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Multi-decadal atmospheric carbon dioxide measurements in Hungary, central Europe

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SUPPLEMENTARY FIGURES

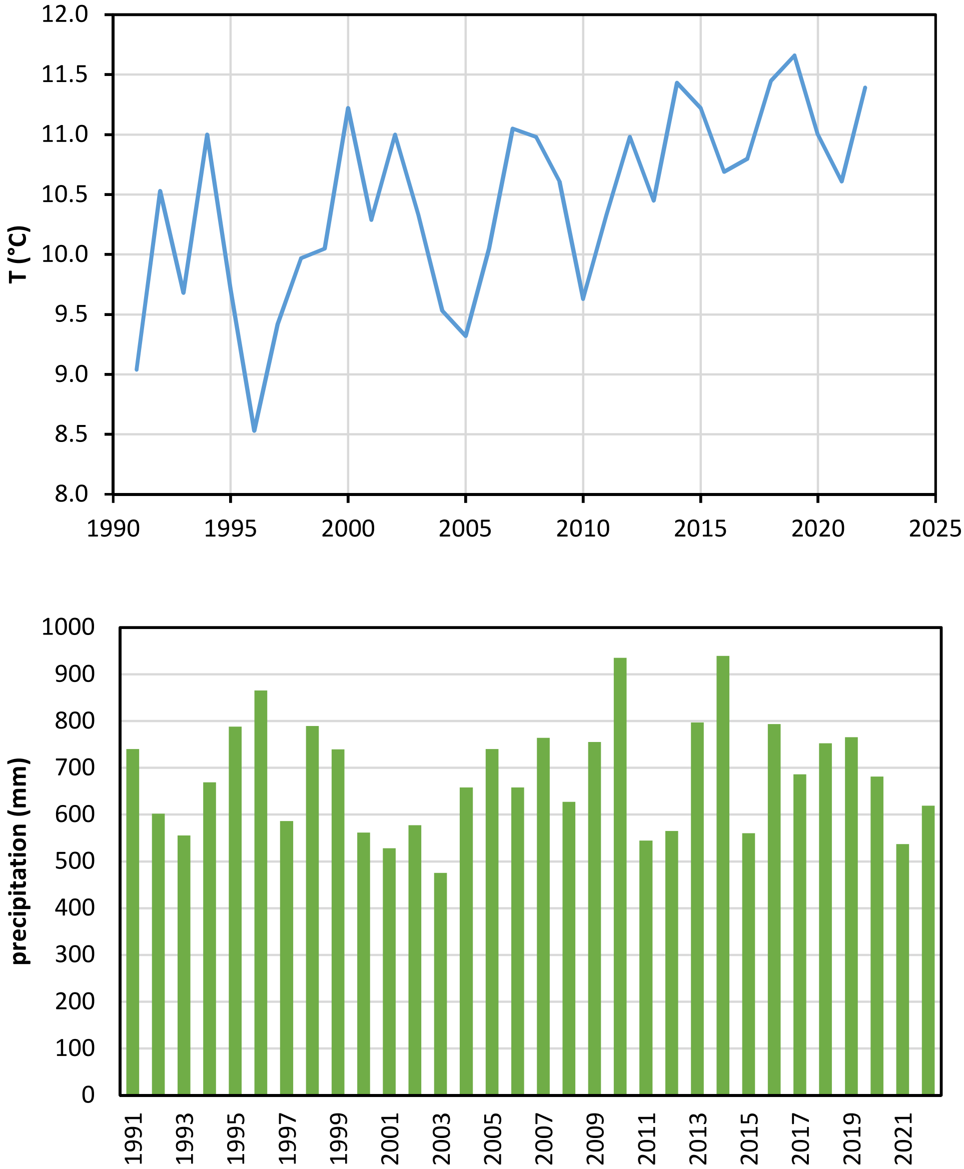

Figure S1: Temporal variation of the annual mean temperature (upper panel) and the annual amount of precipitation (lower panel) at HUN (Hungarian Meteorological Service, 2023). The positive trend in temperature (1991-2020: 0.54±0.13 °C decade^{-1}) is statistically significant at $p<0.01$. Statistically significant changes in the precipitation amount cannot be detected.

