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## 1. Data Set Description:

The **Cassiar Tunnel site** is located at 49.28139 N and -123.0318 W, at 40 m above sea level (a.s.l.). The tunnel is used mostly by light duty traffic with peak traffic volumes at rush hours. The goal of measurements at this site was to reduce the uncertainty in mobile source inventory for gas and particle emissions from light duty traffic sources, emphasizing the emissions of the precursors to PM formation and primary PM emissions for comparison with tailpipe emissions data from traditional testing conducted in laboratory on mobile source emissions, particularly for mass emission rates and chemical profiles. Duration of the emission study was from August 3rd to 10th, 2001.

For several measurements, different sampling and analytical techniques were used as a check on the accuracy of the measurements. For most gas measurements, two sets of instruments were deployed, one at each end of the tunnel, whereas most of the PM measurements were conducted at the exit end of the tunnel. Gas measurements included the typical pollution gases (SF<sub>6</sub> as the tracer, NO<sub>x</sub>, N<sub>2</sub>O, CO, CO<sub>2</sub>, methane, SO<sub>2</sub>, VOCs, carbonyls, organic acids, NH<sub>3</sub>, Graham and Gray, 2002). The PM chemical and physical properties were measured in great details. For physical properties, particle number size distributions from 10 nm to 3 µm were measured, and hygroscopic properties were measured at two sizes (Prenni et al., 2002). Chemical measurements characterized the mass, inorganic and carbonaceous compositions of the primary particles.

**Measurements at the Cassiar Tunnel Site**

Measurements	Technique	Time resolution	Frequency	
<b>Gas phase measurements</b>	NO <sub>2</sub>	DNPH cartridges	3 day <sup>-1</sup>	
	Organic acids	KOH-impregnated filters-IC	3 day <sup>-1</sup>	
	C <sub>1</sub> -C <sub>7</sub> carbonyls	DNPH-cartridges	3 day <sup>-1</sup>	
	NMHCs, including aromatics	Canisters-GC/FID	3 day <sup>-1</sup>	
	CO, CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, SF <sub>6</sub>	Canisters-GC	3 day <sup>-1</sup>	
<b>Particle characterization measurements</b>	PM <sub>1</sub> , PM <sub>2.5</sub> mass	Low-vol FP-microbalance weight difference	3 day <sup>-1</sup>	
	OC/EC (<1 µm), OC/EC (<2.5 µm)	Low-vol FP-thermal optical detection	3 day <sup>-1</sup>	
	Black carbon	PSAP - Absorption	1-h	Continuous
	Trace organic species-organic ions, inorganic ions	Low-vol FP-IC	3-h	3 day <sup>-1</sup>
	Trace metals	Low-vol FP-XRF	3-h	3 day <sup>-1</sup>
	Number size distribution (0.06-0.3 µm)	Differential mobility analyzer (DMA)	10-min	Continuous

The **Pacific 2001 Air Quality Study (PAC2001)** was conducted from 1 August to 31 September, 2001 in the Lower Fraser Valley (LFV), British Columbia, Canada. The study consisted of individual research projects organized to address several issues on ambient particulate matter and ozone that are important to policy makers. A special issue of Atmospheric Environment [Vol. 38(34), Nov 2004] describes specific study objectives (Li, 2004) and presents a series of results papers from the field study. The ground sampling sites during the study were (1) Cassiar Tunnel, (2) Slocan Park, (3) Langley Ecole Lochiel, (4) Sumas Eagle Ridge, and (5) Golden Ears Provincial Park and aloft measurements were taken from a Convair 580 and a Cessna 188. Selected measurement data have been compiled for each site and aircraft and are archived as site-specific data sets.

### The data set should be cited as follows:

Li, Shao-meng. 2004. NARSTO PAC2001 Cassiar Tunnel Gaseous and Particle Mass and Composition Data. Available on-line via [NARSTO Data and Information](#) at the Atmospheric Science Data Center at NASA Langley Research Center, Hampton, Virginia, U.S.A.

## 2. Sample Data Record/Data Format:

Data files are in the NARSTO Data Exchange Standard (DES) format that is described in detail on the [NARSTO Quality Systems Science Center \(QSSC\) web site](#). The files follow a tabular layout and are stored as ASCII comma-separated values files (.csv). The DES does not rely on row position to identify specific information, but uses a tag to describe the information contained in the row. The DES is a self-documenting format with three main sections: the header contains information about the contents of the file and the data originator; the middle section contains metadata tables that describe/define sites, flags, and other codified fields; and the final section is the main data table that contains key sampling and analysis information and the data values. Descriptions of the standardized metadata fields are also available on the QSSC web site.

