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ll and Sara K. Conrad, Editors

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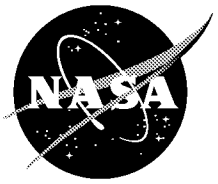

Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall and Sara K. Conrad, Editors

Volume 236

BOREAS TGB-7 Rainwater Herbicide and Organochlorine Concentration Data

Don Waite
Environment Canada, Regina, Saskatchewan

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

November 2000

Available from:

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320
Price Code: A17

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Price Code: A10

BOREAS TGB-7 Rainwater Herbicide and Organochlorine Concentration Data

Don Waite

Summary

The BOREAS TGB-7 team measured the concentration and flux of several agricultural pesticides in air and rainwater samples in order to determine the associated yearly deposition rates. This data set contains information on the rainwater concentration of seven herbicides [2,4-dichlorophenoxyacidic_acid (2,4-D), bromoxynil, dicamb, 2-methyl-4-chlorophenoxyacetic acid (MCPA), triallate, trifluralin, and diclop-methyl] known to appear in the atmosphere of the Canadian prairies. Also, the concentration of three herbicides (atrazine, alachlor, and metolachlor), two groups of insecticides (lindane and breakdown products and dichloro-diphenyl-trichloroethane (DDT) and breakdown products), and several polychlorinated biphenyls commonly used in the central United States was measured. All of these chemicals are reported, in the literature, to be transported in the atmosphere. Many have been reported to occur in boreal and arctic food chains. The sampling was carried out from 16-Jun to 13-Aug-1993 and 04-May to 20-Jul-1994 at the BOREAS site in the Prince Albert National Park (Waskesiu). The data are stored in tabular ASCII files.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

BOREAS TGB-07 Rainwater Herbicide and Organochlorine Concentration Data

1.2 Data Set Introduction

This data set contains herbicide concentrations in rainwater collected from Waskesiu.

1.3 Objective/Purpose

The objective of this study was to measure the wet deposition (in rainfall) of herbicides in the boreal forest at Waskesiu.

1.4 Summary of Parameters and Variables

This data set contains herbicide concentrations in rainwater collected from Waskesiu.

1.5 Discussion

The deposition into the boreal forest of seven herbicides [2,4-dichlorophenoxyacidic acid (2,4-D), bromoxynil, dicamba, 2-methyl-4-chlorophenoxyacetic acid (MCPA), triallate, trifluralin, and diclop-methyl] known to appear in the atmosphere of the Canadian prairies, three herbicides (atrazine, alachlor, and metolachlor) commonly used in the central United States, two groups of insecticides (lindane and breakdown products and dichloro-diphenyl-trichloroethane (DDT) and breakdown products), plus several polychlorinated biphenyls was measured. All of these chemicals are reported, in the literature, to be transported in the atmosphere. Many have been reported to occur in boreal and arctic food chains. The sampling was carried out at the BOReal Ecosystem-Atmosphere Study (BOREAS) site in the Prince Albert National Park (PANP) (Waskesiu).

1.6 Related Data Sets

BOREAS TGB-07 Ambient Air Herbicide and Organochlorine Concentration Data
BOREAS TGB-07 Dry Deposition Herbicide and Organochlorine Flux Data
BOREAS TGB-09 Above-Canopy NMHC at SSA-OBS, SSA-OJP, and SSA-OA Sites
BOREAS TGB-10 Volatile Organic Carbon Data over the SSA
BOREAS TGB-10 Oxidant Concentration Data over the SSA
BOREAS TGB-10 Oxidant Flux Data over the SSA

2. Investigator(s)

2.1 Investigator(s) Name and Title

Don Waite
Environment Canada

Allan Cessna
Agriculture and Agri-Foods Canada

Narine Gurprasad
Environment Canada

2.2 Title of Investigation

Atmospheric Transport of Agricultural Pesticides into the Boreal Ecosystem

2.3 Contact Information

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Regina, Saskatchewan
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Code 923
NASA GSFC
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(301) 286-7858
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Jeffrey.Newcomer@gsfc.nasa.gov

3. Theory of Measurements

Rain samples are collected by the dry deposition sampler (dust collector), which consists of a 1-m x 0.5-m, stainless steel (316-grade) tray, with 5-cm-high sides. When rainfall is detected on the conductivity-type rain detector, the dust collector pump shuts down and two valves operate to divert rainwater into an exterior, stainless steel container. When the rainfall stops, the rain detector dries with the help of a built-in heater. The pump restarts and dry deposition sampling is resumed. Rain time is recorded on an integrated timer. Rain volume is measured separately with a standard rain gauge. The rainwater is solvent extracted, following published procedures, and the extracts analyzed for target chemicals. Rain samples were collected as 7-day composite samples.

