

Determination of the size of the gas flux

The flux size was determined from the following formula:

$$E = \frac{dm}{Fdt} = \rho \frac{V_k}{F} \frac{dc}{100dt} = \rho_n \frac{P}{P_n} \frac{T_n}{T} \frac{V_k}{F} \frac{dc}{100dt}$$

where:

E - gas flux [$\text{kg m}^{-2}\text{s}^{-1}$]

dm - mass of gas flowing through the surface F over time dt [kg]

ρ - CO_2 density under measurement conditions [kg m^{-3}]

ρ_n - CO_2 density under normal conditions [1.977 kg m^{-3}]

V_k - active volume of the accumulation chamber [m^3]

F - surface area through which gas flows into the accumulation chamber [m^2]

P - atmospheric pressure during gas measurement [bar]

P_n - normal pressure [1.01325 bar]

T_n - normal temperature [273.15 K]

T - temperature during gas measurement [K]

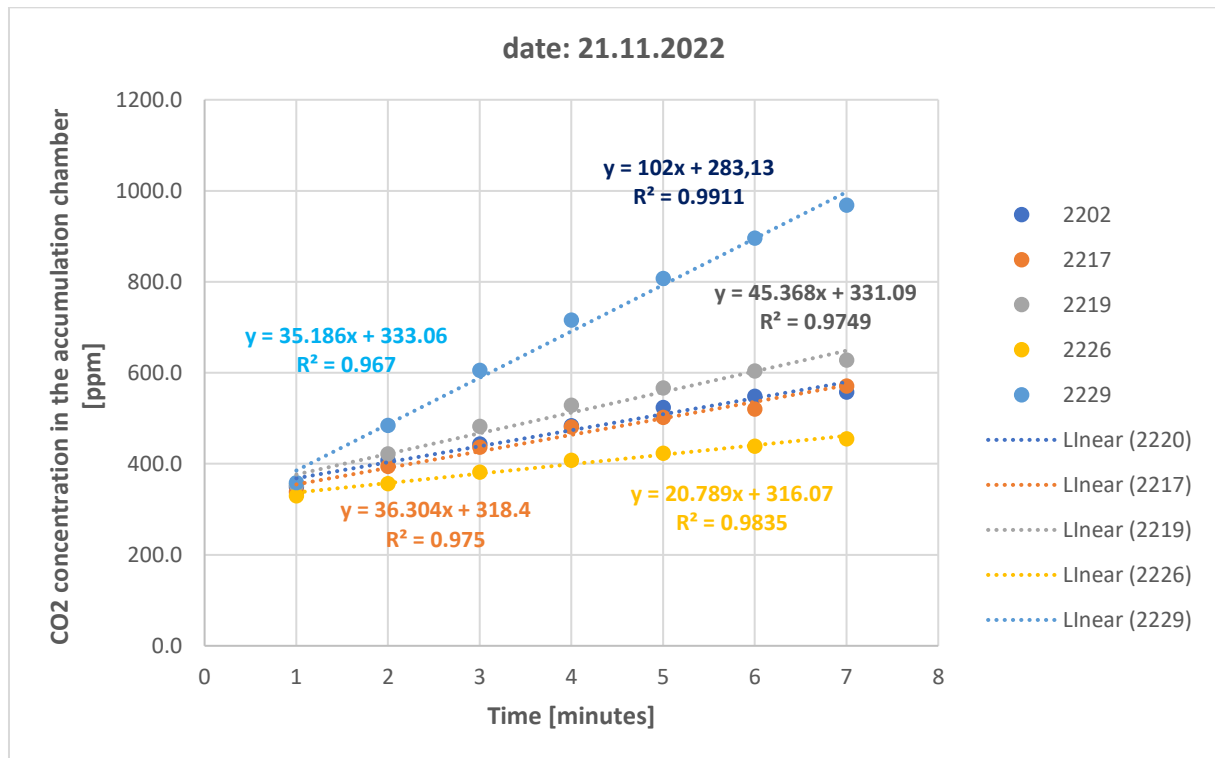
dc - change in the volumetric concentration of gas in the chamber over time dt [%vol]

dt - time increment [s]

