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Project Summary

Analysis of Acid Precipitation Samples Collected by State Agencies: 1988

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This report presents analytical data from the 30 acid precipitation collection sites in the State-Operated Network. Samples are collected weekly in plastic bag liners and shipped in 500 mL polyethylene bottles to Global Geochemistry Corporation (the central laboratory for the network). The report contains maps showing the location of each site, plots of analytical data, tables of all field and analytical data, plots comparing field and laboratory pH and conductivity, and information on data quality. Samples are analyzed for pH, strong acid, conductivity, fluoride, chloride, nitrite, phosphate, bromide nitrate, sulfate, ammonium, sodium, potassium, calcium, and magnesium. The central laboratory renders technical assistance to the collection sites on problems concerning pH and conductivity. Each of the 11 participating state agencies receives analytical reports for the samples analyzed the previous month. Analyte concentration data are sent to the Acid Deposition System (ADS) for inclusion in the National Acid Precipitation Data Base.

This Project Summary was developed by EPA's Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

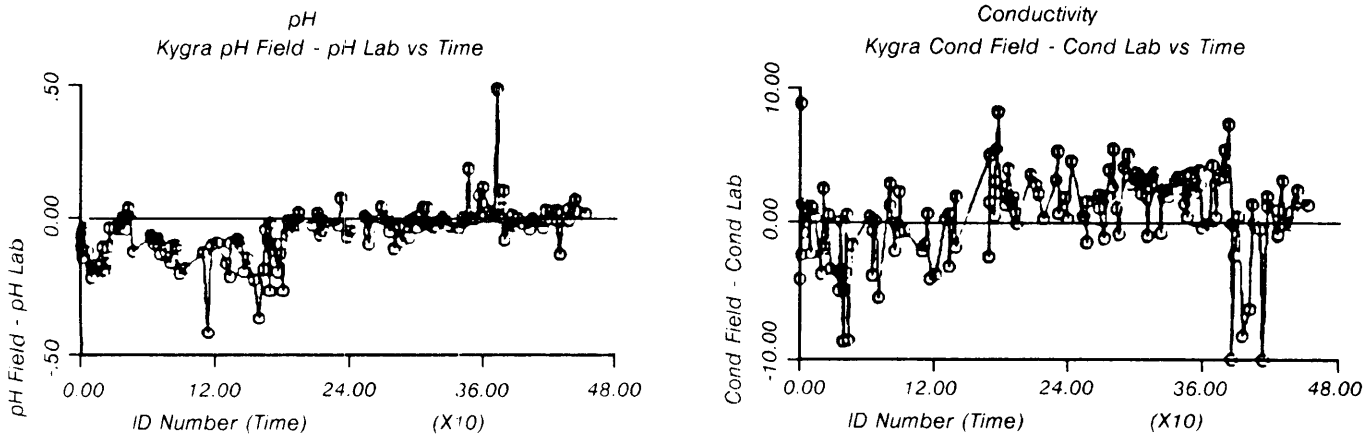
Introduction

As the central laboratory for the State-Operated Network, Global Geochemistry Corporation (GGC) analyzes acid precipitation samples for pH, strong acid, conductivity, fluoride, chloride, nitrite, phosphate, bromide, nitrate, sulfate, ammonium, sodium, potassium, calcium, and magnesium. The central laboratory provides the collection sites with plastic bucket liners, 500 mL sample bottles, field data sheets, pH and conductivity solutions, and other supplies incidental to collecting and shipping a collected rain sample. The central laboratory also provides technical assistance whenever it is requested by the field sites. This assistance has consisted mostly of advice on field pH and conductivity measurement procedures and equipment. The report contains maps showing the location of each site, plots of analytical data during the time period, tables of all field and analytical data, a comparison of analyte concentrations at all sites (frequency of occurrence), precipitation weighted data for each site, plots comparing field and laboratory pH and conductivity, and quality control tables and plots. Each participating state agency and sponsoring EPA region receives a monthly report of analytical data. Data are summarized on magnetic tape for inclusion in the yearly report of the national acid rain data base, the Acid Deposition System (ADS), funded by EPA.

Network Description

There were 30 acid rain collection sites in operation during most of 1988.

Table 1. pH and Conductivity-Field vs. Laboratory



The State-Operated Network collects weekly samples using a wet/dry bucket collector. Samples are collected in a plastic bag bucket liner, and an aliquot is sent to the central laboratory unrefrigerated in a 500 mL polyethylene bottle.

The following analytes are measured: pH, conductivity, strong acidity, chloride, sulfate, phosphate, nitrate, ammonium, sodium, potassium, calcium, and magnesium. Plots are presented in the main report showing the weekly concentration of each analyte throughout the year. The amount of precipitation is given for each weekly collection period. Each site conducts field measurements for pH and conductivity. Representative plots are presented for a single site in Table 1 for all samples analyzed since 1983.