4. Equipment

4.1 Sensor/Instrument Description

4.1.1 Collection Environment
The data were collected under all environmental conditions.

4.1.2 Source/Platform
Ground.

4.1.3 Source/Platform Mission Objectives
None given.

4.1.4 Key Variables
The key variable is herbicide concentration in composite rainwater samples.

4.1.5 Principles of Operation
Rain was sampled by the dust collector, a sampler designed to collect dry and wet atmospheric deposits of trace organics. The collecting surface is a 0.5- x 1.0-m^2 stainless tray. During dry conditions, acidified water was constantly circulated across this surface, collecting dry deposits. Rainfall triggers a sensor, stopping the water flow. Rain falling on the clean collecting tray is diverted into a stainless steel container that is emptied, manually, at the end of the sampling period (7 days). At the end of the rainfall, the sampler reverts to dry deposition sampling. Rain duration is recorded by a timer in the sampler and rain volume by a standard rain gauge.

4.1.6 Sensor/Instrument Measurement Geometry
Dust Collector: A newly designed sampler employing an XAD-2 resin column to extract dry deposits from a continuously flowing sheet of water and collecting separate rain samples.

4.1.7 Manufacturer of Sensor/Instrument
None given.

4.2 Calibration
None given.

4.2.1 Specifications
None given.

4.2.1.1 Tolerance
None given.

4.2.2 Frequency of Calibration
None given.

4.2.3 Other Calibration Information
None given.

5. Data Acquisition Methods

The herbicide analyses were carried out at the Agriculture and Agri-Food Canada Research Station at Regina, Saskatchewan, whereas insecticide and organochlorine analysis was carried out by the Environment Canada laboratory in Edmonton, Alberta. All residues were quantified and confirmed using a Hewlett-Packard gas chromatograph equipped with a mass selective detector (GC-MSD).

Rain samples (500 mL each) were acidified to pH 2 with dilute H_2SO_4 solution, extracted with dichloromethane and the extract methylated with diazomethane and subjected to Florisil column prior to GC-MSD analysis for extracted herbicides (Cessna et al., 1985). A second 500-mL aliquot was extracted with dichloromethane, subjected to Florisil column, and analyzed for insecticides and organochlorines by GC-MSD (Cessna et al., 1985).

Depending on the compound, from two to four ions were monitored on the MSD. The presence of each compound was considered to be confirmed if all ions monitored were present, a peak appeared at the retention time (± 0.02 min) obtained for a standard solution of the pesticide in the reconstructed chromatograms of all ions, and the peak area ratio was within 30% of the ratio obtained using a standard solution of the pesticide.

6. Observations

6.1 Data Notes
None.

6.2 Field Notes
None.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

The North American Datum of 1983 (NAD83) coordinates for the Southern Study Area (SSA) measurement site are:

	Longitude	Latitude
Waskesiu	106.067° W	53.917° N

7.1.2 Spatial Coverage Map

None given.

7.1.3 Spatial Resolution

The measurements were made at a single location in the SSA.

7.1.4 Projection

Not applicable.

7.1.5 Grid Description

Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

The data were collected from 16-Jun to 13-Aug-1993 and 04-May to 20-Jul-1994.

7.2.2 Temporal Coverage Map

All the data were collected at the same location.

7.2.3 Temporal Resolution

The samplers operated 24 hours per day over each 7-day sampling period.

7.3 Data Characteristics

7.3.1 Parameter/Variable

The parameters contained in the data files on the CD-ROM are:

Column Name
SITE_NAME
SUB_SITE
START_DATE
END_DATE
PRECIP
BROMOXYNIL_CONC
DICAMBA_CONC
2,4-D_CONC
MCPA_CONC
DICLOFOP_CONC
TRIALLATE_CONC
TRIFLURALIN_CONC

ALACHLOR_CONC
ATRAZINE_CONC
METOLACHLOR_CONC
CRTFCN_CODE
REVISION_DATE

7.3.2 Variable Description/Definition

The descriptions of the parameters contained in the data files on the CD-ROM are:

