(Date: 6 October 2022)

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1. General Information

Site name (three letter code)	Teshio CC-LaG experiment site (TSE)
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Observation period	2001 to ongoing
Measurement frequency	Continuous
Infrastructure	**Tower:** 32 m（Climbable）& 5m **Electrical power:** By commercial power line from February 2005. AC100&200V are available. **Facilities for communication:** Mobile phone is available at the tower top. **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	Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, Culture, Sports, Science and Technology
Research fund #2	
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)	45deg03'21" N, 142deg06'26" E Elevation: ca.70m, 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	>1km (mixed forest), 200−500 m (after clear-cutting)
Climate (Köppen Climate Classification)	Cool-temperate (Snow – fully humid – warm summer [Dfb])
Mean annual air temperature	5.7degC
Mean annual precipitaion	1000mm
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)
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	3 and 4−4.5 in a full-growing period for canopy and *Sasa* layer, respectively in the mixed forest, Larch LAI in the stripe-cut row is ca. max 1.3 in 2005 and *Sasa* in the remained row is increasing (ca. max 5.7 in 2005) after the clear-cutting (measured by LAI-2000, LI-COR)
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)
PAR (upward)	N.A.	N.A.
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	Ventilated platinum resistance thermometer (VAISALA, HMP45D)
Humidity	32, 25, 21, 15, 10, 6, 4, 2 m	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	Photo-electric cup anemometer (MetOne, 010C)
Wind direction	32 m	Photo-electric wind vane (MetOne, 020C)
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: 10 cm, Height at 4.6 m, 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: 32 m, 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 Septerber 2003), NDIR-gas analyzer (LI-7500 , LICOR), Sensor span: 12.5 cm, Separation distance: 20 cm, Height at 4.6 m, ca. 3 m (in 2006) 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, ca. 30 & 3 (in 2005) m above canopy surface, Distance between gas inlet and anemometer: 15 & 5 cm.
CO_2	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-), 8 points for larch saplings (2004-2005), 8 points for *Sasa* (June 2004-) and 8 points for soil; 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 − Decemver, 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), 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), 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.,

	2006, 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 in 1961 (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.

Publications

Fukuzawa, K., Shibata, H., Takagi, K., Satoh, F., Koike, T. and Sasa, K. (2006) Vertical distribution and seasonal pattern of fine-root dynamics in a cool-temperate forest in northern Japan: implication of the understory vegetation, *Sasa* dwarf bamboo. *Ecological Research*, in press.

Tsuji, H., Nakatsuka, T. and Takagi, K. (2006) $\delta^{18}O$ of tree-ring cellulose in two species (spruce and oak) as proxies of precipitation amount and relative humidity in northern Japan. *Chemical Geology*, 231, 67-76.

Fukuzawa, K., Shibata, H., Takagi, K., Nomura, M., Kurima, N., Fukazawa, T., Satoh, F. and Sasa, K. (2006) Effects of clear-cutting on nitrogen leaching and fine root dynamics in a cool-temperate forested watershed in northern Japan. *Forest Ecology and Management*, 225, 257-261.

Takagi, K., Nomura, M., Ashiya, D., Takahashi, H., Sasa, K., Fujinuma, Y., Shibata, H., Akibayashi, Y. and Koike, T. (2005) Dynamic carbon dioxide exchange through snowpack by wind-driven mass transfer in a conifer-broadleaf mixed forest in northernmost Japan. *Global Biogeochemical Cycles,* 19*,* GB2012, doi: 10.1029/2004GB002272.

Takagi, K., Nomura, M., Fukuzawa, K., Kayama, M., Shibata, H., Sasa, K., Koike, T., Akibayashi, Y., Fujinuma, Y., Inukai, K. and Maebayashi, M. (2005) Deforestation effects on the micrometeorology in a cool-temperate forest in northern Japan. *Journal of Agricultural Meteorology,* 60, 1025-1028.

Kayama, M., Kitaoka, S., Koike, T., Quoreshi, A.M., Takagi, K., Satoh, F., Wang, W., Shi, F., Sugata, S., Hojyo, H., Sugishita, Y., Nomura, M., Akibayashi, Y., Matsuura, Y. and Sasa, K. (2001) Photosynthetic capacity of hybrid larch and dwarf bamboo grown in the Teshio Experimental Forest located at the border between Russia and Japan. *NIES/CGER report of the National Institute of Environmental Studies*, 105-108.

Wang, W., Kitaoka, S., Koike, T., Quoreshi, A.M., Takagi, K., Kayama, M., Ishida, N., Mamiya, H., Shi, F., Zu, Y. and Sasa, K. (2001) Respiration of non-photosynthetic organs and forest soil of Japanese larch plantation and its contribution to CO_2 flux estimation. *NIES/CGER report of the National Institute of Environmental Studies*, 119-123.

Shi, F., Xiangwei, C., Wang, W., Takagi, K., Akibayashi, Y., Sasa, K. and Uemura, S. (2001) Vegetation Characteristics of a Larch-dominant Site for CO_2 Flux: Monitoring Study at the Laoshan Experimental Station in Northeast China. *Eurasian Journal of Forest Research*, 3: 55-67.

Koike, T., Hojyo, H., Naniwa, A., Ashiya, D., Sugata, S., Sugishita, Y., Kobayashi, M., Nomura, M., Akibayashi, Y., Nakajima, J., Takagi, K., Shibata, H., Satoh, F., Wang, W., Takada, M., Fujinuma, Y., Shi, F., Matsuura, Y. and Sasa, K. (2001) Basic data of the study site for CO_2 flux monitoring of a young larch plantation located in the border between northern Japan and far east Russia--Current status of a mature mixed conifer-hardwood forest stand --. *Eurasian Journal of Forest Research*, 2, 65-79.