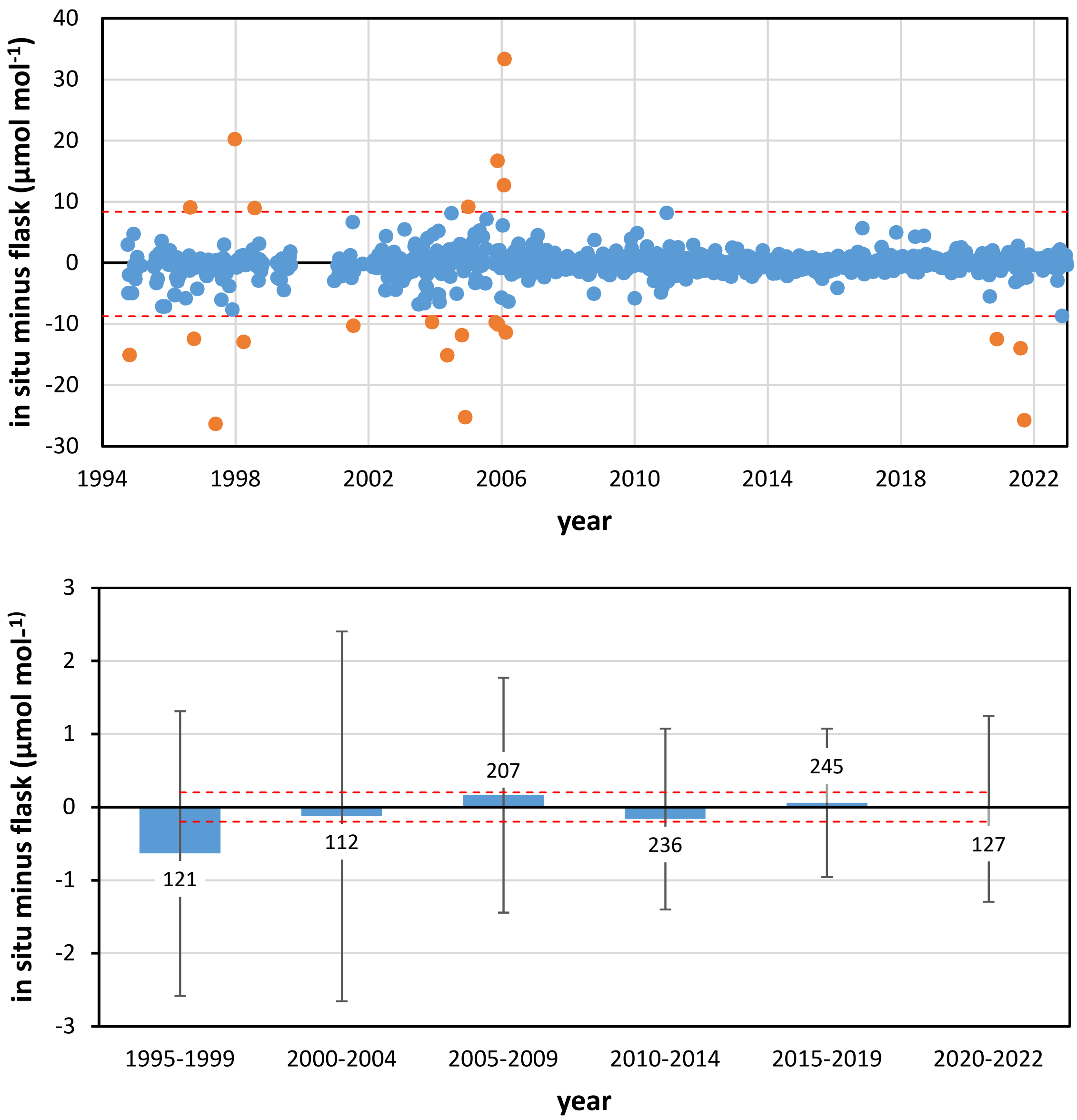

Figure S2: Comparison of CO_2 concentrations measured from flask samples and by the in situ analyzer. The in situ analyzer sequentially samples the intakes along the tower with an 8-minute cycle time. The in situ concentration values in the figures are the averages of the measurements performed at 82 m and 115 m elevations within the ±20-minute time window around the nominal sampling time of the flask samples taken at 96 m above the ground. The **upper panel** shows all available data pairs (the flask data was downloaded from https://gml.noaa.gov/aftp/data/trace_gases/co2/flask/surface/txt/co2_hun_surface-flask_1_ccgg_event.txt on 7 June 2024 – Lan et al., 2023). The red dashed horizontal lines