



# **Associated ICOS Ecosystem Station Labelling Report**

**Station: CH-BaK (Basel Klingelbergstrasse)**

*Italy, Belgium, France, October 9<sup>th</sup> 2024*

## 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 <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> 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 in January 2024 and completed the data and metadata submission in September 2024. Here below a summary of the submitted data and metadata is reported.

### Station Description

Basel Klingelbergstrasse (ICOS code CH-BaK) is an urban ecosystem station located in the city center of Basel, Switzerland. The station is situated on the flat roof top of the 20 m high building (260 m a.s.l.), where the Atmospheric Sciences Group of the University of Basel is located. The greenhouse gas flux and most meteorological measurements are made on top of a 18 m high lattice tower (39 m above ground level). The neighbourhood of the site is mainly characterised by the inner ring street Klingelbergstrasse to the east with heavy traffic (15000 vehicles per workday), oriented along the 200°/20° axis, and by residential buildings enclosing green backyards to the west. Furthermore, some tall university buildings are located approximately 250 m to the north and the northeast of the site. Within a 400 m radius circle around the tower, 38 % of the surface is covered by buildings (mean height 17 m), 20 % is paved, 29 % is covered by vegetation (14 % trees, 15 % grass/soil) and 13 % are roads (Stagakis et al., 2023). Due to a combination of wind direction (characterised by two main wind sectors) and the approximately N-S orientated axis of a canyon that leads to nearly perpendicular, the emissions from the eastern sector are high and have a significant contribution from traffic, while the fluxes from the western mainly residential area are lower and dominated by heating in the winter season.

Station coordinates in the WGS system are: Latitude 47.56173 °N, Longitude 7.58049 °E. The elevation is 273 m above sea level, the UTC offset is equal to +01. The site is marked by the following climate characteristics:

- Average annual temperature: 10.9 °C
- Average total annual precipitation: 842 mm
- Average annual incoming shortwave radiation: 150 W m<sup>-2</sup>
- Average annual number of days of snow cover: 15 days



Figure 1 - CH-BaK tower

## Team description

The staff of the site has been defined and communicated in April and it includes in addition to the PI only a CO-PI. Below the summary table of the actual Team members is reported.

Table 2: Team members of site

MEMBER_NAME	MEMBER_INSTITUTION	MEMBER_ROLE
Christian Feigenwinter	University of Basel	PI
Stavros Stagakis	University of Basel	CO-PI

## Metadata about the sensors

The metadata were sent in August 2024 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 characterised by one analyzer LI-COR and one anemometer Gill as reported in the underlying Table 3.

Table 3: The Eddy Covariance system

MODEL	SN	HEIGHT (m)	EASTWARD_DIST (m)	NORTHWARD_DIST (m)
GA_OP-LI-COR LI-7500A	75H-0556	39	0	2
SA-Gill HS-100	H000046	39	0	2

A set of instruments are located near the tower measuring the main meteorological variables such as radiations (Long and Short wave), air temperature and relative humidity, air pressure, precipitation, wind direction and speed. As the site is located in an urban ecosystem, no soil variables are measured. The main sensors and variables are reported in the following Table 4.

Table 4: The meteorological measurement sensors

MODEL	SN	HEIGHT (m)	EASTWARD_DIST (m)	NORTHWARD_DIST (m)	VARIABLE_H_V_R
RAD_4C-Hukseflux NR01	2306	38	0	-3	SW_IN_1_1_1
					SW_OUT_1_1_1
					LW_IN_1_1_1
					LW_OUT_1_1_1
					NETRAD_1_1_1
RHTEMP-Meteolabor Thygan VTP	148	39	1	1	RH_1_1_1
					TA_1_1_1
PRES-Vaisala PTB10X(X)	R0630004	21	4	8	PA_1_1_1
PREC-OTT Pluvio2	193850	21	1	-3	P_1_1_1
SA-Gill HS-100	H000046	39	0	2	WD_1_1_1
					WS_1_1_1
					WS_MAX_1_1_1

