1. About the data set

Site name (three letter code)	Narita Flux research site (NRT[)	
Period of registered data	from January 1, 2001 to December 31, 2001	
This document file name	FxMt_NRT_2001_30m_03.pdf	
Corresponding data file name	FxMt_NRT_2001_30m_03.csv	
Revision information		
Date	Details of revision	Renewed file name
24 December 2004	First registration	SiIn_NRT_2001_01.pdf FxMt_NRT_2001_30m_01.pdf FxMt_NRT_2001_30m_01.csv
1 August 2005	Data of PAR and VPD were added.	SiIn_NRT_2001_01.pdf FxMt_NRT_2001_30m_02.pdf FxMt_NRT_2001_30m_02.csv
5 February 2006	Modified eddy covariance flux (Fc, H, and LE) data were registered. New quality control methods were applied.	SiIn_NRT_2001_01.pdf FxMt_NRT_2001_30m_03.pdf FxMt_NRT_2001_30m_03.csv
Contact person#1	[Flux] Senichi Hoshino (kachitainya@aaa.bbb.go.jp)	
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Contact person#3		
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2. Site description

☺to Data provider············Please explain <u>the site condition during the period of this dataset.</u>
☻to DB user ··················See also the general information file.

Hour line (Time difference from UTC)	9 hours ahead of UTC (Japan Standard Time (JST))
Vegetation Type	Japanese larch forest
Dominant Species (Overstory)	Japanese larch (*Larix Kaempferi Sarg.*), Birch (*Betula ermanii* and *Betula platyphylla*), Japanese elm (*Ulmus japonica*),Spruce (*Picea jezoensis*)
Dominant Species (Understory)	Fern (*Dryopteris crassirhizoma*, *Dryopteris austriaca*) and *Pachysandra terminalis*
Canopy height	About 15m
LAI	9.2 m^2 m^{-2} (max)(Overstory: 5.6 m^2 m^{-2}, Understory: 3.6 m^2 m^{-2})
Other information	

3. Observation and calculation

☺to Data provider··················A list of references is shown in the last page. **Please fill-in the blanks as much as possible, or select the suitable option.**

3-1. Flux observation system and data acquisition

Type of sonic anemometer	DA600-3TV (Probe TR-61C) (KAIJO)
Type of IRGA	Open-path CO_2/H_2O gas analyzer, LI-7500 (LI-COR) (H, LE) Closed-path CO_2/H_2O gas analyzer, LI-6262 (LI-COR) (F_C)
Sampling rate	10 Hz
Averaging time	30 min
Flux measurement height #1	22 m above the ground (from January 1, 2001 to May 28, 2001)
Flux measurement height #2	27 m above the ground (from May 28, 2001 to December, 2001)
Flux measurement height #3	
Zero-plane displacement	
Roughness length	
Calibration information	Open-path analyzers were calibrated approximately every two months with standard CO_2 gases and a dew point generator (LI610, LI-COR). The gain of CO_2 of the closed-path analyzers were checked once a day by flowing two standard CO_2 gases of 320 ppmv and 420 ppmv that were automatically controlled using a CR23X (LI-COR).
Other information	

3-2. Flux calculation

		Note/References
Flow attenuation [*4-6]	✓ Yes	Shimizu, T. et al., 1999. Boundary-Layer Meteorol., 64: 227–236.
Coordinate rotation [*1-3]	✓ Planar fit	
Lag removal [*2, 7, 8]	✓ Constant	Digital delay for LI7500 and DA-600 Time lag between *w*' and *c*' for closed-path system

3-3. Flux corrections

		Note/References
For sensible heat flux	✓ Cross wind correction [*9, 10] ✓ Water vapor correction [*11]	
High frequency loss	• **[u*, H, LE]** ✓ Moor (1986) [*15] (Correction for path length and sensor separation) • **[Fc]** ✓ Experimental approach [*2]	
Low frequency loss [*16] (Detrending)	✓ Block average	

WPL Correction[17-21]	✓ For latent heat (LE) flux ✓ For CO_2 flux	
Others [22-24]	✓ Temperature dependency for latent heat: L ✓ Temperature dependency for air density ✓ Pressure dependency for air density	

3-4. Quality control [25-26]

		Note/References
Raw data test	✓ Spike test [27] ✓ Absolute limits	
Non steady state test	✓ YES	
Integral turbulence characteristics	✓ YES (u*)	
Correlation coefficient	✓ Not applied	
Wind direction	✓ YES	Data with wind blowing from the tower were excluded to remove the tower's influence on measurements.
Footprint test [28, 29]	✓ Not applied	
Absolute thresholds	✓ YES	
Others	✓	

3-4. Storage term

		Note/References
Storage term	• **[CO_2]**	From CO_2 profile data (26, 22, 16, 12, 6, 3, 1 m) When CO_2 profile data were missing, CO_2 data at the flux measuring height was used.