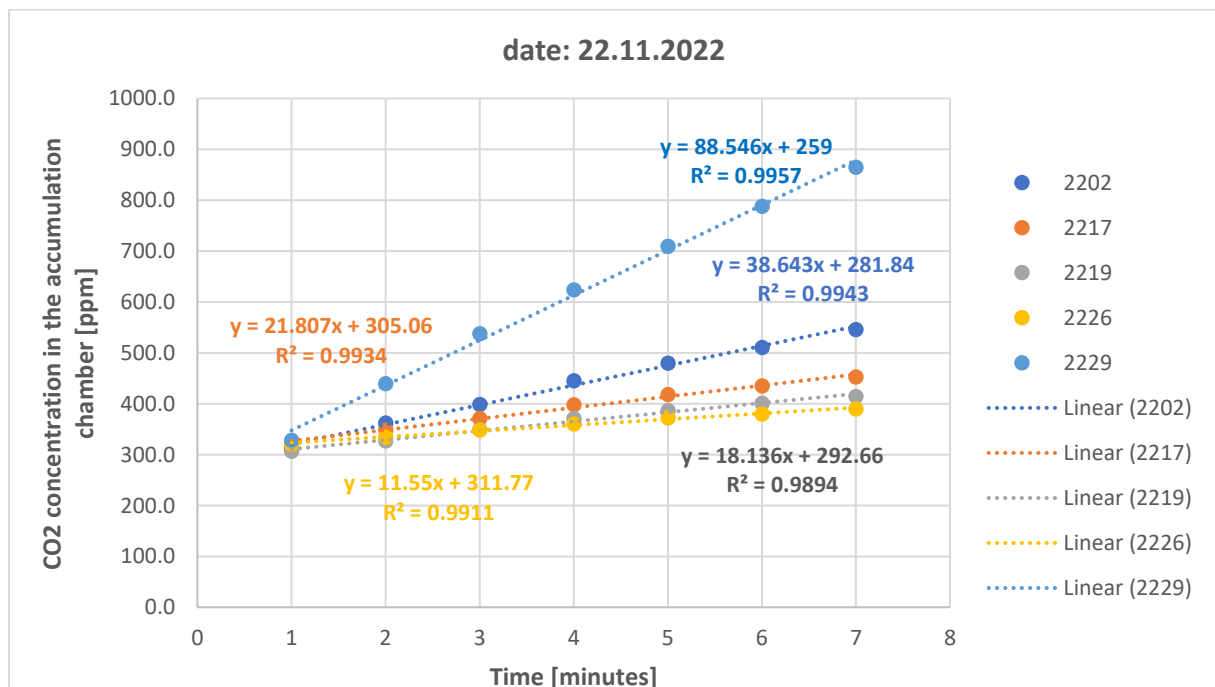
In order to determine the gas flux, it is necessary to know the active volume of accumulation chamber V_k , the surface area F through which the tested gas flows into the chamber, the pressure P and the temperature T of the air during the measurements, and the change in the volumetric concentration of the gas in time dc/dt . The dependence of the gas concentration in the chamber over time should change linearly. Due to the accuracy of the flux determination, precise determination of the changes in CO_2 concentration over time (dc/dt) is very important.

An accumulation chamber with active volume $V_k = 0.005667 \text{ m}^3$ and surface area $F = 0.133354 \text{ m}^2$ was used. The chamber was sealed with the ground by pressing the edge of the chamber into the ground. All measurements of gas concentration in the chamber were taken into account - during the tests, CO_2 concentration values were determined at one-minute intervals for a period of 6 minutes. The measurements were performed with the use of the ECOPROBE 5.0 instrument. It should be noted that this method measures the total flux of CO_2 , which is a biogenic component (CO_2 production by plants) and an endogenous component. The measurements of the total CO_2 flux were made in 5 points in the area of gas piezometers with the numbers: 2202, 2208, 2217, 2219, 2226, 2229, 6, ST1_2, ST2_4 during 10 days of measurements. On the basis of measurements of CO_2 concentration in the accumulation chamber at specified time intervals, the equation between the concentration and time t ($c=at+b$) was determined. The equation coefficients a and b were calculated for each measurement point by fitting to a straight line for each day of measurement. A summary of the determined equations between concentration and time is presented in **Fig. S53 a-j**.