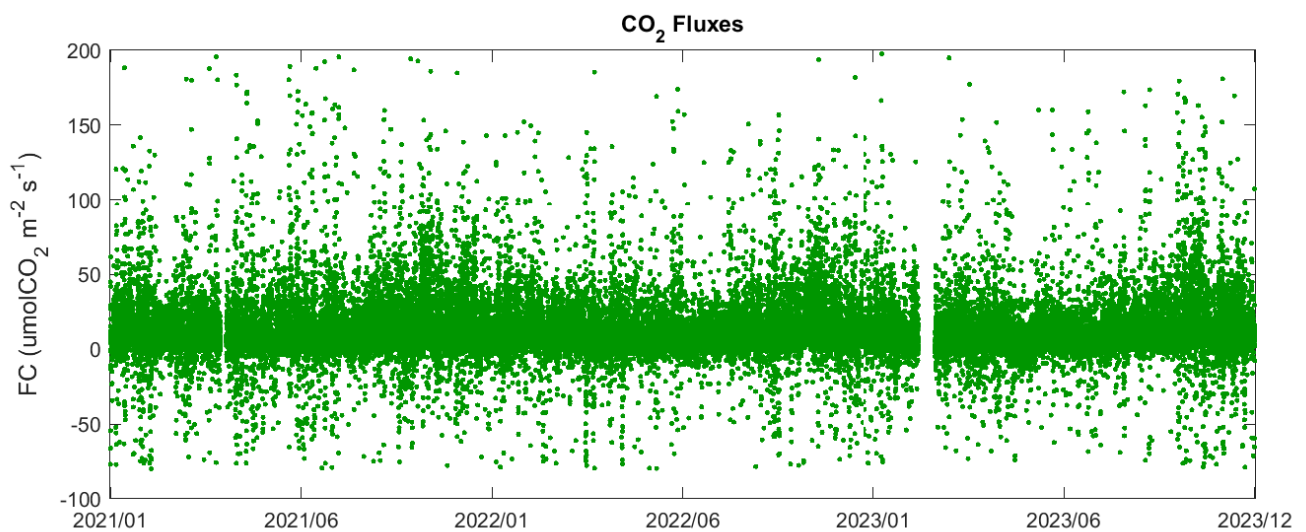
## Ancillary data

The site is located in the centre of an urban area, ancillary variables such as canopy height, biomass and LAI are not currently measured.

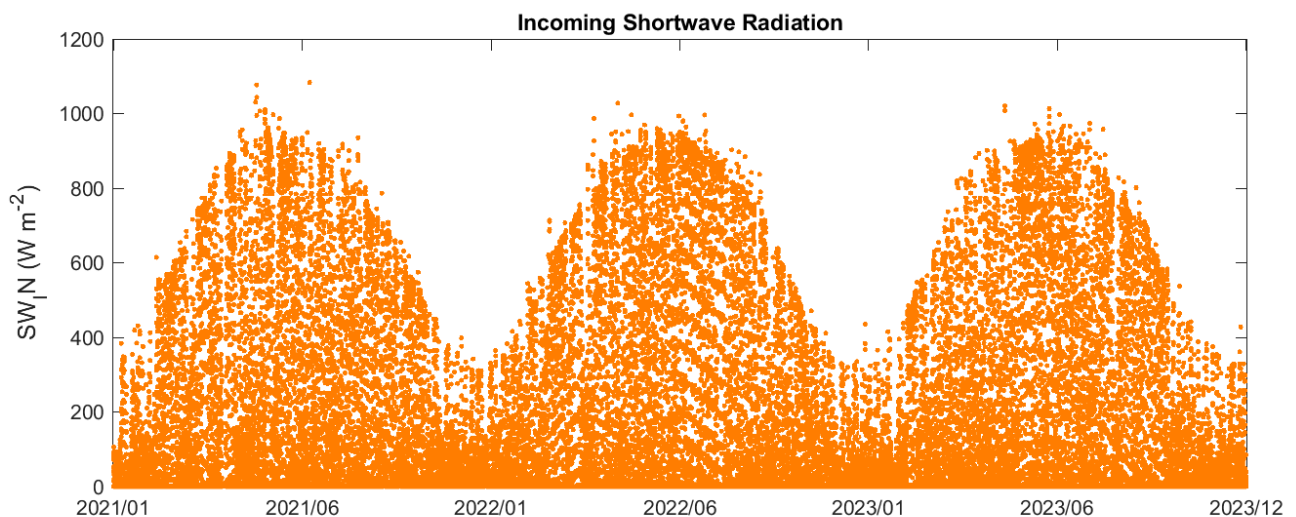
## Submitted data

As requested in the labelling procedure, continuous data have been submitted for the period January 2016 - December 2023. The files were uploaded in August and they include Eddy Covariance fluxes and meteo measurements. The uploaded meteo variables are listed in Table 4. In the following figures plots of some of the key variables for the period 2021-2023 are presented as examples in order to evaluate the data continuity and coverage.

