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# CO<sub>2</sub> Fluxes through the Atmosphere/Grass Interface in an Urban Green Space Located in the North Interior of Portugal

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## Abstract

Climate change has become one of the most worrying environmental issues today, as its effects cross all geographical borders. Currently, the great majority of the scientific community justifies the worsening of climate change due to the high emissions of Greenhouse Gases, such as carbon dioxide [1]–[3]. The challenge on this worrisome environmental problem is in finding sustainable and low-cost solutions to mitigate climate change effects, such as promoting urban green spaces as potentially relevant CO<sub>2</sub> sinks [4]–[6].

In this study, we sought to evaluate the potential of a grass covered surface located in the city of Bragança, Portugal, as a carbon sink, by measuring carbon dioxide fluxes through its atmosphere/surface interface. This green space was subjected to regular grass cutting, during the period between February and June 2021. The CO<sub>2</sub> fluxes were continuously measured using the LI-8100A system from LI-COR Biosciences®, equipped with a transparent chamber. The study also involved monitoring edaphic and meteorological parameters, as well as vegetative parameters such as phytovolume and biomass produced.

The results obtained showed the existence of an expected intraday pattern in which the grass surface behaved as a sink during a considerable part of the solar hours and as an emitter in the complementary period (Fig. 1 (B)). This pattern was visible throughout the observation period, but it was marked by a decrease in CO<sub>2</sub> absorption capacity by the surface and, simultaneously, by an increase in emissions of this greenhouse gas, throughout the spring season (Fig. 1 (A)). This trend was also observed in other studies [7], [8].

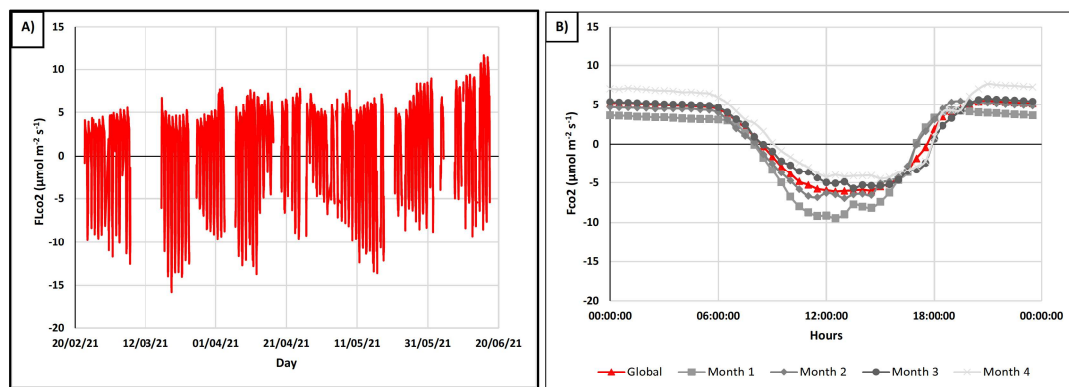


Figure 1 - CO<sub>2</sub> Fluxes. (A) Time evolution over the evaluation period; B) Comparison of the average daily profiles of each month of analysis.

In general, the surface behaved as a source of CO<sub>2</sub> during the evaluation period, with a net emission flux of approximately 0.7 g C m<sup>-2</sup> d<sup>-1</sup>. Studies carried out also show a positive mean term, indicating that the turf has a greater emitter characteristic in the spring period [7], [9]. However, the contribution of the turf as a sink for Greenhouse Gases, in relation to the absence of vegetation on the ground, minimized the upward CO<sub>2</sub> fluxes, i.e., from surface to the atmosphere. In addition, possible human influences that can impair the sink

characteristics of the surface, such as irrigation and fertilizer applications, were observed. Another human action that disfavours the absorption of CO<sub>2</sub> by the turf is the frequent cutting to which it is subjected, with the consequent reduction of photosynthetic capacity, due to the reduction of biomass that compromises the vegetative performance.

**Keywords:** Carbon Dioxide, Net Ecosystem Flux, Soil Respiration.

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