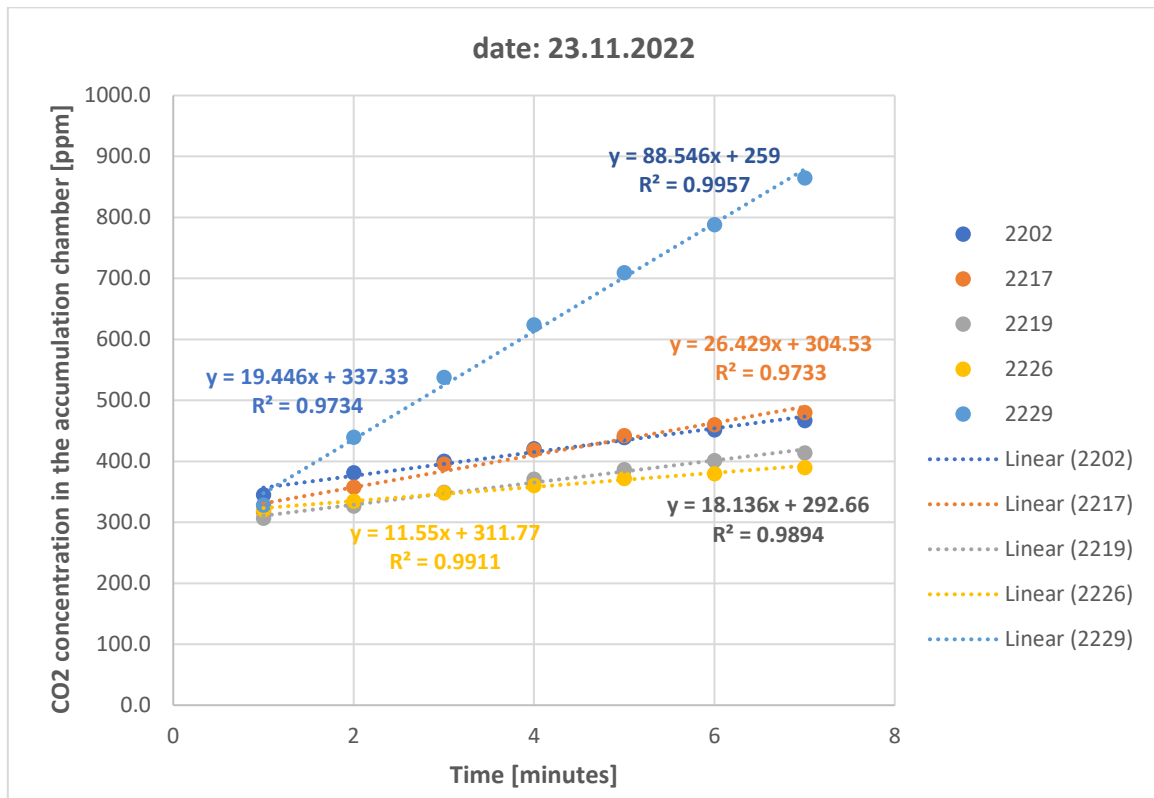
a)



