Supplementary material

Photocatalytic Pavements as an Active CO_2 Mitigation Tool: Quantifying the CO_2 Removal Potential of TiO_2-based Concrete Surface Treatments

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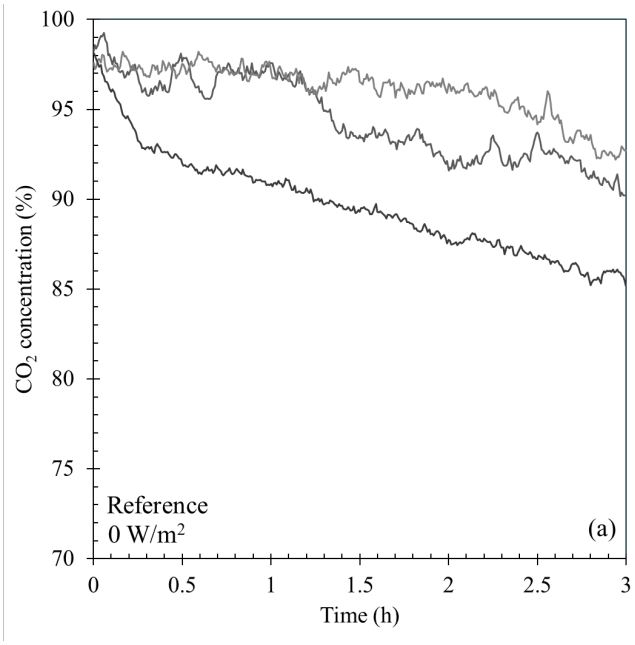
S.1. Raw data

The raw data from the CO_2 photoreduction tests are presented in Figures S.1 to S.6. It is important to note that the samples under no photoreduction mechanism (reference) experience high variability, whereas the samples experiencing CO_2 photoreduction show a clear CO_2 reduction trend.



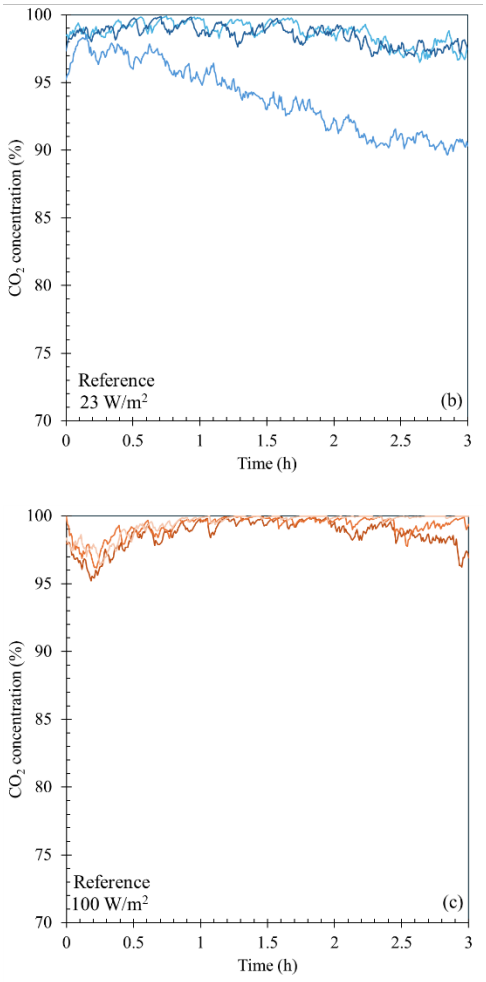


Figure S.1. CO_2 reduction tests raw data for the three reference samples exposed to 100% CO_2 initial concentration: (a) under 0 W/m^2, (b) under 23 W/m^2, and (c) under 100 W/m^2.