indicate the 3-sigma range used for the definition of the extreme outliers to be rejected. The **lower panel** shows the average bias of the in situ measurements from the flask measurements, as well as the standard deviation of the bias and the number of data aggregated in 5-year periods (3 years for 2020-2022). The red dashed horizontal lines indicate the WMO extended network compatibility goal range (0.2 µmol mol^{-1} – WMO, 2020).

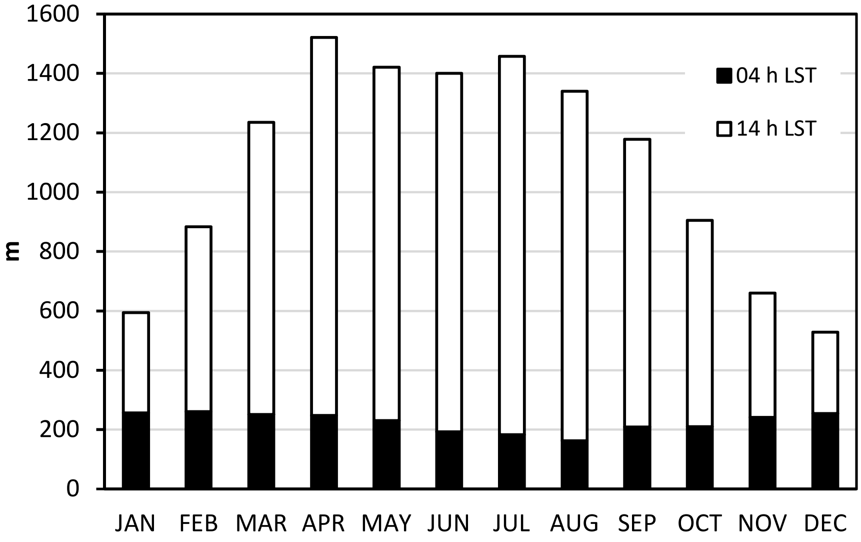

Figure S3: Mean seasonal variation of the nighttime (4 h local standard time) and early afternoon (14 h local standard time) height of the planetary boundary layer (1994-2022). Data are based on ECMWF ERA5 reanalysis (03 and 13 UTC) accessed on 8 October 2023