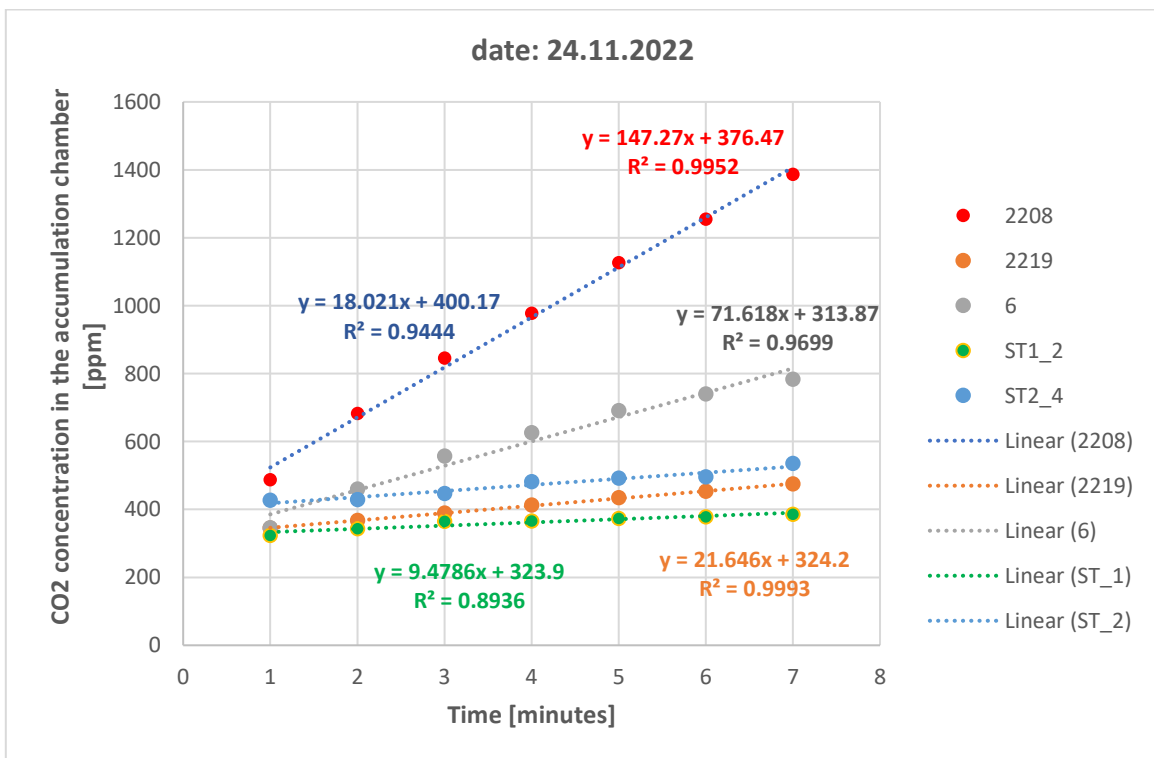
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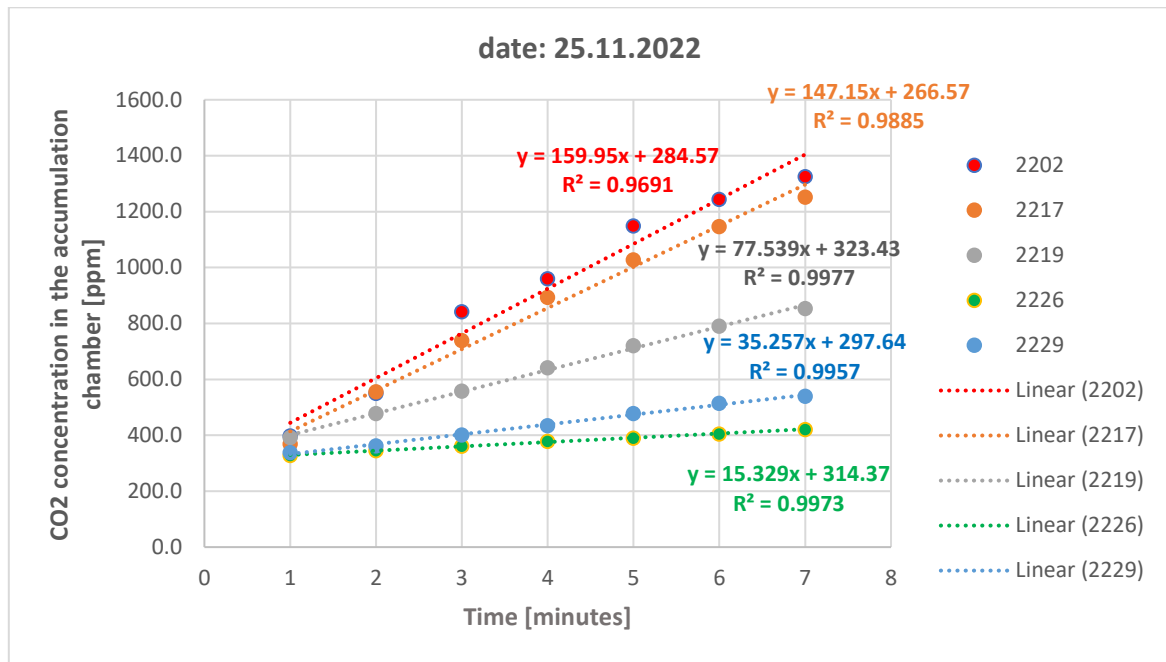