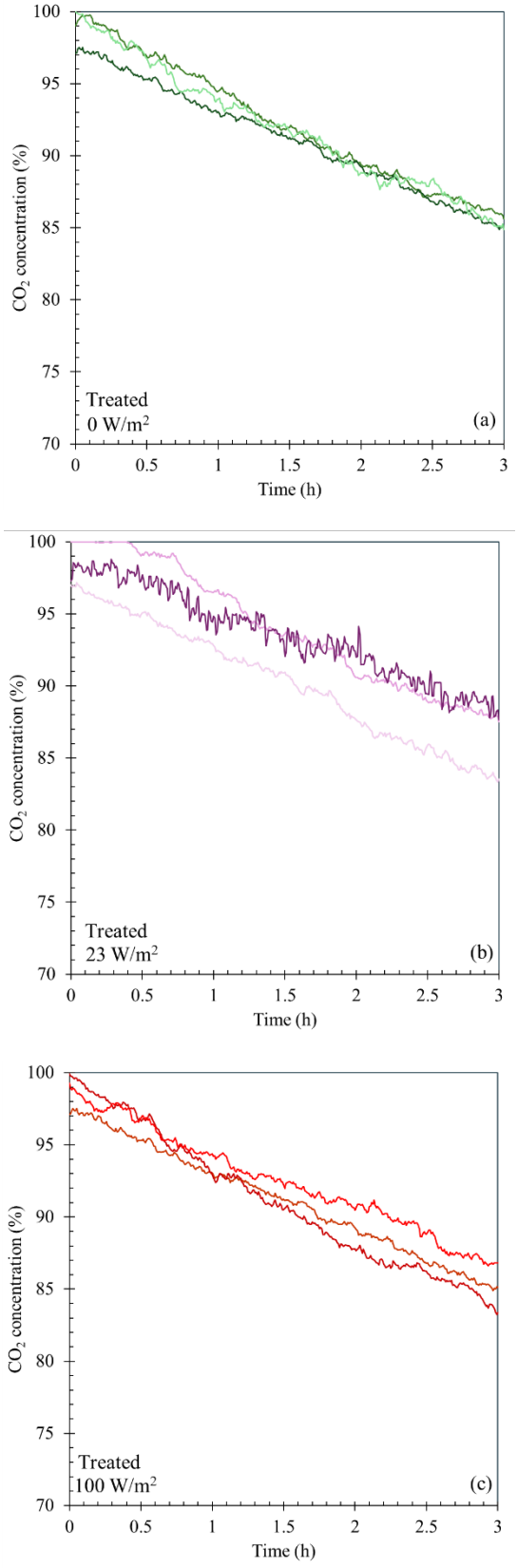


Figure S.2. CO_2 reduction tests raw data for the three TiO_2-treated samples exposed to 100% CO_2 initial concentration: (a) under 0 W/m^2, (b) under 23 W/m^2, and (c) under 100 W/m^2.

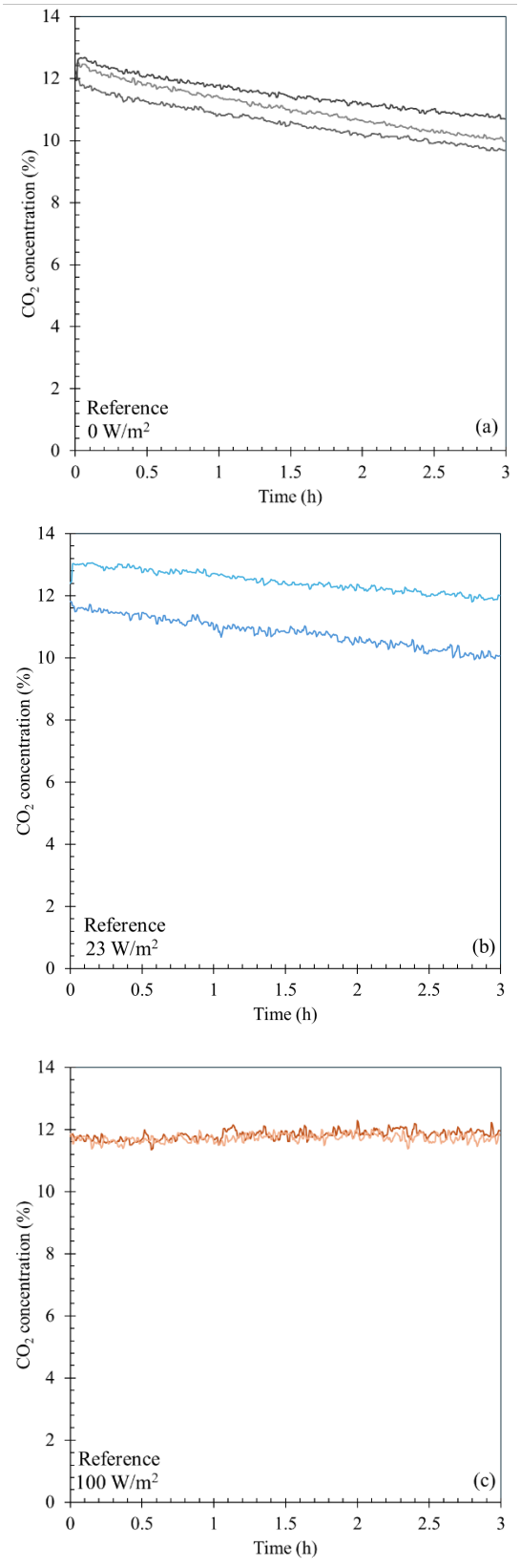


Figure S.3. CO_2 reduction tests raw data for the three reference samples exposed to 12% CO_2 initial concentration: (a) under 0 W/m^2, (b) under 23 W/m^2, and (c) under 100 W/m^2.