### Archived Cassiar Tunnel Data Files

Data File Names	Link to Time Series Plots of Reported Variables (PDF)
NARSTO_PAC2001_CSRT_LAG_ACIDS_FP-IC-CE_20010809D7_V1.csv	<a href="#">View CSRT_LAG_ACIDS_FP-IC-CE_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_CARBOXYLS_DNPH-HPLC_20010809D7_V1.csv	<a href="#">View CSRT_LAG_CARBOXYLS_DNPH-HPLC_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_GASES_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_GASES_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_HALOVOC_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_HALOVOC_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_IONS-PM25_FP-IC-CE_20010809D7_V1.csv	<a href="#">View CSRT_LAG_IONS-PM25_FP-IC-CE_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_METALS-PM10_FP-XRF_20010809D7_V1.csv	<a href="#">View CSRT_LAG_METALS-PM10_FP-XRF_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_METALS-PM1_FP-XRF_20010809D7_V1.csv	<a href="#">View CSRT_LAG_METALS-PM1_FP-XRF_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_METALS-PM25_FP-XRF_20010809D7_V1.csv	<a href="#">View CSRT_LAG_METALS-PM25_FP-XRF_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_NMHC1_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_NMHC1_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_NMHC1_CONT_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_NMHC1_CONT_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_NMHC2_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_NMHC2_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_NMHC2_CONT_CANISTER_20010809D7_V1.csv	<a href="#">View CSRT_LAG_NMHC2_CONT_CANISTER_20010809D7</a>
NARSTO_PAC2001_CSRT_LAG_OCEC_FP-TOT_20010809D7_V1.csv	<a href="#">View CSRT_LAG_OCEC_FP-TOT_20010809D7</a>
NARSTO_PAC2001_CSRT_S-L_PART-FATTY-ACIDS_20010810D05_V1.csv	<a href="#">View CSRT_S-L_PART-FATTY-ACIDS_20010810D05</a>
NARSTO_PAC2001_CSRT_S-L_PART-OHSSTEROLS_20010810D05_V1.csv	<a href="#">View CSRT_S-L_PART-OHSSTEROLS_20010810D05</a>
NARSTO_PAC2001_CSRT_WRL_HYGGRO_HTDMA_20010812D3_V1.csv	<a href="#">View CSRT WRL_HYGGRO_HTDMA_20010812D3</a>
NARSTO_PAC2001_CSRT_J-R_PAH_HIVOL_20010810D5_V1.csv	<a href="#">View CSRT_J-R_PAH_HIVOL_20010810D5</a>
NARSTO_PAC2001_CSTN_J-R_AROM-ACIDS_HIVOL_20010810D5_V1.csv	<a href="#">View CSTN_J-R_AROM-ACIDS_HIVOL_20010810D5</a>
NARSTO_PAC2001_CSTS_J-R_AROM-ACIDS_HIVOL_20010810D5_V1.csv	<a href="#">View CSTS_J-R_AROM-ACIDS_HIVOL_20010810D5</a>
NARSTO_PAC2001_CSTN_R-M_PART-ORG_HIVOL_20010809D6_V1.csv	<a href="#">View CSTN_R-M_PART-ORG_HIVOL_20010809D6</a>
NARSTO_PAC2001_CSRT_S-S_BC_PSAP_20010808_D04_V1.csv	<a href="#">View CSRT_S-S_BC_PSAP_20010808_D04</a>

### Data File Name Syntax

Pacific 2001 data file names are comprised of nine sections, defined as follows:

Model file name: **NARSTO\_PAC2001\_SLPK\_JRB\_MET\_TOWER\_200108D75\_V1.csv**

1. Archive project: **NARSTO**
2. Study acronym: **PAC2001**
3. Site ID / Aircraft ID: **4-character abbreviation**

**Study site and aircraft abbreviations**

Abbreviation	Site Name
BNDB	Boundary Bay
CSRT (CSTN, CSTS)	Cassiar Tunnel
GEPP	Golden Ears Provincial Park
LNEL	Langley Ecole Lochiel
LPHS	Langley Poppy High School
SLPK	Slocan Park
SLPS	Slope Study
SMMT	Sumas Mountain
CSNA	CFS Cessna 188
CNVR	NRC-IAR Convair 580