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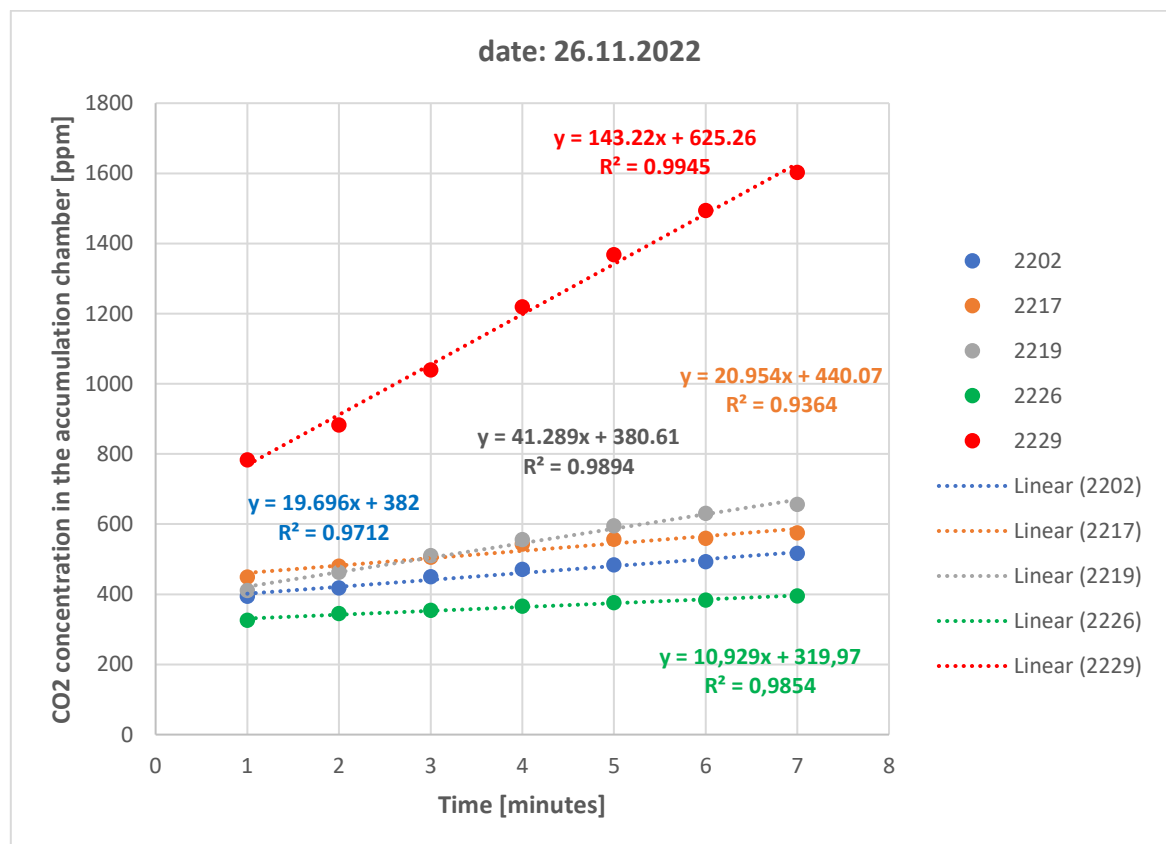
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