



Associated ICOS Ecosystem Station Labelling Report

Station: FI-Kmp (Kumpula)

Viterbo (Italy), Antwerp (Belgium), Bordeaux (France), October 28th 2019

Description of the Labelling procedure

Associated stations have a simplified, one step labelling procedure. After a first general evaluation of the station to ensure the compatibility with the ICOS aims and standard, proposed stations must submit data and metadata. There is a list of mandatory variables and related metadata that must be measured and submitted by an Associated station in order to get and maintain their status and it is reported in Table 1. Calculated fluxes and processed data at the final time resolution must be submitted

Table 1. List of variables and metadata that Associated stations must submit

Variable	Specifications	Metadata
GHG flux	At least one GHG flux + concentration (30 minutes resolution) among CO ₂ , CH ₄ and N ₂ O measured with eddy covariance. In case of forest storage flux measured using a vertical profile.	Description of the system (sensors and setup), description of the processing applied to calculate the fluxes.
Incoming radiation	At least one between SW_IN and PPFD_IN, representative of the target area	Description of the system (sensors and setup)
Air Temperature	Representative of the target area	Description of the system (sensors and setup)
Relative Humidity	Representative of the target area	Description of the system (sensors and setup)
Precipitation	Representative of the target area	Description of the system (sensors and setup)
Horizontal wind speed/direction	Representative of the target area	Description of the system (sensors and setup)
Maximum LAI	LAI or GAI measured at its maximum in the year. Method not prescribed.	Description of the method used.
Above Ground Biomass	Above ground biomass, for annual vegetation the biomass at the maximum in the year	Description of method used.
Soil texture	Average soil texture at the site	Description of method used.
Management and disturbances	Info on the disturbances occurring at the site and management practices	-----

In addition to the mandatory variables, the Associated stations can and are invited to submit other micrometeorological and ancillary data collected at the site that can help to better interpret and analyze the flux variables.

The station must be active, submit at least one year of data and continue to submit the data at least yearly by end of February of the year after the acquisition.

Labelling report

The station started the labelling on April 13th 2017 and completed the data and metadata submission on August 2019. Here below a summary of the submitted data and metadata is reported.

Station Description

The station Kumpula (having ICOS code FI-Kmp) is an urban ecosystem located in Helsinki, Finland. The station is situated on the University of Helsinki campus in Kumpula around 4 Km North-East of Helsinki City Centre. The site is characterized as “an open low-rise” area according the local climate zone classification. Within 1 Km radius circle around the tower, 49% of the surface is covered with vegetation, 15% with buildings and 36% with paved surfaces. The surroundings can be divided into three areas: built, road and vegetation. At the built area in the North (320–40°) in the foreground of the tower the University of Helsinki campus buildings and Finnish Meteorological Institute are located (mean height 15 m) with further away suburban apartments with low building heights and small gardens. In the road area to the East (40–180°), a large road with 44 000 vehicles per workday passes the mast at closest distance of 150 m (Vesala et al., 2008). There are also large crossroads with several traffic lights located in the area. The area between the road and the tower is covered with mixed broadleaf forest (e.g. *Betula pendula* Roth, *Acer platanoides* L., *Populus tremula* L., *Quercus robur* L., *Ulmus glabra* Huds., *Salix caprea* L. and *Prunus padus* L., mean tree height 10 m) and the area behind the road is covered with combined mix of residential and commercial buildings. In the vegetation area to the west (180–320°), the University Botanical Garden and City Allotment Garden are located resulting in a high surface fraction of vegetation. Here the vegetation is highly managed and consists of both native and non-native tree and shrub species including some agricultural vegetation.

As the station is located in an urban area, there have been substantial land use changes in the past, but the surroundings were stabilized in 2000s and no recent changes have taken place.

The station coordinates are: Lat. 60.20289 °N, Long. 24.9611 °E. The elevation above sea level is 26 m and the UTC offset is equal to +02.

