Report from the Ammonia Expert Group:

Establishing the link between ammonia emission control and measurements of reduced nitrogen concentrations and deposition

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Abstract

In the context of efforts under the CLRTAP to reduce the impacts of atmospheric ammonia (NH_3) and ammonium (NH_4^+) (collectively, NH_x), the Ammonia Expert Group (AEG) is addressing the potential for and uncertainties involved in ammonia abatement. Substantial progress was made at the AEG Bern Workshop (18-20 September 2000), which reported a draught 'code of good practice' to reduce NH_3 emissions from agriculture and addressed the uncertainties in ammonia abatement revealed from available monitoring data. The second issue is of particular relevance to the EMEP Task Force on Measurement and Modelling (TFMM), and this presentation was therefore made to report the AEG findings to the TFMM. The background analysis for Bern (Sutton et al. 2001) was presented followed by the workshop conclusions on this issue (Menzi and Achermann 2001).

Although the focus of the AEG is on ammonia abatement, it was found that it is essential to consider both situations where NH_3 emissions changes are certain, for example due to changed source sector activity, as well as cases where NH_3 emission abatement technologies have been implemented. With the latter, correct interpretation of adequate atmospheric measurements is essential, since monitoring data provide the only means to evaluate trends in regional emissions.

These issues were reviewed using available measurements and modelling from nine countries. In addition to historic datasets covering many decades, the analysis here covered countries where NH_3 source sector activity changed (both increases and decreases) and countries where NH_3 abatement policies have been implemented.

In the Netherlands an "ammonia gap" had been identified between the expected reduction and results of atmospheric monitoring, and was attributed initially to ineffectiveness of the abatement measures. The analysis here for a range of countries (including several countries in eastern Europe, where NH_3 emissions decreased following 1989) shows that atmospheric interactions complicate the expected changes, particularly since SO_2 emissions have decreased at the same time, while at many sites only a few years data are available and show substantial inter-annual variation. With regard to the implementation of abatement measures, it appears that policies in the Netherlands and Denmark have been successful in reducing NH_3 emissions, even if the expected decreases may not have been fully realized (e.g. due to confusion in reporting the application of more stringent abatement measures than actually applied).

A number of conclusions and recommendations were made regarding future priorities for emission reporting, process understanding, process generalization/modelling and monitoring needs. It was concluded that the current EMEP protocol of sampling daily total gas / aerosol NH_x is not satisfactory to assess the long-term trends (e.g. since NH_3 may increase while NH_4^+ decreases). High time-resolution measurements (hourly or daily) of gaseous NH_3 and NH_4^+ aerosol are necessary at a few key sites for trajectory analysis, while complementary lower time-resolution measurements (weekly or monthly) are necessary at many sites to allow robust regional estimates and long-term trends to be established at low cost. This recommendation was already made at the EMEP/WMO Aspenaas Herraard Workshop (1997), and it was noted that a review is necessary to identify the limitations to its implementation.

Together with an increased focus of monitoring NH_3, NH_4^+ and wet deposition of NH_4^+ in source regions (including evaluation of site representativity), these measurements will be essential to monitor compliance of the new international agreements on NH_3 emission abatement. Given the inter-year variability, a target of 8 years monitoring prior to 2010 implies an urgent need to implement improved NH_3 and NH_4^+ monitoring across Europe.

References

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