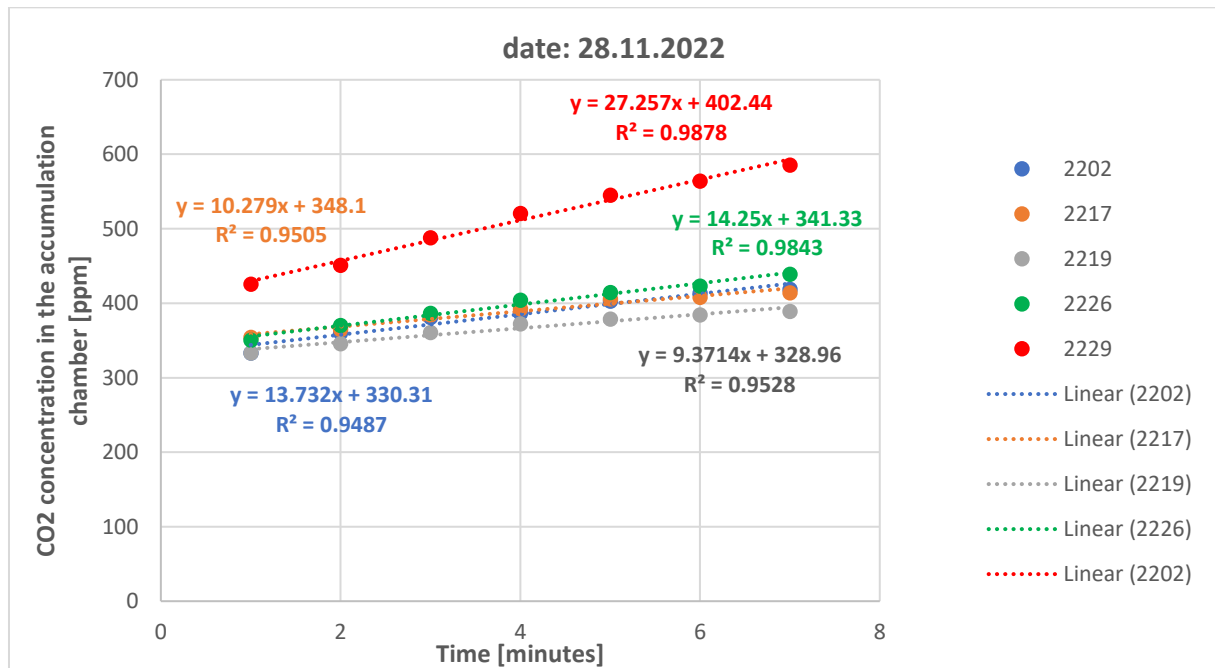
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