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1. General Information

Site name (three letter code)	Teshio CC-LaG experiment site (TSE)
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Contact Address#3	
Observation period	2001 to ongoing
Measurement frequency	Continuous
Infrastructure	**Tower:** 32 m (Climbable) & 8m **Electrical power:** By commercial power line from February 2005. AC100&200V are available. **Facilities for communication :** Internet communication is available. **Accommodation:** A portable house of ca. 10 m^2 in base area is available for working in the study site. Experimental Forest has accommodation for 15 researchers and students (formalities are required).
Research fund #1	collaboration among Hokkaido University, National Institute for Environmental Studies, and Hokkaido ElectricPower Co., Inc.
Research fund #2	the A3 Foresight Program (CarboEastAsia)
Research fund #3	Scientific Research on Innovation Areas
URL	https://db.cger.nies.go.jp/gem/en/flux/teshio.html
Other information	When this data set is referred to in publications, it should be cited in the following format. Takagi and Takahashi (2022), Micrometeorological CO_2 Flux Data at Teshio CC-LaG Experiment site (TSE), Ver.x.x *1, National Institute for Environmental Studies, DOI:10.17595/20221006.001. (Reference date *2: YYYY/MM/DD) *1 The version number is indicated in the name of each data file. *2 As the reference date, please indicate the date you downloaded the files.

2. Site description

Site name (three letter code)	Teshio CC-LaG experiment site (TSE)
Country	Japan
Location	Teshio Experimental Forest, Toikanbetsu, Horonobe, Hokkaido
Latitude and Longitude (first decimal of second precision), Elevation (geographic coordinates, surveying method)	45 deg 03' 21" N, 142 deg 06' 26" E Elevation: ca. 70 m, a.s.l.
Slope	< 8 deg
Terrain Type	Flat Terrace
Area	13.7 ha (Clear-cutting area), however, same vegetation type extends ca. >1 km for each direction before clear-cutting
Fetch	>1 km (mixed forest), 200–500 m (after clear-cutting)
Climate (Köppen Climate Classification)	Cool-temperate (Snow – fully humid – warm summer [Dfb])
Mean annual air temperature	5.9 deg C
Mean annual precipitaion	1200 mm
Vegetation Type	Conifer-Hardwood mixed forest until January 2003, Young larch plantation from late October 2003 (ca. 30000 saplings (ca. 2500 saplings ha^{-1}; 0.04 tC ha^{-1}))
Dominant Species (Overstory)	*Quercus crispula*, *Betula ermanii*, *Betula platyphylla* var. *japonica*, *Abies sachalinensis*, *Picea jezoensis* (mixed forest), hybrid (*Larix gmelinii*×*L. kaempferi*) larch (young larch plantation)
Dominant Species (Understory)	*Sasa senanensis* and *Sasa kurilensis*
Canopy height	18–25 m (mixed forest), 1–2.5 m (larch plantation in 2006) —3.5(av. in 2011) m (larch plantation), 1.5 m (Sasa)
Age	Age of a tree (*Quercus crispula*; DBH is 58 cm) in the clear-cutting area was ca.165 years. In Autumn 2003, 2-year-old larch saplings were planted.
LAI	The plant area index (PAI) values for the canopy trees and the understory Sasa bamboos, measured using an LAI-2000 leaf-area meter (Li-Cor, Lincoln, NE, USA), were 3.2 and 4.1 m^2 m^{-2}, respectively, at this parameter's seasonal maximum in 2002 (Figure). From January to March 2003, trees covering an area of 13.7 ha were clear-cut. The total biomass volume of trees at the site was 2193 m^3 (Koike et al. 2001), of which 1203 m3 (ca. 25 Mg C ha^{-1}) were removed as logs by clear-cutting. Sasa was left intact under the snowpack, but 7 months later, just before the planting of hybrid larch seedlings (in late October 2003), they were strip-cut into alternating 4-m-wide cut and uncut rows in the clear-cut area to give space for the planting of ca 30 000 2-year-old hybrid larch (Larix gmelinii (Rupr.) Kuzen. ver japonica (Maxim. Ex Regel) Pilg. × L. kaempferi (Lamb.) Carrière) at a density of 2500 ha^{-1} (0.04 Mg C ha^{-1}). In the rows where Sasa remained, Sasa PAI increased steeply from 1 year after clear-cutting until 2007, reaching a peak at 8.0 m2 m^{-2} in 2010, which is about double the value in 2002 before clear-cutting. In the rows where Sasa was strip-cut, Sasa weeding in the strip cut rows was conducted from once (2005 and 2006) to three times (2004) per year between late May and late July until 2006. Weeding eliminated all Sasa growing between the larch trees. The Sasa was no longer weeded starting in 2007 because the larch was higher than the surrounding Sasa, and was able to receive enough solar radiation to grow without interference. Sasa soon recovered in the strip-cut rows, and in 2008, 2 years after the last weeding, the PAI was almost the same as that in the surrounding uncut rows, blanketing all gaps between the trees. On the other hand, the PAI of the larch remained low (1.7 m^2 m^{-2} in 2010) at its seasonal maximum and was minor compared with that of Sasa.
Soil type	The bedrock was Cretaceous sedimentary rock. The dominant soil was a Gleyic Cambisol (FAO 1988) with about 10 cm of O horizon, with a mor humus type, 20 cm of A horizon, and 30 cm of B horizon