4. Principal Investigator ID: **Initials (3 characters)**

**Principal Investigator's initials and affiliation**

Initials	Name	Affiliation
AMM	Anne Marie Macdonald	Environment Canada
ANL	Anna Lise Norman	University of Calgary
C-M	Cris Mihele	Environment Canada
DKW	Danny Wang	Environment Canada
FAF	Frank Froude	Environment Canada
GVRD	Greater Vancouver Regional District	Greater Vancouver Regional District
HAB	H. A. Weibe	Environment Canada
J-R	Jochen Rudolph	York University
JRB	Jeff Brook	Environment Canada
JWB	Jan Bottenheim	Environment Canada
KGA	Kurt Anlauf	Environment Canada
LAG	Lisa Graham	Environment Canada
M-M	Mike Mozurkewich	York University
M-S	Mahiba Shoeib	Environment Canada
PCB	Peter Brickell	Environment Canada
R-M	Robert McLaren	York University
S-L	Shoa-meng Li	Environment Canada
S-P	Sara Pryor	University of Indiana
S-S	Sangeeta Sharma	Environment Canada
WOR	Douglas Worsnop	Aerodyne Research Inc.
WRL	Richard Leaitch	Environment Canada

5. Measurement activity: **General measurement type**
6. Instrument name or analysis method: **General analysis method**
7. Sampling date with sampling days or flight number:

- **For Ground-based measurements:**

The first date in the data file (YYYYMMDD), followed by the letter "D" and the total number of sampling days.

- Examples:

- 20010801D1 (starting August 1, 2001, total of 1 day)
- 20010815D61 (starting August 15, 2001, total of 61 days)

- **For Aircraft measurements:**



The first date in the data file (YYYYMMDD), followed by the letter "F" and the flight number for the date.

■ Examples:

- 20010815F1 (first flight on August 15, 2001)
- 20010815F2 (second flight on August 15, 2001)

8. Archive data file version number: The file version number starts at "**V1**". The version number is incremented if the archive data file is replaced.
9. Suffix: **.csv** (comma separated values)

### 3. References:

- Graham, L., Gray, C., 2002. Pacific 2001: Cassiar Tunnel study - gaseous emissions measurements. Presentation at the Symposium on Atmospheric Aerosols and Pacific 2001 Field Study, 85th CSC Conference, Vancouver, Canada, June 1-5, 2002.
- Prenni, A.J., Kreidenweis, S.M., DeMott, P.J., 2002. Hygroscopic growth measurements during PACIFIC 2001. Presentation at the Symposium on Atmospheric Aerosols and Pacific 2001 Field Study, 85th CSC Conference, Vancouver, Canada, June 1-5, 2002.
- Li, Shao-Meng. 2004. A concerted effort to understand the ambient particulate matter in the Lower Fraser Valley: the Pacific 2001 Air Quality Study. Atmospheric Environment, Volume, 38(34), pp. 5719-5731. (Pacific 2001 Special Issue)

### 4. Contact Information:

#### Investigator(s) Name and Title:

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#### Data Center:

The User and Data Services Office at the Langley Atmospheric Science Data Center is involved throughout the system to monitor the quality of data on ingest, to ensure prompt replies to user questions, to verify media orders prior to filling them, and to ensure that the needs of the users are being met.

If you have a problem finding what you need, trouble accessing the system, or need an answer to a question concerning the data or how to obtain data, please contact the User and Data Services staff.

Telephone: (757) 864-8656  
FAX: (757) 864-8807  
E-mail: [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov)  
URL: <http://eosweb.larc.nasa.gov>

### 5. Acknowledgement:

When data from the Langley Atmospheric Science Data Center are used in a publication, we request the following acknowledgment be included: "These data were obtained from the NASA Langley Research Center Atmospheric Science Data Center".

The Langley Data Center requests a reprint of any published papers or reports or a brief description of other uses (e.g., posters, oral presentations, etc.) of data that we have distributed. This will help us determine the use of data that we distribute, which is helpful in optimizing product development. It also helps us to keep our product-related references current.

Please contact us at [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov) for instructions on mailing reprints.



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