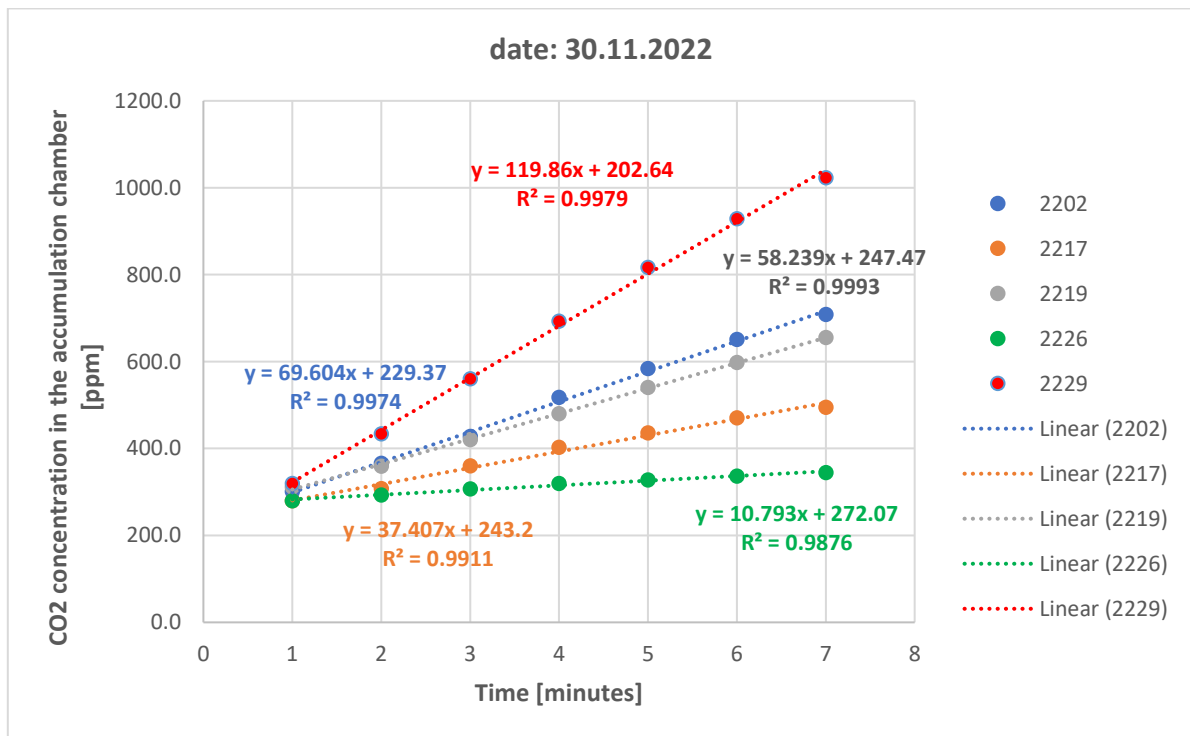
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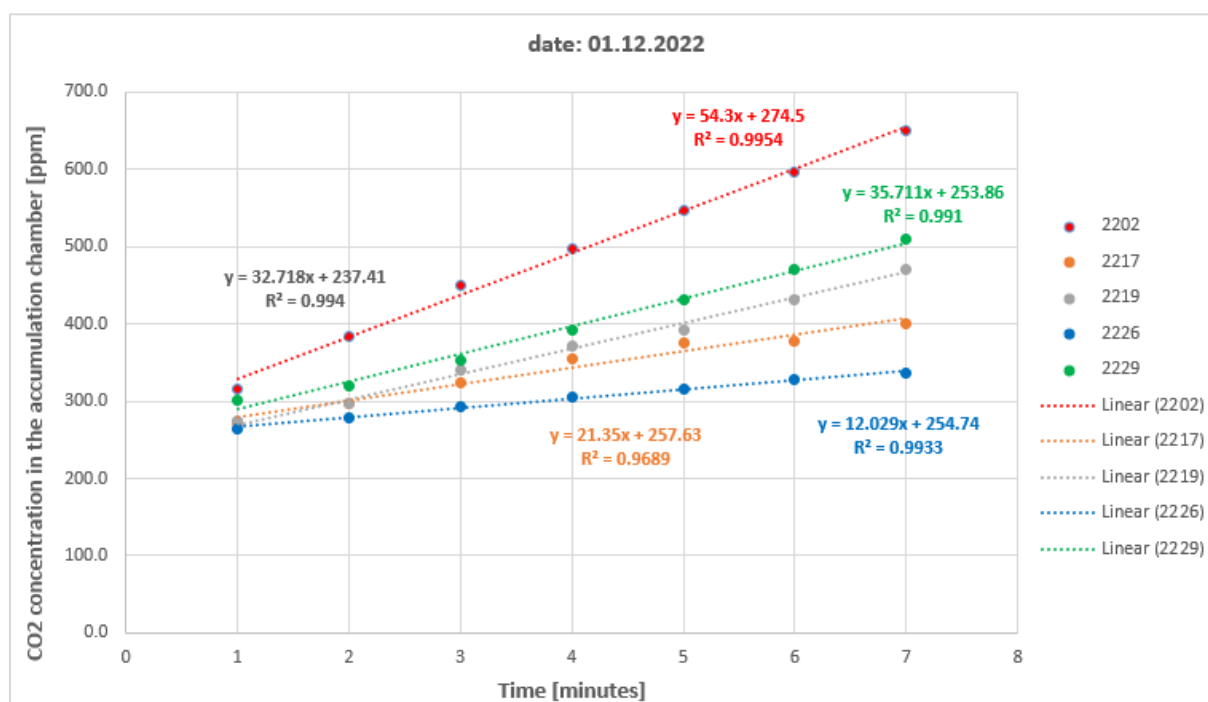
g)



