

Title : ACCLIP 20220804-20220805 Converted Data (ACCLIP_NIER Flight Data)

Authors :

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Award(Grant) ID :

Nothing special

1. Data Set Description

These data contain a number of precursor data collected from the multiple instruments onboard in the Beechcraft 1900D aircraft operated by the NIER.

2. Disclaimer

These data merges directly reflect the data quality of ~~~ instrument data. If any errors or anomalies are found in the merges, please email the author so that they can be fixed and/or resolved.

3. Instrument Description

a. SP2

The SP2 measures Black Carbon (BC) particles by detecting their heat-emitted energy and shares an inlet line with UHSAS during aerial observations, maintaining a flow of 5 liters per minute.

Flow Rate : 120 cm^3/min (30 ~ 180)

Data Acquisition Rate : 0 ~ 12,500 $particles/cm^3$ at 120 vccm

Scattering Signal : 200 ~ 430nm

Incandescent Signal : 70 ~ 500nm (At BC density $1.8g/cm^3$)

Laser : Nd:YAG Laser: 1,064nm, $3MW/cm^2$

BC Detection Limit : $10ng/m^3$

b. MCEA1-911

Using Lambert-Beer law and Off-Axis ICOS, the instrument measures absorbance during flights, sharing an inlet line with other gases and maintaining a 2 LPM flow through a filter.

Measurement Range :

CH_4 : 0.3ppb ~ 100ppm CO : 0.05 ~ 1,000ppm CO_2 : 0.1 ~ 300ppm

Operating Range :

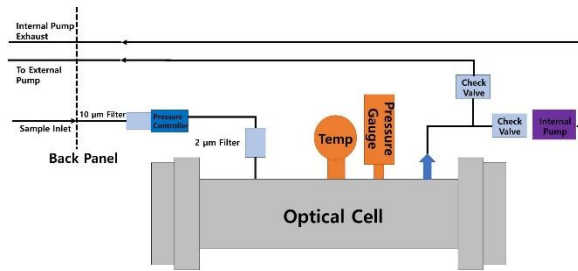
CH_4 : 0 ~ 0.1% CO : 0 ~ 1% CO_2 : 0 ~ 3%

Precision (1sec) :

CH_4 : 3ppb CO : 0.07ppm CO_2 : 0.2ppm

Variability (operating over 24 hrs, 15 min avg) :

CH_4 : 3ppb CO : 0.1ppm CO_2 : 0.2ppm



< Fig1. MCEA1-911 >

c. HR-ToF-AMS

The instrument real-time analyzes aerosols under 1 µm, such as organic and sulfate particles, and is connected to an HR-ToF-AMS with a 5 LPM flow rate for flight observations

Flow Rate : 85 cc/min

Mass Range(m/z) : 1 ~ 1200

Detection Limit : $0.003 \mu\text{g}/\text{m}^3$ (V mode)

Mass Resolving Power : $2000m/\Delta m$

Particle Diameter Measurement Range : 40nm ~ 1µm

Resolution(size) : $5\sim 10 (D_{aero}/\Delta D_{aero}, FWHM)$

d. EAA-911

The instrument uses Lambert-Beer law and Off-Axis ICOS to measure absorbance, and during flights, it maintains a Teflon inlet line at 50°C with a 2 LPM flow rate.

Measurement Range : 0 ~ 10,000 ppb

Precision(1-sigma) :

1 sec : below 1ppb

10 sec : below 0.3ppb

100 sec : below 0.1ppb

Response Time :

10s (only internal pump)

2s (with external pump)

Operating Range : 0 ~ 200 ppm

e. T265

Flow Rate : $500 \text{ cc}/\text{min} \pm 10\%$

Measurement Range : 0 ~ 2,000 ppb

Detection Limit : below 0.3 ppb

Zero / Span Noise : below 0.5% (at below 0.15ppb(RMS) / over 100ppb)

Zero / Span Variability : below 0.5ppb/24hrs / below 0.5% of full scale/24hrs

Linearity / Precision : 1% / 0.5%

f. PTR-1000

The instrument analyzes VOCs using a proton transfer reaction and is connected to PTR-ToF-MS for aerial observations, maintaining sample flow at 5 LPM and temperature control from 50°C to 60°C, with system status indicated by gauge colors and maintained in stand-by mode when not measuring.

Flow Rate : 50 ~ 800 sccm

Mass Range (amu) : 1 ~ 10,000

Detection Limit : below 10ppt

Sensitivity : over 200 cps/ppbv

Resolution : $1500m/\Delta m$

Response Time / Linearity : below 100ms / 100pptv ~ 1ppmv

4. Data collection and Processing

Quality control and assurance were conducted by the NIER scientists manually.

4. Data Format

Data format : NetCDF

Naming Convention : Campaign_Date_Status.nc

Timestamp : "seconds since 2022-08-04 13:01:15.002000"

Type : 1D (Lat,Long,time), GeoTraj (Others)

FillValue : NaN

Details: The data is formatted in NetCDF, which is a binary file format commonly used for storing multi-dimensional scientific data. The files are named following a specific naming convention: the campaign name is followed by the date and the status of the data, with the components separated by underscores and ending with a ".nc" extension, for example, "Campaign_20220804_Final.nc". Each data point is timestamped in the format of "seconds since 2022-08-04 13:01:15.002000", providing a precise reference to the time of the measurement. The data type is 1D for latitude, longitude, and time variables, and GeoTraj for other types of geospatial trajectory data. Any missing values within the dataset are represented by 'NaN', which stands for 'Not a Number', to denote data that is not available or applicable.

5. Data Remarks

Please contact Dr. Jinsoo Park or Ja-Ho Koo if any question exists related to this dataset. Thanks.

6. Appendix

ACCLIP, Earth Science, Atmosphere, Atmospheric chemistry, Airplane