1. About the data set

Site name (AsiaFlux three letter code)	Kawagoe forest meteorology research site (KWG)
Period of registered data	From January 1, 2002 to December 31, 2002
This document file name	KWG_2002_002c.pdf
Corresponding data file name	KWG_2002_002.csv

Revision information

Date	Details of revision	Renewed file name
31 March 2010	First registration	KWG_2002_001.pdf KWG_2002_001.csv
8 June 2010	Document file is updated: p.9, line19: Publication list URL	KWG_2002_002.pdf
28 July 2010	Document file is renamed (no change in document contents): Version management is changed: 002 → 001b (corresponding data version + alphabetical sequence)	KWG_2002_001b.pdf
31 March 2011	Second registration: WD data is added Document file is updated accordingly	KWG_2002_002a.pdf KWG_2002_002.csv
19 October 2011	Document file is updated: Site position is corrected.	KWG_2002_002b.pdf
10 November 2011	Document file is updated: Flux measurement height is corrected.	KWG_2002_002c.pdf
31 July 2012	Document file is updated: p.1: Details in each revision are added.	KWG_2002_002d.pdf

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2. Site description

Hour line (Time difference from UTC)	Japan Standard Time (JST) (9 hours ahead of UTC)
Location (address)	Kawagoe, Saitama, Japan
Position	35.8725N, 139.4869E (World Geodetic System 1984)
Elevation	26m above sea level (World Geodetic System 1984)
Terrain type	flat
Slope	0 degrees
Area	approx. 40ha
Fetch	50-500m
Climate	Warm temperate (Köppen climate classification: Cfa)
Mean annual air temperature	15 degree C
Mean annual precipitation	1300mm
Vegetation Type	Deciduous broadleaf forest
Dominant Species (Overstory)	*Quercus serrata* (Konara oak), *Carpinus laxiflora* (red-leaved hornbeam), *Clethra barbineris* (japanese sweetspire), *Ilex macropoda*
Dominant Species (Understory)	-
Canopy height	Approx. 15m
Breast High Diameter	mainly 10-15cm
Age	NA
LAI	approx. 5.5 at max in early summer
Soil Type	Black soil Bl_D (Andosols)
Other information	A local street goes through the forest. Approx. 500m away from Kan-Etsu Expressway. Fallen leaves are occasionally swept away.

References

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WATANABE Tsutomu, YAMANOI Katsumi, YASUDA Yukio(2000) Testing of the bandpass eddy covariance method for a long-term measurement of water vapour flux over a forest. Boundary-Layer Meteorology, 96(3):473-491

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3. Registered data

Observation items	Symbol	Unit	Height(s) Depth(s)	Instruments	Note
Date	DATE	-	-	-	yyyymmdd
Time	TIME	-	-	-	hhmm
Precipitation	PPT	mm	0.6m	RT-5 (IKEDA)	
Air temperature	Ta	degrees C	20.92 m	HMP-35D (VAISALA)	
Relative humidity	Rh	%	20.92 m	HMP-35D (VAISALA)	See Note [1]
Wind speed	U	$m \cdot s^{-1}$	21.13m	WM-30P (IKEDA)	
Wind direction	WD	-	25.9 m	WD-16 (IKEDA)	16 cardinal points (0-15) See Note [2]
Global solar radiation (incoming / downward)	Sd	$W \cdot m^{-2}$	25m	MR-22 (EKO)	See Note [3]
Reflected solar radiation (upward)	Su	$W \cdot m^{-2}$	25m	MR-22 (EKO)	See Note [3]
Photosynthetic active photon flux density (downward)	Pd	micromol$\cdot m^{-2} \cdot s^{-1}$	25m	ML020P（EKO) LI190(LI-COR)	See Note [3]
Reflected PAR (upward)	Pu	micromol$\cdot m^{-2} \cdot s^{-1}$	25m	ML020P（EKO) LI190(LI-COR)	See Note [3]
Net radiation	Rn	NA	NA	NA	
Soil heat flux	G	$W \cdot m^{-2}$	-0.02m	MF-81 (EKO)	
Sensible heat flux	H	$W \cdot m^{-2}$	20.0m	DAT-300, DA-600-3T (KAIJO)	
Latent heat flux	lE	NA	NA	NA	
Friction velocity	Ust	$m \cdot s^{-1}$	20.0m	DA-600-3T (KAIJO)	
CO_2 flux	Fc	micromol$\cdot m^{-2} \cdot s^{-1}$	20.0m	DA-600-3T (KAIJO) LI-6262 (LI-COR) Or LI-6252(LI-COR)	Closed-path system, See 4-4 for QC
Storage change in canopy air layer	Sc	micromol$\cdot m^{-2} \cdot s^{-1}$	16, 12, 8, 4m	LI-6252 or LI-6262 (LI-COR)	
Net ecosystem exchange	NEE	micromol$\cdot m^{-2} \cdot s^{-1}$	-	-	NEE=Fc+Sc, Ust screening (Ust >= 0.2), gap filled
Ecosystem respiration	Re	micromol$\cdot m^{-2} \cdot s^{-1}$	-	-	gap filled
Gross primary production	GPP	micromol$\cdot m^{-2} \cdot s^{-1}$	-	-	GPP=-NEE+Re

Note

[1] value of >100% is replaced by 100%
[2] clockwise from north (=0) to north-northwest (=15)
[3] value in night time is replaced by 0.0

Gap filling

NEE	–NEE(daytime) = Agmax* alpha*APAR/ (Agmax+alpha*APAR) +C: Parameters were derived per 7days.
Re	Re = -NEE(nighttime & winter season) = a* b^(Ta/10) : Parameters (a & b) were derived yearly.

