



Wet and dry atmospheric deposition of major nutrients across the CAP LTER ecosystem

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Why measure atmospheric deposition at CAP LTER?

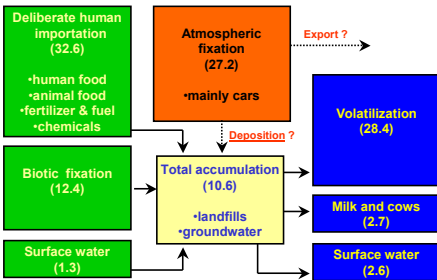
It can be a significant source of major nutrients (e.g. nitrogen and carbon) to terrestrial ecosystems

However existing monitoring networks such as the National Atmospheric Deposition Program (NADP) typically sample only wet deposition

but DRY deposition can be the major component in arid ecosystems

Also most collectors in national networks are deliberately located in remote and/or rural areas, away from urban influences

yet urban activities can potentially enhance deposition rates significantly (e.g. for N - see below)

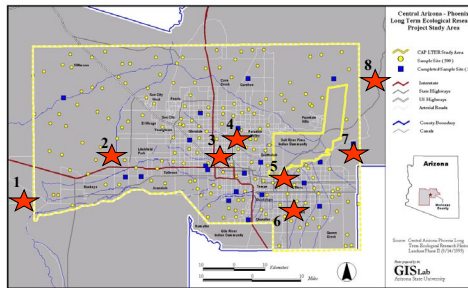


CAP urban ecosystem (kg N ha⁻¹ yr⁻¹)
inputs = green (& red), storage = yellow, exports = blue & (red)

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Location of CAP wet/dry deposition collectors



There are 2 approaches to measuring dry deposition

Inferential Method

- Measure ambient concentrations of aerosols, meteorological conditions and land use characteristics, using air filter packs or denuders
- Calculate rates of dry deposition using inferential modeling (e.g. CASTNet uses a 'Multilayer' model)



At site 7 (shown above) dry deposition is measured by the CASTNet program using the inferential method (at the tower on the left) and by CAP LTER using a wet/dry bucket collector (in foreground to right). Comparison of deposition rates obtained by the two methods at this site will provide an estimate of how much N deposition is occurring in the form of very fine particulates and nitric acid vapor, both of which are not well represented in bucket collectors which tend to sample only larger particulates.

Direct

- Collect deposition using a 'surrogate surface' e.g. plastic bucket
- Rinse dry buckets with 500mL nanopure water & analyze for dissolved nitrate, ammonium, chloride, phosphate and DOC
- Calculate deposition rates (total mg's collected ÷ by bucket surface area, converted to kg ha⁻¹ yr⁻¹)

Conclusions

- There is no obvious enhancement of inorganic N deposition at urban core versus desert sites
- Inorganic N deposition is largely in the form of ammonium, rather than nitrate
- Ammonium-N deposition occurs predominantly as dry fall
- DOC deposition is greater at most urban sites compared to undeveloped desert locations
- Phosphate-P is mainly deposited as dry fall; it is greater in urban core & agricultural locations
- Chloride deposition in dry fall is enhanced at urban core sites; this pattern is not seen in rain.

Future work

- Archived samples of wet and dry deposition are currently being analyzed for other major ions (SO₄²⁻, Na⁺, Mg²⁺)
- Sample collection at a background site, remote from urban influences (Organ Pipe Cactus National Monument) was initiated in late 2000. Data from this site will be used as a 'control' for comparison with existing collectors
- A publication is in preparation on the initial monitoring results
- The patterns in deposition established during the first 3 years of monitoring will be used to help draw up a strategy for long-term monitoring of deposition across CAP LTER

First year's results from CAP deposition collectors

Graphs below show annual wet and dry deposition of NO₃-N, NH₄-N, PO₄-P, Cl and DOC from Jan to Dec 2000 at the 8 monitoring sites.