h)



i)



j)

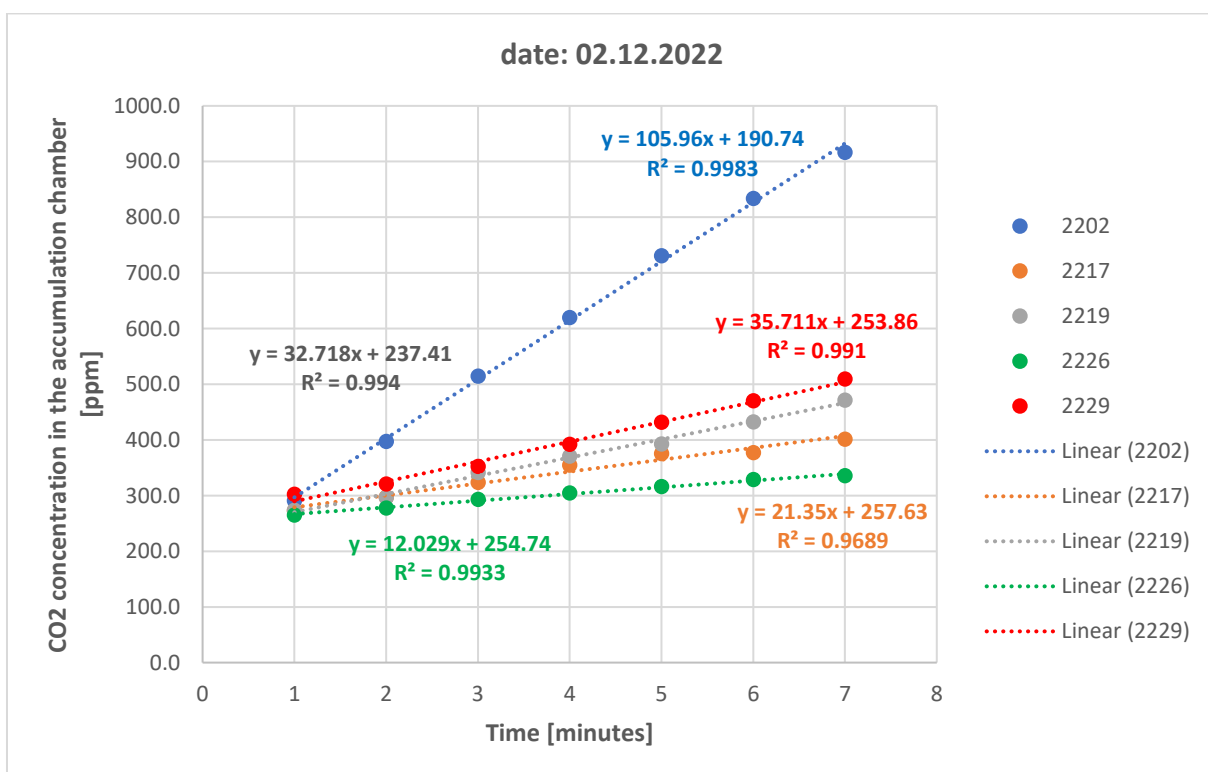


Figure S53. Charts of changes in CO₂ concentration in soil gas over time based on measurement series between 21.11.2022 and 02.12.2022