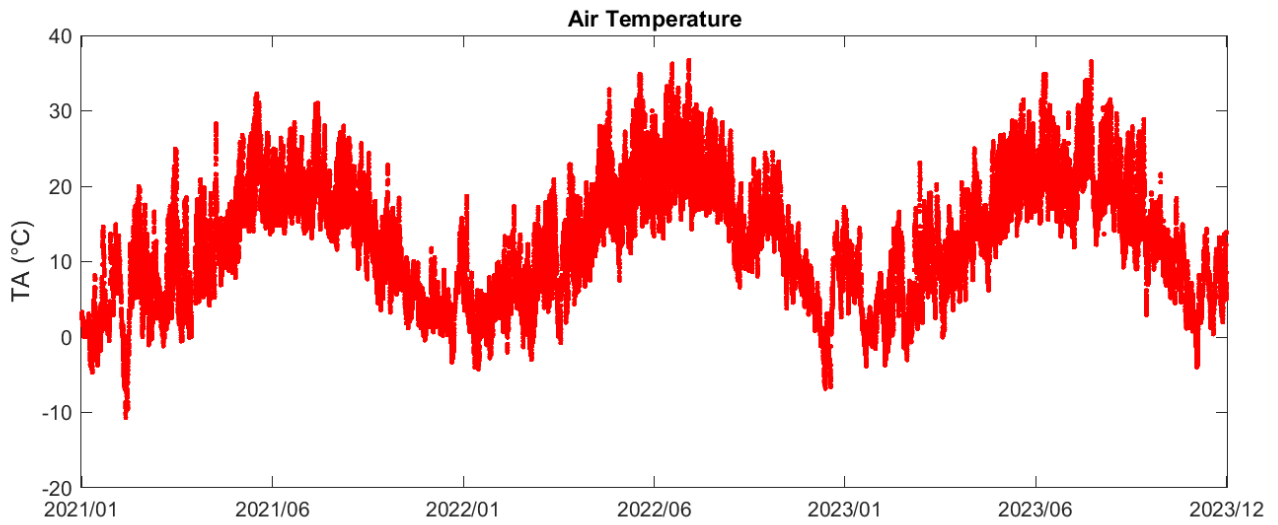
### CO<sub>2</sub> fluxes measured with eddy covariance (39 m)



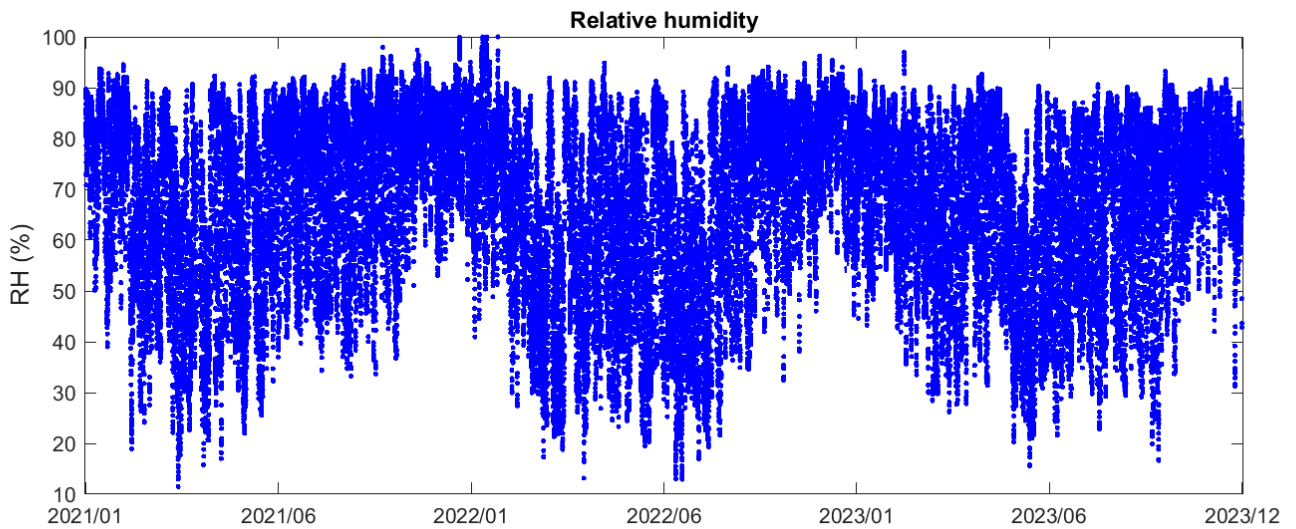
### Incoming shortwave radiation (38 m)