3. Measurement Item

3-1. Meteorology

Observation items	Levels /Depth (from Nov. 2002)	Instrument
Global radiation (downward)	32 m	Thermopile type pyranometer (Kipp & Zonen, CM-21F)
Shortwave radiation (downward)	32, 3 m	Net radiometer (Kipp & Zonen, CNR-1)
Shortwave radiation (upward)	32, 3 m	Net radiometer (Kipp & Zonen, CNR-1)
Longwave radiation (downward)	32, 3 m	Thermopile type infrared radiometer (EPPLEY, PIR only at 32m), Net radiometer (Kipp & Zonen, CNR-1)
Longwave radiation (upward)	32, 3 m	Net radiometer (Kipp & Zonen, CNR-1)
Net radiation	32, 3 m	Net radiometer (Kipp & Zonen, CNR-1)
PAR (downward)	32, 3 m	Quantum sensor (LI-COR, LI-190SZ until May 2007), (EKO Instruments, ML-020P from May 2007)
PAR (upward)	32, 3 m	Quantum sensor (EKO Instruments, ML-020P) from May 2007
Direct/diffuse radiation	N.A.	N.A.
Direct/diffuse PPFD	N.A.	N.A.
Air temperature	32, 25, 21, 15, 10, 6, 4, 2 m (until April 2008) 32, 21, 10, 4, 2 m (from April 2008)	Ventilated platinum resistance thermometer (VAISALA, HMP45D)
Humidity	32, 25, 21, 15, 10, 6, 4, 2 m (until April 2008) 32, 21, 10, 4, 2 m (from April 2008)	Ventilated HUMICAP hygrometer (VAISALA, HMP45D)
Soil temperature	-1, -5, -10, -20, -40,-80, -120 cm (× 1 profile), -1, -5, -10 cm(×4 profiles)	Platinum resistance thermometer (CLIMATEC, C-PTWP)
Soil heat flux	-2 cm×5 points	Heat flow transducer (REBS, HFT-1.1)
Soil moisture	-5, -10, -30, -60 cm (×1 profile), -5, -10 cm (×4 profiles)	Water content reflectometer (CSI, CS615)
Wind speed	32, 25, 21, 15, 10, 6, 4 m (until April 2008) 32, 21, 10, 4 m (from April 2008)	Photo-electric cup anemometer (MetOne, 010C) (until April 2008) Photo-electric cup anemometer (MetOne, 010C) at 32 m and Ultrasonic wind sensor (Gill Instruments, WindSonic) at other heights (from April 2008)
Wind direction	32 m (until April 2008) 32, 21, 10, 4 m (from April 2008)	Photo-electric wind vane (MetOne, 020C) (until April 2008) Photo-electric wind vane (MetOne, 020C) at 32 m and Ultrasonic wind sensor (Gill Instruments, WindSonic) at other heights (from April 2008)
Atmospheric pressure	2 m	BAROCAP barometer (VAISALA, PTB210-C6C5A)
Precipitation	3 m	0.1 mm-pulse tipping-bucket rain gauge with heater (RM Young, CYG-52202)
Snow depth	Setting height: ca. 4m	Sonic ranging sensor (CSI, SR50)

