

Interim Report to AEA Technology

Dry deposition of ammonia on rain collectors

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SUMMARY

- Collectors from standard secondary network bulk rainfall samplers have been exposed under a roof to investigate the rate of accumulation of gaseous ammonia and particulate ammonium (together referred to as NH_x) over varying times up to one week, in conjunction with real-time measurement of ambient ammonia concentrations in air
- Deposition over one week was of the order of 10 μg per collector. Typical deposition in rain was several hundred μg per collector, meaning that the error caused by dry deposition of NH_x to bulk collectors was only a few percent of the wet deposition
- These results applied where air concentrations were small, typically 1-2 $\mu\text{g m}^{-3}$

- A second set of experiments was conducted in open-top chambers supplied with known measured large concentrations of ammonia gas, at concentrations between 15 and 70 $\mu\text{g m}^{-3}$
- There was no detectable difference in overall deposition rates over 24 h at the different air concentrations under these conditions, with ca. 1.2 $\mu\text{g NH}_3$ deposited per collector
- The deposition over 24 h is of the same order as that observed at ambient concentrations, despite the very large concentration difference
- Deposition to old collectors (after several years exposure in the field) was initially (over the first 8 h) faster than to new collectors, but the differences were not detectable after 24 h.

- The initial conclusion is that dry deposition to bulk rain collectors, as used in the UK secondary network, represents a negligible bias in estimating the wet deposition of ammonium ions in precipitation over the whole of the UK

- Future work will make measurements in order to model in more detail the relationship between dry deposition of NH_3 , the dependence on SO_2 concentrations, and cycles of repeated wetting and drying of the funnel surface.