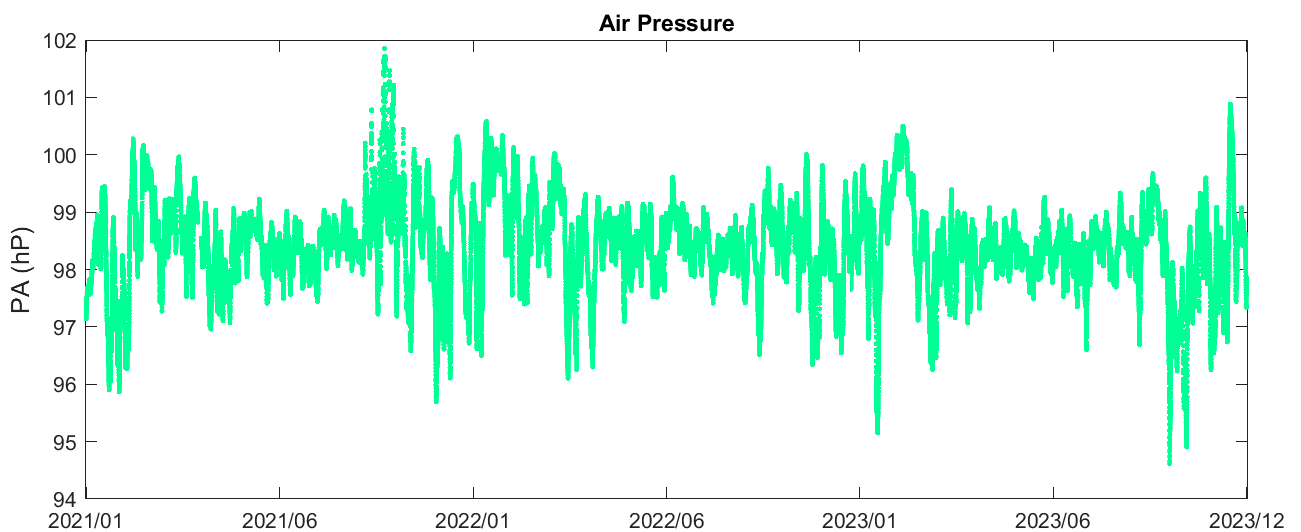
Air temperature (39 m)



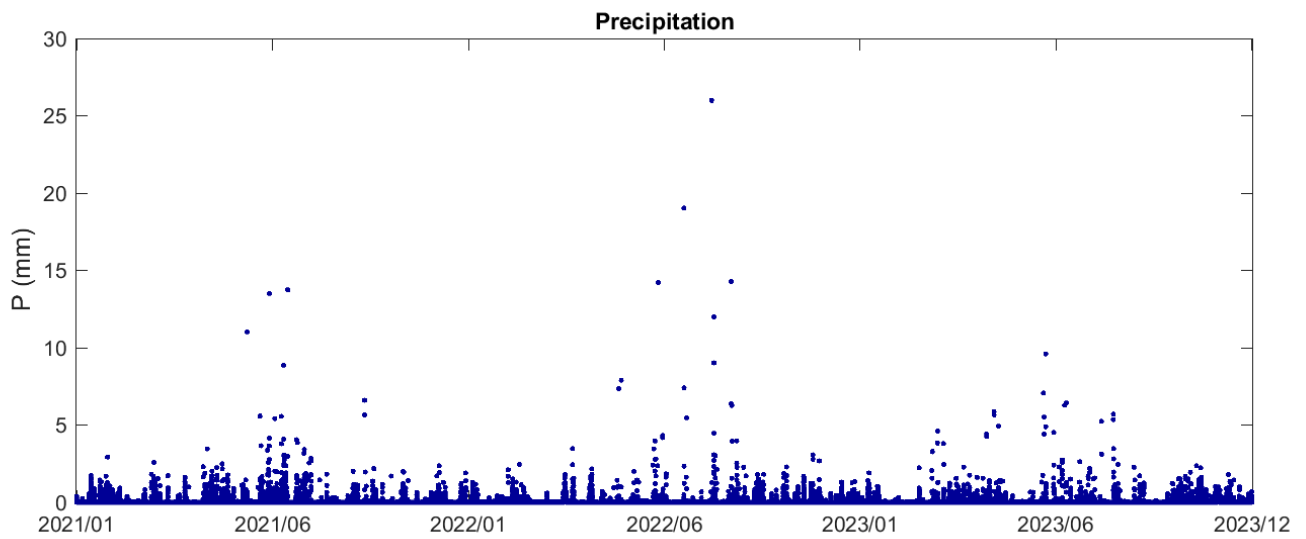
Relative humidity (39 m)



Air pressure (21 m)



## 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 Basel Klingelbergstrasse (CH-BaK) is labelled as ICOS Associated Ecosystem station.

October 9<sup>th</sup> 2024

Dario Papale, ETC Director