1. About the data set

Site name (three letter code)	Suwa Lake Site (SWL)	
Period of registered data	From April 8, 2015 to December 31, 2015	
This document file name	FxMt_SWL_2015_30m_01.pdf	
Corresponding data file name	FxMt_SWL_2015_30m_01.csv	
Revision information		
Date	Details of revision	Renewed file name
11 June 2018	First registration	SiIn_SWL_2015_01.pdf FxMt_SWL_2015_30m_01.pdf FxMt_SWL_2015_30m_01.csv
Contact person#1	[General] Hiroki Iwata (hiwata@shinshu-u.ac.jp)	
Contact person#2		
Contact person#3		
Contact person#4		

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	Lake
Dominant Species (Overstory)	(*Scientific name*)
Dominant Species (Understory)	(*Scientific name*)
Canopy height	
LAI	
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. If you are not sure what to write, leave it as a blank.**

3-1. Flux observation system and data acquisition

Type of sonic anemometer	CSAT3 (Campbell Scientific)
Type of IRGA	Open-path CO2/H2O gas analyzer, EC150 (Campbell Scientific)
Sampling rate	10 Hz
Averaging time	30 min
Flux measurement height #1	Approximately 3.2 m (depending on the water level)
Flux measurement height #2	
Flux measurement height #3	
Zero-plane displacement	
Roughness length	
Calibration information	The open-path gas analyzer was calibrated once a year with standard CO2 gases and a dew point generator (LI610, Li-Cor). Additionally, the calibration of water vapor density was checked against a Vaisala humidity sensor.
Other information	

3-2. Flux calculation

		Note/References
Flow attenuation [*4-6]	✓ Not applied	
Coordinate rotation [*1-3]	✓ Double (2D) rotation	
Lag removal [*2, 7, 8]	✓ Automatic	A relationship between lag time and wind speed/direction was developed and applied (Iwata et al., 2014. Boundary-Layer Meteorol., 151: 95-118)

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, Fc]** ✓ Massman (2000, 2001) [*13, 14]	
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	

	✓ Humidity dependency for specific heat: Cp ✓ 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 ✓ Higher-moment statistics ✓ Resolution test ✓ Harr mean/variance test ✓ Discontinuities	
Non steady state test	✓ YES	
Integral turbulence characteristics	✓ Not applied	
Correlation coefficient	✓ Not applied	
Wind direction	✓ YES	Data with flow from the land were excluded.
Footprint test [*28, 29]	✓ Not applied	
Ablosute thresholds	✓ Not applied	
Others	✓	

3-5. Storage term

		Note/References
Storage term		

3-6. 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	micoromol･m^{-2}･s^{-1}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell) and open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Sensible heat flux	H	W･m^{-2}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell) and open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Latent heat flux	LE	W･m^{-2}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell) and open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Water vapor flux	E	mmol･m^{-2}･s^{-1}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell) and open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Friction velocity	USt	m･s^{-1}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell)	Quality-controlled
Momentum flux (along wind)	TAU wu	kg m^{-1}･s^{-2}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell)	Quality-controlled
Momentum flux (cross wind)	TAU wv	kg m^{-1}･s^{-2}	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell)	Quality-controlled

Atmospheric stability parameter	ZL	-	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell) and open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Global solar radiation (incoming)	Rg	$W \cdot m^{-2}$	2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Global solar radiation (outgoing)	Rg_out	$W \cdot m^{-2}$	2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Long-wave radiation (incoming)	Rgl	$W \cdot m^{-2}$	2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Long-wave radiation (outgoing)	Rgl_out	$W \cdot m^{-2}$	2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Net Radiation	Rn	$W \cdot m^{-2}$	2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Albedo	Alb		2.7 m	Four-component net radiometer (CNR4, Kipp & Zonen)	Quality-controlled
Wind direction	WD	degrees	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell)	Quality-controlled
Wind speed	WS	$m \cdot s^{-1}$	3.2 m	Three-dimensional sonic anemo-thermometer (CSAT3, Campbell)	Quality-controlled
Barometric pressure	Pa	kPa	1.9 m	Barometer (PTB100, Vaisala)	Quality-controlled
Air temperature	Ta	degrees C	3.2 m	Platinum resistance thermometer and capacitive hygrometer (HMP60, Vaisala)	Quality-controlled
Relative humidity	Rh	%	3.2 m	Platinum resistance thermometer and capacitive hygrometer (HMP60, Vaisala)	Quality-controlled
Vapor pressure deficit	VPD	kPa	3.2 m	Platinum resistance thermometer and capacitive hygrometer (HMP60, Vaisala)	Calculated from Ta and Rh Quality-controlled

Vapor pressure	VP	kPa	3.2 m	Platinum resistance thermometer and capacitive hygrometer (HMP60, Vaisala)	Calculated from Ta and Rh Quality-controlled
H_2O concentration	Ho	mmol・mol^{-1}	3.2 m	Open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
CO_2 concentration	Co	micoromol・mol^{-1}	3.2 m	Open-path CO2/H2O analyzer (EC150, Campbell)	Quality-controlled
Water temperature	Tw(1)	degrees C	-0.2 m	Thermistor (Pt100, Campbell)	Quality-controlled
Water temperature	Tw(2)	degrees C	-0.45 m	Thermistor (Pt100, Campbell)	Quality-controlled
Water temperature	Tw(3)	degrees C	-0.95 m	Thermistor (Pt100, Campbell)	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
From Oct 5 to Nov 09	The depth of water temperature measurements may be changed to 80, 130, and 155 cm depth sometime during the period. We found the float of water temperature sensors was missing and sensors were lowered in the water on November 9.

References

Flux calculation

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

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

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Flux correction

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

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

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

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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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*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

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