The site is marked by the following climate characteristics:

- Average annual temperature: 5.9 C°
- Average total annual precipitation: 655 mm
- Average annual incoming radiation: 108.6 W m⁻²

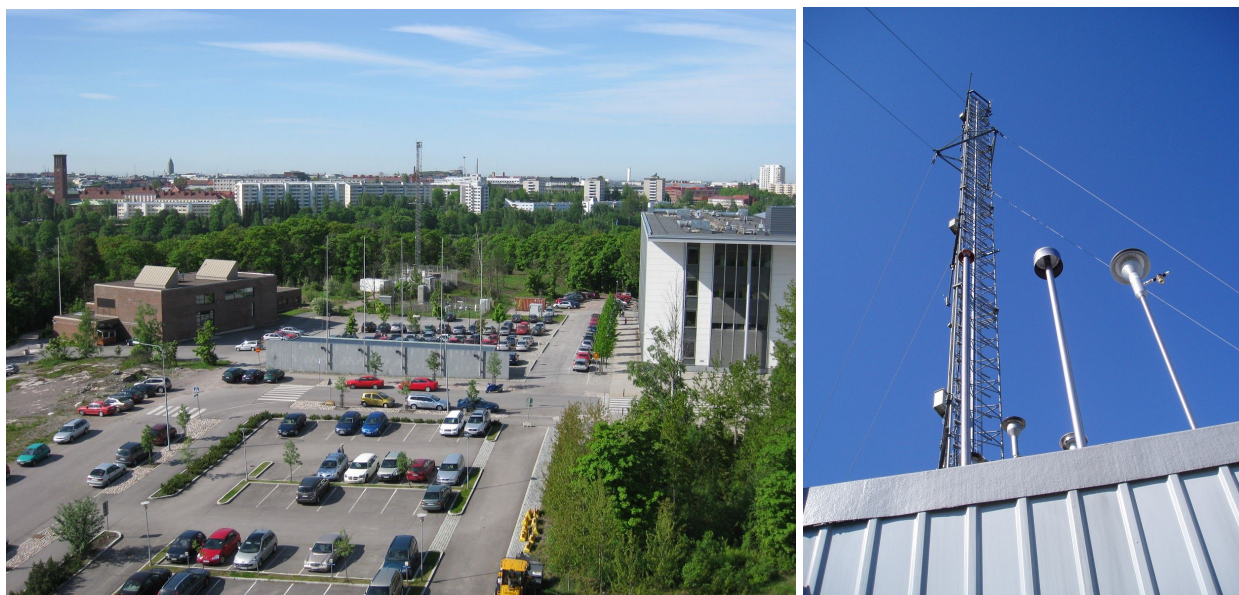


Figure 1- FI-Kmp Tower

Team description

The staff of the site has defined and communicated in September 2017. It includes in addition to the PI, the scientific and technical experts. Below the summary of the Team Members is reported.

Tab. 2 - Team members of site

MEMBER_NAME	MEMBER_INSTITUTION	MEMBER_ROLE	MEMBER_MAIN_EXPERT
Leena Järvi	University of Helsinki	PI	MICROMET
Pasi Kolari	University of Helsinki	DATA	DATAPROC
Petri Keronen	University of Helsinki	TEC-FLX	MICROMET
Erkki Siivola	University of Helsinki	TEC-FLX	MICROMET

Metadata about the sensors

The metadata were sent between November 2017 and August 2019 and for each of the measured variables the sensor has been described, communicating the model, the serial number, its position (height, eastward and northward distances). The Eddy station is characterized by one analyzer LI-COR and an anemometer Metek as reported in the underlying Table 3:

Tab. 3 - The Eddy Covariance system

MODEL	SN	HEIGHT (m)	EASTWARD_DIST (m)	NORTHWARD_DIST (m)
GA_CP-LI-COR LI-7200	72H-0316	31	0	0

SA-Metek uSonic-3 Scientific	103102682	31	0	0
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A set of instruments located near the tower measure the following variables: Radiations (Long and Short wave), PPFD, air pressure and relative humidity, a temperature profile, precipitation. Being an urban site no soil variable is measured.