3-2. Eddy correlation method

System	Open-(periodic & continuous from Apr. 2006) & Closed-path techniques
Wind speed	Sonic anemometer-thermometer (KAIJO, DA600-3TV, TR-61C), Sensor span:20 cm, Height at 32 m, ca. 10 m above canopy surface. After the clear-cut (from June 2003), another sonic anemometer-thermometer (KAIJO, DA600-3TV, TR-61A) has been set near the ground surface, Sensor span: 10cm, Height at 4.6 m (until May 2007) and 5.7 m (from May 2007)., ca. 3 m (in 2005) above canopy surface
Air temperature	Same as above
Water vapor	**Before the clear cut:** [Open-path method (periodic)] NDIR-gas analyzer (Data Design Group , OP-2), Sensor span: 20 cm, Separation distance: 20 cm, Height at 32 m, ca. 10 m above canopy surface, [Closed-path method] NDIR-gas analyzer（LI-COR, LI-7000）, Distance between gas inlet and NDIR: 6m, Height of gas inlet: 32m, ca. 10 m above canopy surface, Distance between gas inlet and anemometer: 15 cm. **After the clear cut:** [Open-path method (periodic)] NDIR-gas analyzer (Data Design Group , OP-2), Sensor span: 20 cm, Separation distance: 30 cm, Height at 4.6 m, ca. 4 m above canopy surface (from June to September 2003), NDIR-gas analyzer(LI-7500 , LICOR), Sensor span: 12.5 cm, Separation distance: 20 cm, Height at 4.6 m (until May 2007) and 5.7 m (from May 2007), ca. 3 m (in 2005) above canopy surface (from April 2006) [Closed-path method] Two NDIR-gas analyzers（LI-COR, LI-7000）, Distance between gas inlet and NDIR: 6 & 15 m, Height of gas inlet: 32 & 4.6 m (until May 2007) and 5.7 m (from May 2007), ca. 30 & 3 (in 2005) m above canopy surface, Distance between gas inlet and anemometer: 15 & 5 cm.
CO2	Same as above
Measurement height	See above
Sampling frequency	10 Hz
Averaging time	30 min
Data logger	DRM3 (TEAC Corp) (until Oct 2003), CR5000 (CSI) (from Nov 2003)
Data storage	MO & HD (until Oct 2003), HD card & HD (from Nov 2003)
Storing data (Raw data or statistics)	All the raw data are recorded and saved

3-3. Other

Soil respiration	Automated closed chamber (Liang et. al., 2003, Agricultural and forest meteorology, 123, 97-117) (June 2003- ongoing), 8 points for larch saplings (2004-2005), 8 points for *Sasa* (June 2004-2008) and 8 points for soil (ongoing, 10 points from 2012); Sampling interval: every 1 hour in snow free period
Photosynthesis	Sasa & Larch data in the above chamber measurement can be available for NEP estimation.
Ecological Investigation	**LAI**：Canopy and *Sasa* layers (LI-COR, LAI-2000) Sampling interval: ca. every 2 weeks (May 2001 – December 2002, before the clear cut), Larch saplings and remained *Sasa* rows (LI-COR, LAI-2000), Sampling interval: ca. every 2 weeks to 1 month (from May 2003 –, after the clear cut) **Biomass**：1. Tree DBH (and its inter-annual change (2000–2002)), species, crown size measurement in a 50×50 m quadrat beside the tower (2000), (Koike et. al., 2001, Eurasian Journal of Forest Research, 2, 65–79; Aguilos et al., 2014, Agricultural and Forest Meteorology, 197, 26-39) 2. Soil survey (2000, 2002), 3. 14ha experiment site wood biomass survey (2000) (Koike et. al., 2001, Eurasian Journal of Forest Research, 2, 65–79), 4. Biomass research of *Sasa* species (above and below the ground surface in 2001), 5. Biomass researches for dominant species (from 2001, 1 species for 1 year)(Takagi et al., 2010, Eurasian Journal of Forest Research, 13, 1-7), 6. Airborne LIDAR measurement (2002, 2004), 7. Larch growth observation (every year), 8. Fine root biomass & the turnover rate (Fukuzawa et. al., 2006, Forest Ecology and Management, 225, 257-261; Fukuzawa et. al., 2007, Ecological Research, doi: 10.1007/s11284-006-0031-y)

4. Note

250 m south from power generators (until February 2005) and 200 m west from unpaved road. There was a selection cutting in1961 (15% of trees) in this experimental area. Some trees around the tower had been cut in advance, to prevent causing damage to the tower when trees were clear-cut. During January to March 2003, trees in the area of 13.7 ha were clear-cut. Preliminary research revealed that the total biomass volume of trees in this area was 2193 m^3 (Koike et. al., 2001 , Eurasian Journal of Forest Research, 2, 65−79) and this cutting removed the woods of 1203 m^3 (ca. 19 tC ha^{-1}) from this ecosystem. *Sasa* bamboos (the above ground biomass is 6–12 tC ha^{-1}) under the snowpack had been kept intact during the clear-cutting period in winter, however in order to plant larch saplings, those were strip-cut into 4 m rows (a half of the clear cut area) seven month after the clear-cutting and just before the plantation (late October 2003). ca. 30000 saplings (ca. 0.04 tC ha^{-1}) of 2-year old hybrid larch were planted in Oct. 2003.

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[No.5] A Watershed-Scale Experiment on the Carbon Cycle of a Larch Plantation "CC-LaG (Carbon Cycle and Larch Growth) Experiment"

[No.8] Report on Larch Planting Ceremony and Workshop at CC-LaG (Carbon Cycle and Larch Growth) Experiment Site

[No.21] Report on the FLUXNET synthesis workshop 2007.