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Atmospheric Dry Air Mole Fraction of the Greenhouse Gases and Carbon and Oxygen Isotopic ratios of Carbon Dioxide (*δ*13C-CO2 and *δ*18O-CO2) from the NIES/CGER Air Sampling Network

Created: 2022-02-1

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1. DATA SOURCE

Correspondence concerning these data should be directed to:

National Institute for Environmental Studies (NIES)

Center for Global Environmental Research (CGER)

16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan

Contacts:

NTL and CLA data: Yukio Terao (yterao@nies.go.jp)

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2. USE OF DATA

These data are made freely available to the public and the scientific community. The availability of these data does not constitute publication of the data. If the data are obtained for potential use in a publication or presentation, NIES/CGER should be informed.

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3. DATA - GENERAL COMMENTS

We used following instruments for analysis of mole fractions in air samples; a nondispersive infrared analyzer (NDIR) for CO2, a gas chromatograph equipped with a flame ionization detector (GC-FID) for CH4, a gas chromatograph with a reduction gas detector (GC-RGD) for CO and H2, and a gas chromatograph with an electron capture detector (GC-ECD) until 2011 and with a micro-electron capture detector (GC-micro-ECD) from 2012 for N2O and SF6.

The measurement of CO2, CH4, CO, H2, N2O and SF6 in air are made relative to standards whose mole fraction is determined with high precision and accuracy. Because detector response is non-linear in the range of atmospheric levels, ambient samples are bracketed during analysis by a set of standards used to calibrate detector response.

Measurements are reported in units of micromol/mol (10-6 mol CO2 per mol of dry air or parts per million (ppm)), nanomol/mol (10-9 mol CH4, CO, H2 and N2O per mol of dry air or parts per billion (ppb)) picomol/mol (10-12 mol SF6 per mol of dry air or parts per trillion (ppt)). Measured dry air mole fractions are directly traceable to the CO2-NIES09 scale, CH4-NIES94 scale, CO-NIES09 scale, H2-NIES96 scale, N2O-NIES01 scale, and SF6-NIES01 scale.

δ13C-CO2 and δ18O-CO2 were measured by MAT-252 or MAT-253 using the working standard CO2 gas which are traceable to the NIES Atmospheric Reference CO2 for Isotopic Studies (NARCIS). The measured isotopic ratios are expressed against the value of CO2 evolved from VPDB calcite.

Uncertainties of the measurements are included in the data, which arise from our ability to propagate the scales to working standards, the repeatability of the analyzers used for sample measurement, and agreement between pairs of samples collected simultaneously.

See Nomura et al. (2021) for details of measurement methods.

Three-letter station codes are:

NTL Natnital, India

CLA Comilla, Bangradesh

Air sampling time and intervals, flasks used, and sampling method are as follows:

NTL and CLA: around 2:00 p.m. local time, weekly, 1.5 L Pyrex flask, cooled to -30 °C and pressurized to 0.25 MPa

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4. FILE NAME DESCRIPTION

Encoded into each file name are the parameter (trace gas identifier); sampling site; sampling project; and optional qualifiers that further define the file contents.

All file names use the following naming scheme:

1 2 3 4 5

[parameter]\_[site]\_[project]\_[optional qualifiers].[file type]

1. [parameter]

Identifies the measured parameter or trace gas species. (ex) co2, ch4,

2. [site]

Identifies the sampling site code. (ex) ntl, cla,

3. [project]

Identifies sampling platform and strategy. (ex) station-flask, ship-flask,

4. [optional qualifiers]

Data subsetting or averaging.

(ex)

event Measurement results for all collected samples

monthly Computed monthly averages using all collected samples

5. [file type]

File format.

(ex) txt UTF-8 text file

“co2\_ntl\_station-flask\_event.txt” contains CO2 measurement results for all flask samples collected at Nainital, India.

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5. DATA DESCRIPTION

The data files contain multiple lines of header information followed by one record for each atmospheric measurement of a single parameter or trace gas species.

Fields are defined as follows:

Field 1: [SITE CODE] The three-character sampling location code (see above).

Field 2: [YEAR] The sample collection date and time in UTC.

Field 3: [MONTH]

Field 4: [DAY]

Field 5: [HOUR]

Field 6: [MINUTE]

Field 7: [FLASK ID] The sample container ID.

Field 8: [TRACE GAS NAME] Gas identifier (e.g., CO2, CH4, CO2C13,).

Field 9: [MEASURED VALUE] Dry air mole fraction or isotopic composition. Missing values are denoted by -999.00.

Field 10: [UNCERTAINTY] Estimated uncertainty of the reported measurement value. Missing values are denoted by -999.00.

Field 11: [FLAG] the number indicates the results of our data rejection and selection process.

1 RETAINED as good value

3 REJECTED by error in sampling or analysis, obviously contaminated, and others

Field 12: [INSTRUMENT] A 2-character code that identifies the instrument used for the measurement.

L6 LI-COR, LI-6252

　　H5 Agilent Technologies, HP-5890

H6 Agilent Technologies, HP-6890

H7 Agilent Technologies, HP-7890

R2 Trace Analytical RGD-2 + HP-5890

P1 Peak Laboratories, Peak Performer 1 RCP + HP-5890

M2 Thermo Fisher Scientific, MAT-252

M3 Thermo Fisher Scientific, MAT-253

Field 13: [YEAR] The measurement date and time in local time (JST).

Field 14: [MONTH]

Field 15: [DAY]

Field 16: [LATITUDE] The latitude where the sample was collected, (negative (-) numbers indicate samples collected in the Southern Hemisphere).

Field 17: [LONGITUDE] The longitude where the sample was collected, (negative (-) numbers indicate samples collected in the Western Hemisphere).

Field 18: [ALTITUDE] The altitude of the sample inlet (masl). The reported altitude is the surface elevation plus sample intake height.

Field 19: [ELEVATION] Surface elevation (masl).

Field 20: [INTAKE HEIGHT] Air sample collection height above ground level (magl).

Fields in each line are delimited by whitespace.

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6. REFERENCES

Nomura. S., Naja, M., Ahmed, M. K., Mukai, H., Terao, Y., Machida, T., Sasakawa, M., and Patra, P. K. (2021), Measurement report: Regional characteristics of seasonal and long-term variations in greenhouse gases at Nainital, India, and Comilla, Bangladesh, Atmos. Chem. Phys., 21, 16427-16452, https://doi.org/10.5194/acp-21-16427-2021. (Measurement methods, NTL and CLA data)

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7. WARNINGS

We reserve the right to make corrections to the data based on recalibration of standard gases or for other reasons deemed scientifically justified.

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8. UPDATE NOTES

2022-02-1 Created for NTL and CLA data

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