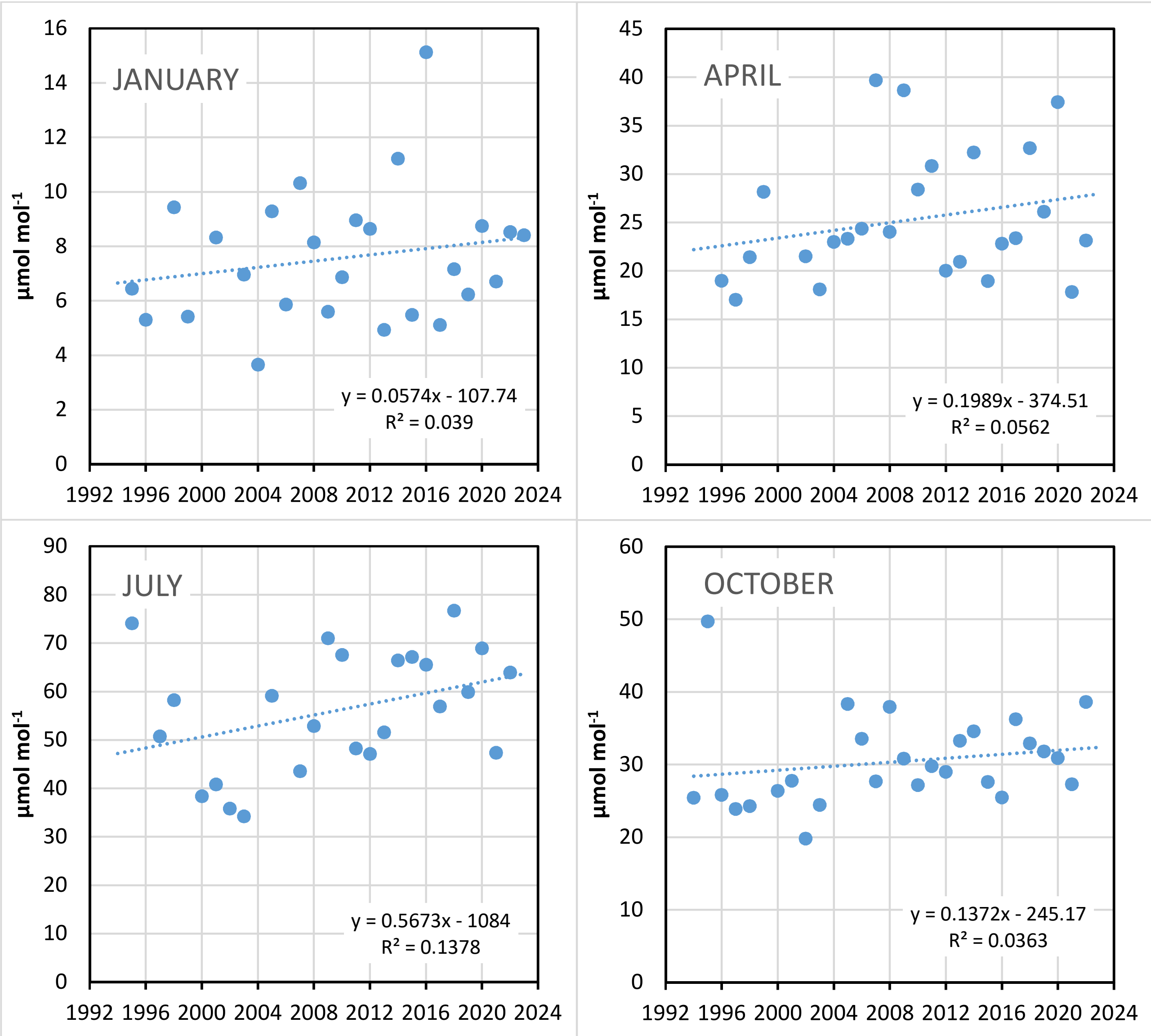

Figure S4: Temporal variation of the monthly mean diurnal amplitude of CO_2 concentration at 10 m elevation

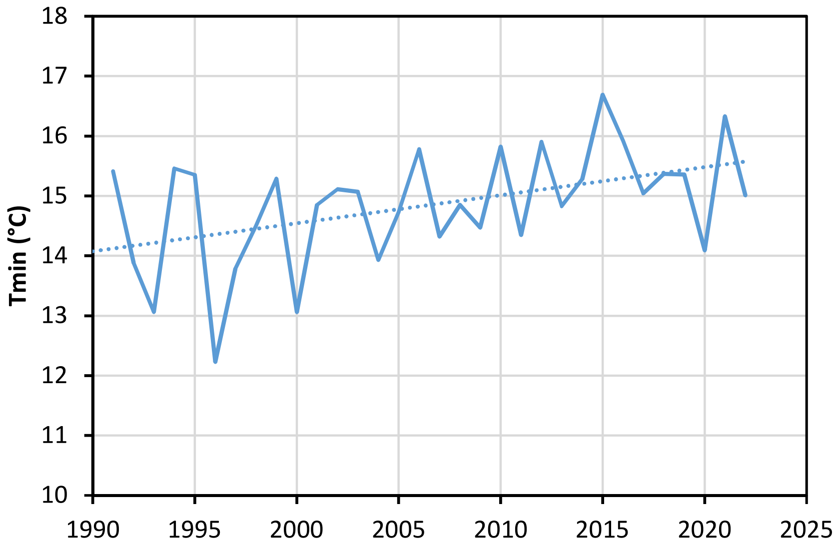

Figure S5: Temporal variation of the mean daily minimum temperature at Hegyhátsál in July. The trend (0.47±0.17 °C decade^{-1}) is statistically significant at $p<0.01$.

References

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