler to apply and more cost effective to regulate on a local level and NH_3 specific measures

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WG2

- To what extent can independent atmospheric measurements verify where regional changes in ammonia emissions have and have not occurred?

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Conclusions

- Many conclusions from Bern workshop remain valid
- New knowledge has led to better understanding of emission / transport / deposition including ammonia gap
- Emission reduction policies shown to have been effective from atmospheric monitoring data
- Recognition of need for long term, international monitoring strategy
- Recognition of need for model intercomparison

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WG3

- How can transboundary air pollution assessment be downscaled to deal with ammonia hotspots in relation to operational modelling and monitoring?

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Conclusions

- Discussed issues of how deposition near hotspots is linked to transboundary air pollution
- Identified how landscape modelling could provide protection against hotspots and when linked with large scale models provide improve understanding
- Need to share country experiences
- Identified recommendations to improve modelling - better estimation of temporal and spatial emissions, focus on compensation point and surface resistance, reference cases to assess different models, improved background data
- Discussed monitoring assessment strategies

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WG4

- What are the differences between mesoscale (regional) atmospheric transport and chemistry models in relation to their formulation and results for ammonia?

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Conclusions

- Reviewed the parameterizations used in the models, highlighting specific areas of uncertainty – e.g. need to test bidirectional flux
- Discussed differences between the models and noted that nested approach was particularly effective for assessing local and long range impacts
- Recognised the need for model intercomparison especially with EMEP and highlighted need for improved monitoring to verify models

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CCGA

- What are the reliability of ammonia emissions data and abatement efficiencies?

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Conclusions

- Uncertainty is variable within emission inventories and there is a need for countries to focus on uncertainty analysis
- Activity data is the biggest uncertainty and there is a need to collaborate on an international scale to address this
- Work to improve emission factors is needed especially in E and S Europe
- Key mitigation methods are known and agreed
- Debate on benefits of soft approaches
- Continued need to focus on cost effectiveness and applicability of emerging technologies

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CCGB

- What is the agricultural and environmental policy context and how can scientific understanding help address the future challenges to reduce the negative effects of ammonia?

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Conclusions

- Need to consider direct and indirect legislation and links to other policy relevant areas
- Need to link legislation to eliminate loopholes
- Assess consequences of revised critical levels
- Highlighted reliability of cause / effect policy chain especially pollution swapping
- Explored strategy approaches
- Need linkage of scales including decisions on priorities
- Need to improve temporal and spatial concentration resolution of models
- Need to analyse reduction policies in multi effect, multi media and multi scale way

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Were the objectives achieved?

- Focused on four specific issues of high priority for the Convention
  - ✓ to recommend up-to-date values for NH_3 critical levels
  - ✓ to assess whether observed trends in atmospheric NH_3 and NH_4^+ match the expectations of emission mitigation policies
  - ✓ to identify best-practice for quantifying ammonia impacts in hot-spots
  - ✓ to review the status of different transboundary models of atmospheric NH_x
- Realised through bringing together international expertise on ammonia across themes of the Convention
- Will provide “Ammonia Science” underpinning for the UNECE Convention on LRTAP - feed into future policy climate

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Thank you for your attention

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