Tab. 4: The installed sensors and relative codes for the measured meteo variables

MODEL	SN	HEIGHT (m)	EASTWARD_DIST (m)	NORTHWARD_DIST (m)	VARIABLE_H_V_ R
TEMP-ElectResis	KU-B35	31	0	0	TA_1_1_1
TEMP-ElectResis	KU-B34	16	0	0	TA_1_2_1
TEMP-ElectResis	KU-B33	8	0	0	TA_1_3_1
TEMP-ElectResis	KU-B32	4	0	0	TA_1_4_1
RAD-Other	3520	31	0	0	SW_IN_1_1_1
RAD-Other	3521	31	0	0	SW_OUT_1_1_1
RAD-LW Pyrgeom	3478	31	0	0	LW_IN_1_1_1
RAD-LW Pyrgeom	3479	31	0	0	LW_OUT_1_1_1
RAD-PAR Quantum	040441	24	120	190	PPFD_IN_1_1_1
RH-Other	X0420002	24	120	190	RH_1_1_1
PRES-ElectBar	W31105	24	120	190	PA_1_1_1
PREC-OpticGauge	KA4310019	24	120	190	P_1_1_1
					P_SNOW_1_1_1

Ancillary data

To describe the site, the climatic annual averages of temperature, precipitation and radiation (shortwave) have been sent in August 2019 (see the Station Description paragraph). The dates in the of planting in the vegetated areas in the past have been reported.

Further and detailed ancillary data have been provided, and in particular:

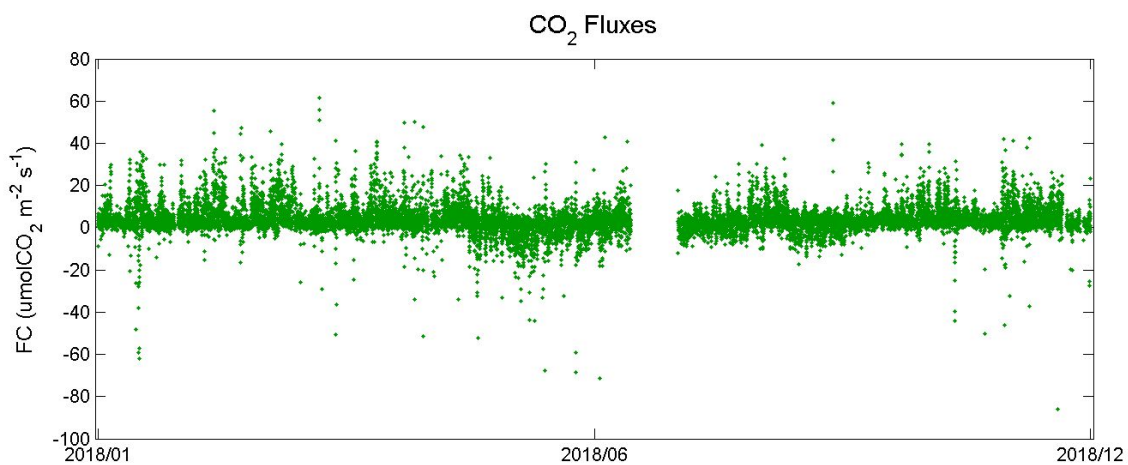
- **LAI:** $6.4 \text{ m}^2 \text{ m}^{-2}$ calculated from a sample of 386 observations using the methodology Lidar and allometric equations, period 2010-2012. The average value in the whole footprint area is $1.9 \text{ m}^2 \text{ m}^{-2}$.
- **Biomass:** 750 gC m^{-2} calculated in the vegetation area from the same sample, period 2010-2012. The average value in the whole footprint area is 112 gC m^{-2} .