References

Data format

Data consists of fixed length (8 digits) comma separated format. Missing data is labeled as "-9999.00"

Line 1: Symbol (Date, Time, PPT, Ta, …..)

Line 2: Unit (yyyymmdd, hhmm, mm, degC, ….)

"hhmm" shows intermediate time of averaging period.

i.e. "1215" labels half-hourly average (or sum) of data from 12:00 to 12:30

Line 3: Comment

Line 4: Data

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Data example

```
    Date, Time,      PPT,       Ta,       Rh,        U,       WD,       Sd,       Su,       Pd,       Pu, ...........
yyyymmdd, hhmm,       mm,     degC,        %,     ms-1,      deg,     Wm-2,     Wm-2,    (*1),      (*1), ...........
File= KWG_2000_001.CSV; Created: 20100326; Gap= -9999.0; (*1): micro-mol m-2 s-1                          ...........
20000101, 0015,      0.0,     3.34,    87.19,     1.58, -9999.0,      0.1, -9999.0,      0.1,      0.0, ...........
20000101, 0045,      0.0,     3.12,    88.14,     1.44, -9999.0,      0.0, -9999.0,      0.1,      0.0, ...........
20000101, 0115,      0.0,     2.36,    90.51,     1.15, -9999.0,     -0.3, -9999.0,      0.1,      0.0, ...........
20000101, 0145,      0.0,     2.14,    91.32,     0.83, -9999.0,      0.0, -9999.0,      0.1,      0.0, ...........
20000101, 0215,      0.0,     2.28,    88.96,     0.49, -9999.0,     -0.3, -9999.0,      0.1,      0.0, ...........
20000101, 0245,      0.0,     2.24,    89.82,     0.35, -9999.0,     -0.2, -9999.0,      0.2,      0.0, ...........
20000101, 0315,      0.0,     2.05,    89.49,     1.50, -9999.0,      0.1, -9999.0,      0.2,     -0.1, ...........
20000101, 0345,      0.0,     2.41,    87.25,     1.27, -9999.0,      0.0, -9999.0,      0.2,      0.0, ...........
20000101, 0415,      0.0,     2.31,    86.83,     1.12, -9999.0,     -0.2, -9999.0,      0.1,      0.0, ...........
20000101, 0445,      0.0,     2.84,    83.36,     0.54, -9999.0,     -0.6, -9999.0,      0.0,      0.0, ...........
20000101, 0515,      0.0,     2.53,    83.32,     1.23, -9999.0,      0.2, -9999.0,      0.2,      0.0, ...........
20000101, 0545,      0.0,     1.59,    87.54,     1.29, -9999.0,     -0.6, -9999.0,      0.0,      0.0, ...........
20000101, 0615,      0.0,     1.89,    85.13,     0.94, -9999.0,      0.4, -9999.0,      0.3,      0.0, ...........
20000101, 0645,      0.0,     1.77,    82.40,     0.83, -9999.0,      3.5, -9999.0,      8.5,      0.4, ...........
20000101, 0715,      0.0,     2.67,    76.83,     1.38, -9999.0,     45.8, -9999.0,     71.9,     11.6, ...........
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4. Observation and calculation

4-1. Flux observation system and data acquisition

Type of sonic anemometer	DAT-300, DA-600-3T (KAIJO)
Type of IRGA	LI-6262, LI-COR
Sampling rate	5Hz
Averaging time	30 min
Flux measurement height #1	20.0m
Zero-plane displacement	
Roughness length	
Calibration information	LI-6262 was calibrated using standard gases (twice a day)
Other information	

4-2. Flux calculation

Calculation methods		Note
Flow attenuation [*4-6]	Applied	
Coordinate rotation [*1-3]	Applied	first-rotated
Lag removal [*2, 7, 8]	Applied	Manual

4-3. Flux corrections

Correction methods		Target flux	Note
Cross wind correction[*9, 10]		sensible heat flux (H)	
Vapor correction		sensible heat flux (H)	
High frequency loss	Band-pass covariance method [*12]	CO_2 flux (Fc)	
	Experimental approach [*2]		
Low frequency loss (Detrending)	Linear detrend [*16]	sensible heat flux (H), friction velocity (Ust), CO_2 flux (Fc)	
WPL Correction[*17-21]		(Not applied)	
Others [*22-24]			

4-4. Quality control [*25-26]

QC methods				Note
Raw data test [*25,26]	Spike test [*27]		Applied	
	Absolute limits		Applied	
	Absolute variance		Applied	
	Higher-moment statistics	skewness	Applied	
		kurtosis	Applied	
	Discontinuities	Harr mean test	Applied	
		Harr variance test	Applied	
	Visual inspection		Applied	
Non steady state test[*25]			Not applied	
Absolute thresholds			Not applied	
Others				

4-5. Storage term

Target storage		Note
CO_2	From CO_2 profile data (16, 12, 8, 4 m) Sampling interval: 1 minute at each height	

References

5. Important events

Date	Events
2002/ 7/ 9 16:50	electrical outage occurred
2002/ 7/23 - 2002/ 8/ 3	electrical outage occurred during this period
2002/ 8/16 0:40 - 2002/ 8/20 8:55	electrical outage occurred during this period

Please note that there may be more electrical outages other than listed above.

6. Publications relating to this site

YASUDA Yukio, WATANABE Tsutomu (2001) Comparative measurements of CO_2 flux over a forest using closed-path and open-path CO_2 analyzers. Boundary-Layer Meteorology, 100(2):191-208

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