Column Name	Description
SITE_NAME	The identifier assigned to the site by BOREAS, in the format SSS-TTT-CCCCC, where SSS identifies the portion of the study area: NSA, SSA, REG, TRN, and TTT identifies the cover type for the site, 999 if unknown, and CCCCC is the identifier for site, exactly what it means will vary with site type.
SUB_SITE	The identifier assigned to the sub-site by BOREAS, in the format GGGGG-IIIII, where GGGGG is the group associated with the sub-site instrument, e.g. HYD06 or STAFF, and IIIII is the identifier for sub-site, often this will refer to an instrument.
START_DATE	The date on which the collection of data commenced.
END_DATE	The date on which the collection of the data was terminated.
PRECIP	Amount of precipitation during the sample period.
BROMOXYNIL_CONC	Concentration of bromoxynil.
DICAMBA_CONC	Concentration of dacamba.
2,4-D_CONC	Concentration of 2,4-DICHLOROPHENOXYACIDIC_ACID.
MCPA_CONC	Concentration of MCPA.
DICLOFOP_CONC	Concentration of diclofop.
TRIALLATE_CONC	Concentration of triallate.
TRIFLURALIN_CONC	Concentration of trifluralin.
ALACHLOR_CONC	Concentration of alachlor.
ATRAZINE_CONC	Concentration of atrazine.
METOLACHLOR_CONC	Concentration of metolachlor.
CRTFCN_CODE	The BOREAS certification level of the data. Examples are CPI (Checked by PI), CGR (Certified by Group), PRE (Preliminary), and CPI-??? (CPI but questionable).
REVISION_DATE	The most recent date when the information in the referenced data base table record was revised.

7.3.3 Unit of Measurement

The measurement units for the parameters contained in the data files on the CD-ROM are:

Column Name	Units
SITE_NAME	[none]
SUB_SITE	[none]
START_DATE	[DD-MON-YY]
END_DATE	[DD-MON-YY]
PRECIP	[millimeters]
BROMOXYNIL_CONC	[picograms][meter^-3]
DICAMBA_CONC	[picograms][meter^-3]
2,4-D_CONC	[picograms][meter^-3]
MCPA_CONC	[picograms][meter^-3]
DICLOFOP_CONC	[picograms][meter^-3]
TRIALLATE_CONC	[picograms][meter^-3]
TRIFLURALIN_CONC	[picograms][meter^-3]
ALACHLOR_CONC	[picograms][meter^-3]
ATRAZINE_CONC	[picograms][meter^-3]
METOLACHLOR_CONC	[picograms][meter^-3]
CRTFCN_CODE	[none]
REVISION_DATE	[DD-MON-YY]

7.3.4 Data Source

The source of the parameter values contained in the data files on the CD-ROM are:

Column Name	Data Source
SITE_NAME	[Assigned by BORIS Staff]
SUB_SITE	[Assigned by BORIS Staff]
START_DATE	Investigator
END_DATE	Investigator
PRECIP	dust collector
BROMOXYNIL_CONC	GC-MSD
DICAMBA_CONC	GC-MSD
2,4-D_CONC	GC-MSD
MCPA_CONC	GC-MSD
DICLOFOP_CONC	GC-MSD
TRIALLATE_CONC	GC-MSD
TRIFLURALIN_CONC	GC-MSD
ALACHLOR_CONC	GC-MSD
ATRAZINE_CONC	GC-MSD
METOLACHLOR_CONC	GC-MSD
CRTFCN_CODE	[Assigned by BORIS Staff]
REVISION_DATE	[Assigned by BORIS Staff]

7.3.5 Data Range

The following table gives information about the parameter values found in the data files on the CD-ROM.

Column Name	Minimum Data Value	Maximum Data Value	Missng Data Value	Unrel Data Value	Below Detect Limit	Data Not Cllctd
SITE_NAME	SSA-999-WSK05	SSA-999-WSK05	None	None	None	None
SUB_SITE	TGB07-CON01	TGB07-CON01	None	None	None	None
START_DATE	16-JUN-93	13-JUL-94	None	None	None	None
END_DATE	21-JUN-93	20-JUL-94	None	None	None	None
PRECIP	0	56.7	-999	None	None	None
BROMOXYNIL_CONC	.1	.1	None	None	-777	None
DICAMBA_CONC			None	None	-777	None
2,4-D_CONC	.1	.2	None	None	-777	None
MCPA_CONC	.1	.1	None	None	-777	None
DICLOFOP_CONC			None	None	-777	None
TRIALLATE_CONC			None	None	-777	None
TRIFLURALIN_CONC			None	None	-777	None
ALACHLOR_CONC			None	None	-777	None
ATRAZINE_CONC			None	None	-777	None
METOLACHLOR_CONC			None	None	-777	None
CRTFCN_CODE	CPI	CPI	None	None	None	None
REVISION_DATE	28-AUG-98	28-AUG-98	None	None	None	None