3-5. Other information

☺ to Data provider……………………… If your flux data were evaluated by gradient method, please explain the observation method here.

		Note/References

4. Registered Data

Observation items	Symbol	Unit	Height(s) Depth(s)	Instruments	Level of data processing
Year	Year	#### (YYYY)	****	****	
Date	DOY	1～365(6)	****	****	
Time	TIME	#### (HHMM)	****	****	
(CO_2 flux)	Fc	micromol・m^{-2}・s^{-1}	27 m	Three-dimensional sonic anemometer-thermometers (DA-600-3TV (Probe TR-61C), KAIJO) and closed-path CO_2/H_2O analyzers (LI6262, LI-COR)	Quality-controlled
(CO_2 storage in canopy air layer)	Sc	micromol・m^{-2}・s^{-1}	Profile (26, 22, 16, 12, 6, 3, 1 m	Closed-path CO_2/H_2O analyzers (LI6262, LI-COR)	Quality-controlled
Net ecosystem carbon exchange	NEE	micromol・m^{-2}・s^{-1}	-	CO_2 flux + CO_2 storage in canopy air layer	Quality-controlled
Sensible heat flux	H	W・m^{-2}	27 m	Three-dimensional sonic anemometer-thermometers (DA-600-3TV (Probe TR-61C), KAIJO, Japan) and open-path CO_2/H_2O analyzers (LI6262, LI-COR)	Quality-controlled
Latent heat flux	LE	W・m^{-2}	27 m	Three-dimensional sonic anemometer-thermometers (DA-600-3TV (Probe TR-61C), KAIJO, Japan) and open-path CO_2/H_2O analyzers (LI6262, LI-COR)	Quality-controlled
Friction velocity	USt	m・s^{-1}	27 m	Three-dimensional sonic anemometer-thermometers (DA-600-3TV (Probe TR-61C), KAIJO)	Quality-controlled
Global solar radiation (incoming)	Rg	W・m^{-2}	40 m	Pyranometer (MS-601, Eko, Japan)	Correlated by comparing with standard reference sensor Quality-controlled
Global solar radiation (outgoing)	Rg_out	W・m^{-2}	40 m	Radiometer (MR40, Eko, Japan)	Correlated by comparing with standard reference sensor Quality-controlled

Net Radiation	Rn	W・m^{-2}	40 m	Radiometer (MR40, Eko, Japan)	Correlated by comparing with standard reference sensor Quality-controlled
Photosynthetic active photon flux density	PPFD	micromol・m^{-2}・s^{-1}	40 m	Quantum sensor (LI-190S, LI-COR)	Correlated by comparing with standard reference sensor Quality-controlled
Transmitted PAR	TPAR	micromol・m^{-2}・s^{-1}	1.5 m (two point-average)	Quantum sensor (LI-190S, LI-COR)	Correlated by comparing with standard reference sensor Quality-controlled
Reflected PAR	RPAR	micromol・m^{-2}・s^{-1}	40 m	Quantum sensor (LI-190S, LI-COR)	Correlated by comparing with standard reference sensor Quality-controlled
Wind direction	WD	degrees	27 m	Sonic anemometer (MA-130A, Eko, Japan)	Quality-controlled
Wind speed	WS	m・s^{-1}	27 m	Sonic anemometer (MA-130A, Eko, Japan)	Quality-controlled
Barometric pressure	Pa	kPa	40 m	Barometer (PTB100, Vaisala)	Quality-controlled
Air temperature	Ta	degrees C	27 m	Platinum resistance thermometers and capacitive hygrometers (HMP45D, Vaisala)	Correlated by comparing with standard reference sensor Quality-controlled
Relative humidity	Rh	%	27 m	Platinum resistance thermometers and capacitive hygrometers (HMP45D)	Correlated by comparing with standard reference sensor Quality-controlled
Vapor pressure deficit	VPD	kPa	27 m	Platinum resistance thermometers and capacitive hygrometers (HMP45D)	Calculated from Ta and Rh Quality-controlled
Precipitation	PPT	mm	40 m	Tipping-bucket rainguage with heater (52 202, R. M. Young)	If data were missing, we gap-filled using data from the nearest meteorological station

