Action title:

FAIR NEtwork of micrometeorological measurements

Action No.: **CA20108**

Acronym: **FAIRNESS**

Action chair: Branislava Lalić

WP No: **2**

WP leader: Mark Roantree

Deliverable writers: Ana Firanj Sremac (Serbia), Jan Geletič (Czech Republic)

Deliverable contributors:

Deliverable: **D2.4 – Report on planned case studies (M18)**

Date: **10.04.2023.**

This deliverable is a result of the work caried out under the task T2.3 Case studies design, which combined activities: A2.3.1 Design of in situ/regional case studies in order to test the Action application potential, and A2.3.2 Implementation and monitoring of the case studies. The activities in this task started from M06 of the action.

The case studies (CS) are initially introduced into the action to demonstrate the effectiveness of FAIRNESS network in creating added value and innovation in different research and application fields. Case studies are designed according to region-specific challenges in rural, urban, rural-to-urban and urban-to-rural areas to identify and assess spatio-temporal weather-to-environment related effects and minimize risks for site-specific human activities that cannot be achieved without international coordination. All data used or produced by the CS are a part of the micrometeorological knowledge share platform (Micromet_KSP) and in accordance to the FAIR data principles.

Currently two CS's are active, one is in the process of activation, one has finished and few are in plan. The list of the active CS's, and how to contribute to the active CS or create new is explained on the project web page (https://www.fairness-ca20108.eu, https://www.fairness-ca20108.eu/documents/case-studies/). Also CS's can be tracked with Case Study Tracker (CST) where all CS's are listed together with all participants and work related details (link). Here we give a short overview of the open and finished CS's with the focus of the CS expected outcome. The CST will stay active until the end of FAIRNESS and beyond as a point of collection of CS related details.

Open case studies:

CS1: Research pilot in urban area of Novi Sad (Serbia)

Persons involved: Stevan Savic (RS), Jelena Dunjic (RS), Milica Vasic (RS)

Short description:

Our research aims to investigate the impact of various urban designs on outdoor thermal conditions. To achieve this, we use mobile devices such as the Kestrel heat tracker and micrometeorological carts (MMCs) to monitor micro-level thermal comfort in outdoor spaces. These instruments are particularly useful during extreme heat events, and we plan to conduct measurement campaigns in 2022/2023. As part of our case study, we may include some field monitoring to collect data using these instruments. The data we gather from these devices provide different thermal comfort parameters that will be valuable for our analysis.

The second part: We possess historical datasets from 17 stations in the urban area of Novi Sad. These datasets consist of 1-hour resolution data recorded from July 2014 to December 2017, specifically on temperature (Ta) and relative humidity (RH). However, the network used to gather these datasets is no longer operational. Despite this, we can utilize these datasets to calculate outdoor thermal comfort indices such as the Physiological Equivalent Temperature/ Mean Radiant Temperature (PET/Tmrt). These OTC indices can be incorporated into the Micromet_KSP and prove useful for researchers.

Expected participants: Students and early carrier researchers willing to be involved in campaign measurements and production of data sets which will be added to the Micromet_KSP, or persons which will use our measurement setup in different regions or previously recorded data in their research.

Expected outcome: data set, master thesis and joint research papers

CS2: Case study focused on season transitions in rural and urban area derived from micrometeorological measurements

Persons involved: Branislava Lalic (RS), Ana Firanj Sremac (RS), Anastasia Paschalidou (EL)

Short description:

Vegetation is a climate modifier - primary like Amazonian Forest or secondary such as agricultural fields of Pannonian lowlands in Central Europe. At the time of growing season start enhanced evapotranspiration shifts energy balance partition towards latent heat flux. This surface flux alteration converges into the boundary layer, and can be detected in the daily variations of air temperature and humidity as well as daily temperature range records.

The following indices will be used in order to assess phenology impact and season transitions in daily micrometeorological records.

a) A daily afternoon average relative humidity ($R1 = q/q_{sat}(T_{max})$), calculated using average daily specific humidity (q) and maximum temperature (T_{max}), identifies the minimum daily relative humidity. It is expected that the R1 annual signal will reflect the influence of plant phenology and consequent changes in surface fluxes partitioning.

b) Relative humidity R2 ($R2 = q_{sat}(T_{min})/q_{sat}(T_{max})$) is calculated to check the impact of plant development on the daily ratio of humidity "stored" in nocturnal/early morning RSL occupied by canopy ($q_{sat}(T_{min})$) and humidity in the well-developed layer associated with T_{max} ($q_{sat}(T_{max})$).

Expected participants: Students and researchers who want to test the selected indices on their data. Data sets produces will be introduced to Micromet_KSP.

Expected outcome: joint research papers, conference presentations and research proposals.

Planed case studies – in activation process

CS3: Data gap filling

Persons involved: Steven Caluwaerts (BE), Branislava Lalic (RS)

Short description:

Gaps in meteorological data are a prevalent issue in measurement networks and experimental campaigns. In particular, if an automated weather station (AWS) is used to collect data, data gaps can occur due to issues with data transfer, data logging, sensor malfunctions, exceptional equipment maintenance, or the removal of erroneous data. Complete data series are crucial if the measurement network aims not only to monitor microclimate but also provide input data for various assessment studies and models, such as those in agriculture, hydrology, or urban modelling. This CS is focused on collecting the methods for gap filling present in the practice, testing their efficiency as well as producing some newly FAIRNESS developed tools. Proposed methods shall be tested regarding data origin (urban, non-urban data) and gap characteristics and classification (length, frequency).

Expected participants: Students and researchers who want to test the selected methods and be involved in testing new methodology in gap filling.

Expected outcome: joint research papers, conference presentations and research proposals.