Submitted data

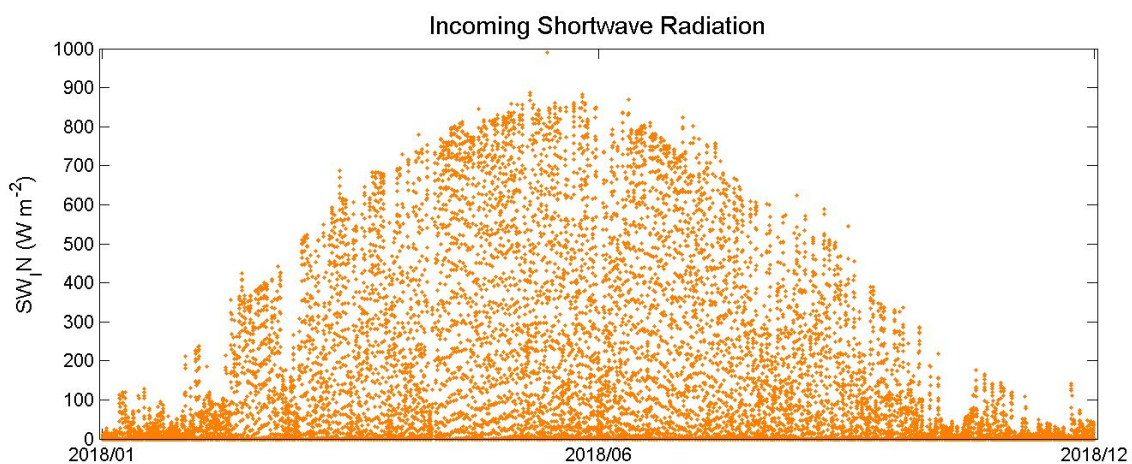
As requested in the labelling procedure, continuous data have been submitted for the period January-December 2018. The file has been uploaded in August and it includes eddy covariance fluxes and meteorological measurements. The flux variables (CO₂ flux, sensible and latent heat flux) report also the Steady State and Integral Turbulence Characteristics tests results according to Foken et al. 2004. The uploaded meteo variables are listed in Table 4.

In the following figures plots of some of the key variables are presented as examples in order to evaluate the data continuity and coverage.

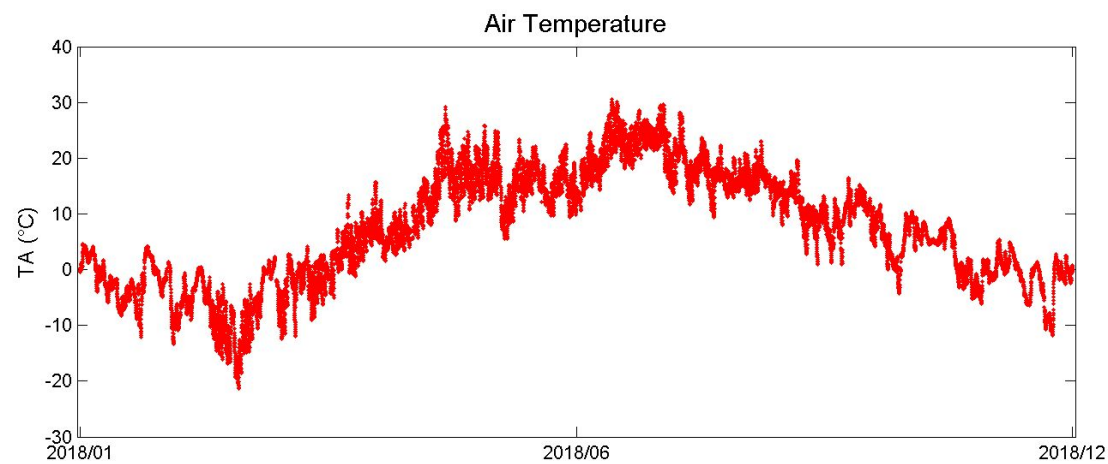
CO₂ fluxes measured with eddy covariance:



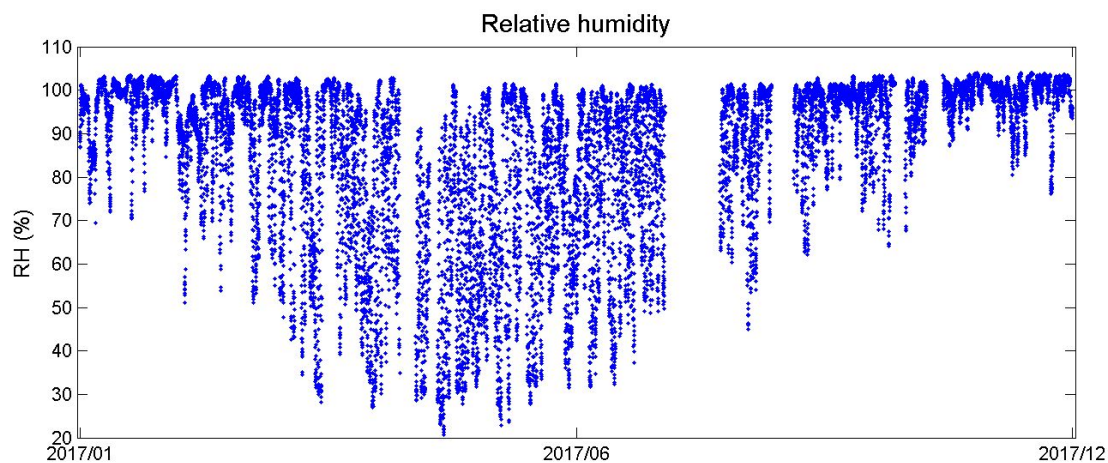
Incoming shortwave radiation:



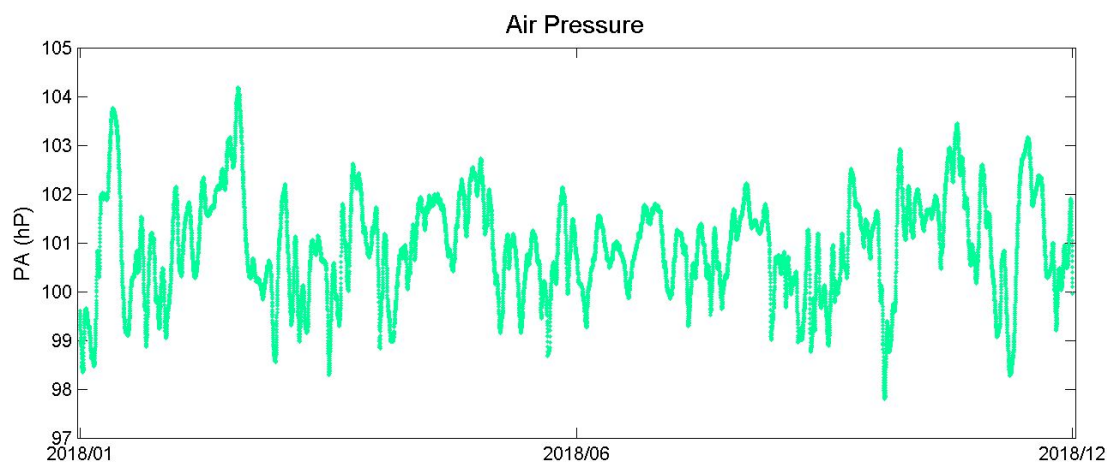
Air temperature:



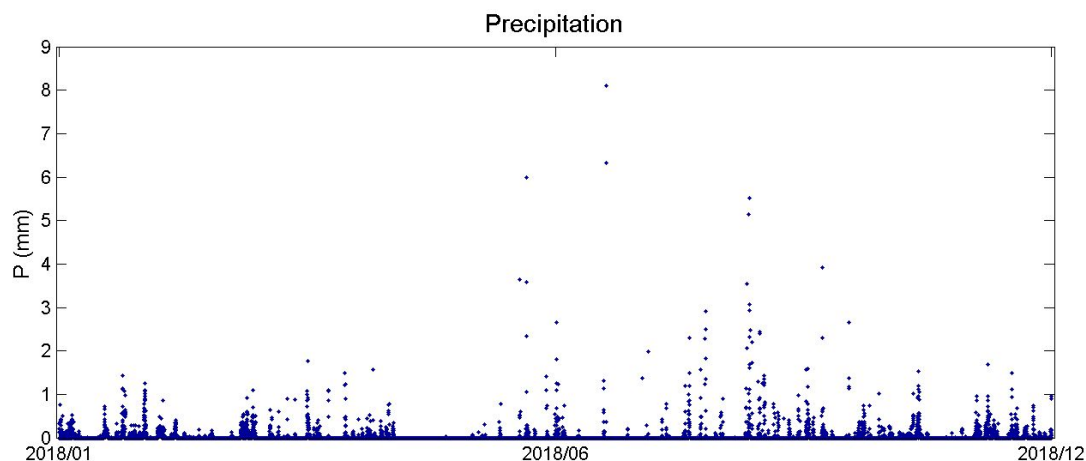
Relative humidity:



Air pressure:



Precipitation:



Labelling summary and proposal

On the basis of the activities performed and data submitted and after the evaluation of the team capacity to be compliant with the ICOS requirements for Associated Ecosystem Stations we recommend that the station Kumpula (FI-Kmp) is labelled as ICOS Associated Ecosystem station.

October 28th 2019

Dario Papale, ETC Director