Once every two months the central laboratory sends each collection site replacement supplies, including 500 mL of pH reference solution and 500 mL of conductivity reference solution. Sites are instructed to measure the reference materials in the same way as a sample. This procedure provides the sites with on-going quality assurance self-checks of the accuracy of their measurements.

The analytical methods used by the central laboratory are shown below in Table 2.

The occurrence of different concentration levels at each site are given in the main report. The concentrations greater than the given values are listed for each site and for each analyte. This is illustrated in Table 3 for pH.

Table 2. *Analytical Methods*

Analyte	*Analytical Method*
pH	*EPA Method 150.1*
Conductivity	*EPA Method 120.1*
Acidity	*Gran Titration*
Cl^-, PO_4^{-3}, SO_4^{-2}, NO_3^-	*Ion Chromatography*
NH_4^+	*EPA Method 350.1*
Na^+, K^+, Ca^{+2}, Mg^{+2}	*EPA Methods 273.1, 258.1, 215.1, 242.1*

Performance Evaluation Surveys (Audits) of Field pH and Conductivity

Performance evaluations of the field pH and conductivity measurements were done in March and in September 1988. The results of these evaluations are shown in Table 4. Overall, the mean values reported for both evaluations agreed very well with the expected values. However, it was noted that in the September 1988 audit, 32% of the 22 participants reported a pH value that differed from the target value by more than 0.10 pH units. This compares to only three (12%) of the 24 participants exceeding this value for the March audit. Two of these three participants exceeded the target value in both audits.

Quality Control

To validate the accuracy of routine analytical procedures, the central laboratory included duplicate and spike samples with all analyses. The duplicate samples were randomly chosen acid rain samples. Spike samples were prepared from stock solutions and were unknown to the analyst. Quality control plots for all analytes are presented in Appendix A of the main report.

Table 3. *Cumulative Frequency of Occurrence: pH*

Site	#PTS	% of Samples Greater than Given Value				
		100%	75%	50%	25%	0%
ALMOB	36	3.97	4.29	4.55	4.76	4.93
ALTAL	28	4.00	4.24	4.56	4.82	5.17
DEGEO	44	3.25	4.11	4.40	4.63	5.66
DELUM	36	3.73	4.04	4.17	4.46	5.25
GABFG	23	3.61	4.23	4.46	4.62	4.98
GADAW	34	3.43	4.21	4.37	4.60	5.36
GADUF	17	4.01	4.41	4.62	4.73	5.58
GAHIW	21	3.84	4.12	4.39	4.58	4.81
GASUM	36	3.63	4.12	4.27	4.50	5.04
GAWAY	28	3.70	4.44	4.70	4.87	5.54
KYGRA	38	3.29	4.00	4.22	4.46	5.79
KYMAN	36	3.65	4.24	4.41	4.52	4.81
LACAR	24	4.33	4.72	5.12	5.56	5.99
LACHS	38	3.78	4.38	4.61	4.90	5.21
LAHOM	10	4.16	4.29	4.44	4.81	5.02
LAROS	42	4.01	4.47	4.72	4.91	5.31
MD3EC	39	3.54	4.02	4.22	4.47	6.23
MDRGP	37	3.27	3.99	4.29	4.45	6.48
MSUNI	35	3.56	4.43	4.61	4.76	5.33
SCCAP	31	3.61	4.31	4.49	4.66	5.84
SCCON	37	3.62	4.13	4.40	4.62	5.10
SCDEL	34	3.41	4.19	4.31	4.47	5.16
SCLON	36	3.84	4.11	4.37	4.55	4.79
SDAPR	3	4.98	3.74	5.69	6.39	6.39
SDBPR	3	4.96	3.72	5.64	6.33	6.35
SDCUS	17	4.98	5.16	5.67	5.98	6.79
TNCEN	30	3.79	4.27	4.46	4.62	4.86
WVAPC	21	3.82	4.08	4.24	4.37	4.56
WVGRN	14	4.02	4.27	4.42	4.51	4.77
WVNEW	22	3.50	3.82	3.97	4.14	4.60

Table 4. *Summary of Survey of pH and Conductivity Accuracy*

Date	Survey Averages				Expected Values	
	pH	Std. Dev.	Conductivity (µS/cm)	Std. Dev.	pH	Conductivity
March 1988	4.24	0.06	37.6	2.2	4.28	37.4
Oct. 1988	4.26	0.15	38.1	3.4	4.23	38.1

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The complete report, entitled "Analysis of Acid Precipitation Samples Collected by State Agencies: 1988," (Order No. PB 90-191-784/AS; Cost: $31.00, subject to change) will be available only from:
National Technical Information Service
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The EPA Project Officer can be contacted at:
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