Minimum Data Value -- The minimum value found in the column.
Maximum Data Value -- The maximum value found in the column.
Missng Data Value -- The value that indicates missing data. This is used to indicate that an attempt was made to determine the parameter value, but the attempt was unsuccessful.
Unrel Data Value -- The value that indicates unreliable data. This is used to indicate an attempt was made to determine the parameter value, but the value was deemed to be unreliable by the analysis personnel.
Below Detect Limit -- The value that indicates parameter values below the instruments detection limits. This is used to indicate that an attempt was made to determine the parameter value, but the analysis personnel determined that the parameter value was below the detection limit of the instrumentation.
Data Not Cllctd -- This value indicates that no attempt was made to determine the parameter value. This usually indicates that BORIS combined several similar but not identical data sets into the same data base table but this particular science team did not measure that parameter.

Blank -- Indicates that blank spaces are used to denote that type of value.
N/A -- Indicates that the value is not applicable to the respective column.
None -- Indicates that no values of that sort were found in the column.

7.4 Sample Data Record

The following are wrapped versions of data record from a sample data file on the CD-ROM.

```
SITE_NAME,SUB_SITE,START_DATE,END_DATE,PRECIP,BROMOXYNIL_CONC,DICAMBA_CONC,
2,4-D_CONC,MCPA_CONC,DICLOFOP_CONC,TRIALLATE_CONC,TRIFLURALIN_CONC,
ALACHLOR_CONC,ATRAZINE_CONC,METOLACHLOR_CONC,CRTFCN_CODE,REVISION_DATE
'SSA-999-WSK05','TGB07-CON01',04-MAY-94,11-MAY-94,-999.0,-999.0,-999.0,.01,
-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,'CPI',16-APR-97
'SSA-999-WSK05','TGB07-CON01',11-MAY-94,18-MAY-94,47.2,-999.0,-999.0,.02,-999.0,
-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,'CPI',16-APR-97
'SSA-999-WSK05','TGB07-CON01',18-MAY-94,25-MAY-94,56.7,-999.0,-999.0,-999.0,
-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,-999.0,'CPI',16-APR-97
```

8. Data Organization

8.1 Data Granularity

The smallest unit of data tracked by the BOREAS Information System (BORIS) was the herbicide concentration in rainwater for a given site in a given sampling period.

8.2 Data Format(s)

The Compact Disk-Read-Only Memory (CD-ROM) files contain American Standard Code for Information Interchange (ASCII) numerical and character fields of varying length separated by commas. The character fields are enclosed with single apostrophe marks. There are no spaces between the fields.

Each data file on the CD-ROM has four header lines of Hyper-Text Markup Language (HTML) code at the top. When viewed with a Web browser, this code displays header information (data set title, location, date, acknowledgments, etc.) and a series of HTML links to associated data files and related data sets. Line 5 of each data file is a list of the column names, and line 6 and following lines contain the actual data.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms

None given.

9.2 Data Processing Sequence

9.2.1 Processing Steps

None given.

9.2.2 Processing Changes

None given.

9.3 Calculations

9.3.1 Special Corrections/Adjustments

None given.

9.3.2 Calculated Variables
None given.

9.4 Graphs and Plots
None given.

10. Errors

10.1 Sources of Error
None given.

10.2 Quality Assessment
Standard laboratory procedures involving blanks, spikes, and replicates.

10.2.1 Data Validation by Source
None given.

10.2.2 Confidence Level/Accuracy Judgment
None given.

10.2.3 Measurement Error for Parameters
None given.

10.2.4 Additional Quality Assessments
None given.

10.2.5 Data Verification by Data Center
The data were examined for general consistency and clarity.

11. Notes

11.1 Limitations of the Data
None given.

11.2 Known Problems with the Data
None given.

11.3 Usage Guidance
None given.

11.4 Other Relevant Information
None given.

12. Application of the Data Set

The data can be used to quantify the trace organic contaminants entering the site from atmospheric transport and identify chemicals that require further research.

13. Future Modifications and Plans

None given.

14. Software

14.1 Software Description

None given.

14.2 Software Access

None given.