Soil temperature	Ts	degrees C	0.05 m (three point-average)	Platinum resistance thermometer	Quality-controlled
Ground heat flux	G	W•m^{-2}	0.05 m (five point-average)	Heat flux plate (MF-81, Eko, Japan) and Platinum resistance thermometer	G was calculated by adding the heat storage change in the topsoil layer above the heat plates to conductive soil heat flux (MF-81). Quality-controlled
Soil water content	SWC	m^3 m^{-3}	0.05 m (three point-average)	TDR sensor (CS615, Campbell)	Correlated by comparing with soil sampling method Quality-controlled

5. Note for data users

☺to Data provider····················If you use some tags (flags/identifiers) to identify the levels of data processing, please explain the meanings of the tags.

The figure of "-99999" denotes missing or rejected data.

6. Important events

☺to Data provider····················Please list noteworthy events during the observation period. For example, relocation of the instruments, reasons for missing observation, dates of sowing and harvesting at agricultural site should be listed in the table by date.

Date	Events
May 28, 2001	Flux measuring height was changed from 22 to 27 m.
October 10, 2001	Direction of flux measuring boom was changed from 153 to 273 degrees.

References

Flux calculation

*1 McMillen, R.T., 1988. Boundary-Layer Meteorology, 43: 231-245.

*2 Aubinet M. et al.,2000. Advances in Ecological Research, 30: 113-175.

*3 Wilczak. J.M., Oncley, S.P. and Stage, S.A., 2001. Boundary-Layer Meteorology, 99: 127-150.

*4 Wyngaard, J. C. and Zhang, S. F., 1985. J. Atmos. Oceanic Tech., 2: 548-558.

*5 Kaimal, J.C. et al., 1990. Boundary-Layer Meteorol., 53: 103-115.

*6 Shimizu, T. et al., 1999. Boundary-Layer Meteorol., 64: 227–236.

*7 Leuning, R. and Judd M.J., 1996.Global Change Biology, 2: 241-254.

*8 Information from Li-Cor

Flux correction

*9 Schotanus, P. et al., 1983. Boundary-Layer Meteorology, 26: 81-93.

*10 Liu, H., Peters, G. and Foken, T., 2001. Boundary-Layer Meteorology, 100: 459-468.

*11 Kaimal J.C. and Gaynor, J.E., 1991. Boundary-Layer Meteorology, 56: 401-410.

*12 Watanabe et al., 2000. Boundary-Layer meteorol. 96, 743-491.

*13 Massman, W. J., 2000. Agric. For. Meteorol. 104, 185-198

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*15 Moore, C.J., 1986. Boundary-Layer Meteorology, 37: 17-35.

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*17 Webb, E. K., Pearman, G.I. and Leuning, R., 1980. Quarterly Journal of the Royal Meteorological Society, 106: 85-100.

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*21 Massman, W. 2004. Concerning the measurement of atmospheric tarce gas fluxes with open- and closed-path eddy covariance system: The WPL terms and spectral attenuation. In: X. Lee (Editor), Handbook of Micrometeorology: A guide for surface Flux Measurements. Kluwer, Dirdrecht, pp. 133-160.

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*23 Stull, R.B., 1988. An Introduction to Boundary Layer meteorology. Kluwer Acad. Publ., Dordrecht, Boston, London, 666pp.

*24 Cohen, E. R. and Taylor, B. N., 1986. The 1986 adjustment of the fundamental physical constants. Internatinal Counsil of Scientific Unions (ICSU), Committee on Data for Science and Technology (CODATA). CODATA-Bulletin, No. 63: 36pp.

Quality control

*25 Vickers, D. and Mahrt, L., 1997. Journal of Atmospheric and Oceanic Technology, 14: 512-526.

*26 Foken, T. and Wichura, B., 1996. Agricultural and Forest Meteorology, 78: 83-105.

*27 Hojstrup, J., 1993. Measuring Science Technology, 4: 153-157.

*28 Schmid, H. P., 1994. Boundary-Layer Meteorology, 67: 293-318.

*29 Korman, R. and Meixner, F.X., 1990. . Boundary-Layer Meteorology, 99: 207-224.