15. Data Access

The rainwater herbicide and organochlorine concentration data are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data

Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products
None.

16.2 Film Products
None.

16.3 Other Products
These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation
None given.

17.2 Journal Articles and Study Reports
Cessna, A.J., D.T. Waite, and M. Constable. 1997. Concentrations of pentachlorophenol in atmospheric samples from three Canadian locations, 1994. Bull. Environ. Contamin. Toxicol. 58(4):651-658.

Cessna, A.J., R. Grover, L.A. Kerr, and M.L. Aldred. 1985. A multiresidue method for the analysis and verification of several herbicides in water. J. Agric. Food Chem. 33, 504-507.

Grover, R., A.E. Smith, and A.J. Cessna. 1994. Fate of bromoxynil n-butyrate and iso-octanoate applied as a mixture to a wheat field. J. Environ. Qual. 23(6), 1304-1311.

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

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Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. Bulletin of the American Meteorological Society. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. Journal of Geophysical Research 102(D24): 28,731-28,770.

Waite, D.T., A.J. Cessna, N.P. Gurprasad, and J. Banner. Evaluation of a new sampler for collecting separate dry and wet atmospheric depositions of trace organic chemicals. Atmos. Environ. Accepted.

Waite, D.T., N.P. Gurprasad, A.J. Cessna, and D.V. Quiring. Atmospheric pentachlorophenol concentrations in relation to air temperature at five Canadian locations. Chemosphere. Accepted.

Thompson, T.S., R. G. Treble, D. T. Waite and A. J. Cessna. 1997. Identification of pentachloronitrobenzene in ambient air extracts. Bull. Environ. Toxicol. Chem. 58:939-944.

Waite, D.T., N.P. Gurprasad, and M.B. Constable. 1996. Concentrations of pentachlorophenol and some related compounds in seasonally collected atmospheric samples from five Canadian locations. Organohalogen Compds. 28:482-489.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None given.

19. List of Acronyms

ASCII	- American Standard for Information Interchange
BOREAS	- BOReal Ecosystem-Atmosphere Study
BORIS	- BOREAS Information System
CD-ROM	- Compact Disk-Read-Only Memory
DAAC	- Distributed Active Archive Center
EOS	- Earth Observing System
EOSDIS	- EOS Data and Information System
GC-MSD	- Gas Chromatograph - Mass Selective Detector
GIS	- Geographic Information System
GSFC	- Goddard Space Flight Center
HTML	- HyperText Markup Language
NASA	- National Aeronautics and Space Administration
NMHC	- Nonmethane Hydrocarbon
NSA	- Northern Study Area
OA	- Old Aspen
OBS	- Old Black Spruce
OJP	- Old Jack Pine
ORNL	- Oak Ridge National Laboratory
PANP	- Prince Albert National Park
SSA	- Southern Study Area
TGB	- Trace Gas Biogeochemistry
URL	- Uniform Resource Locator

20. Document Information

20.1 Document Revision Date

Written: 04-Dec-1997
Last updated: 04-Aug-1999

20.2 Document Review Date(s)

BORIS Review: 27-Aug-1998
Science Review:

20.3 Document ID

20.4 Citation

When using these data, please contact one of the individuals listed in Section 2.3 and as well as citing relevant papers in Section 17.2.

If using data from the BOREAS CD-ROM series, also reference the data as:

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13. ABSTRACT *(Maximum 200 words)*

The BOREAS TGB-7 team measured the concentration and flux of several agricultural pesticides in air and rainwater samples in order to determine the associated yearly deposition rates. This data set contains information on the rainwater concentration of seven herbicides [2,4-dichlorophenoxyacidic_acid (2,4-D), bromoxynil, dicamb, 2-methyl-4-chlorophenoxyacetic acid (MCPA), triallate, trifluralin, and diclop-methyl] known to appear in the atmosphere of the Canadian prairies. Also, the concentration of three herbicides (atrazine, alachlor, and metolachlor), two groups of insecticides (lindane and breakdown products and dichloro-diphenyl-trichloroethane (DDT) and breakdown products), and several polychlorinated biphenyls commonly used in the central United States was measured. All of these chemicals are reported, in the literature, to be transported in the atmosphere. Many have been reported to occur in boreal and arctic food chains. The sampling was carried out from 16-Jun to 13-Aug-1993 and 04-May to 20-Jul-1994 at the BOREAS site in the Prince Albert National Park (Waskesiu). The data are stored in tabular ASCII files.

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