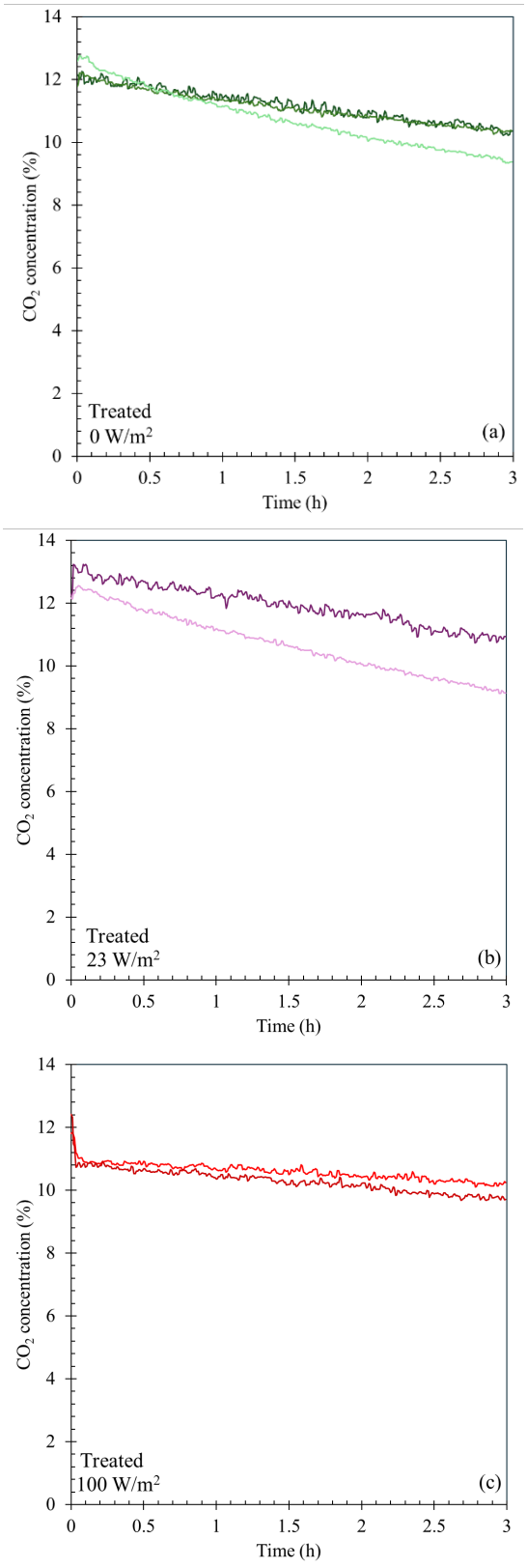


Figure S.4. CO_2 reduction tests raw data for the two TiO_2-treated samples exposed to 12% CO_2 initial concentration: (a) under 0 W/m^2, (b) under 23 W/m^2, and (c) under 100 W/m^2.

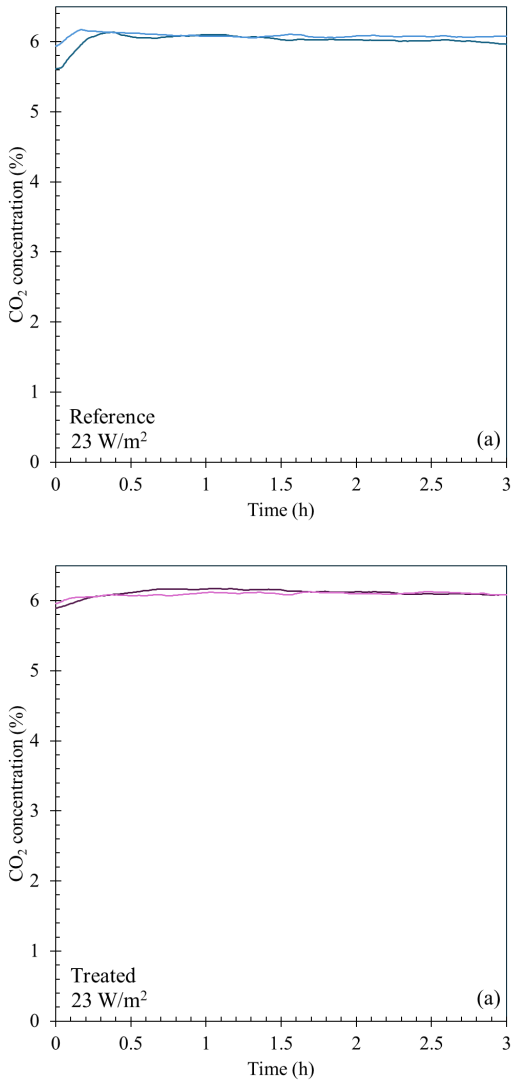


Figure S.5. CO_2 reduction tests raw data for the three reference samples exposed to 6% CO_2 initial concentration: (a) under 23 W/m^2, and (b) under 100 W/m^2.

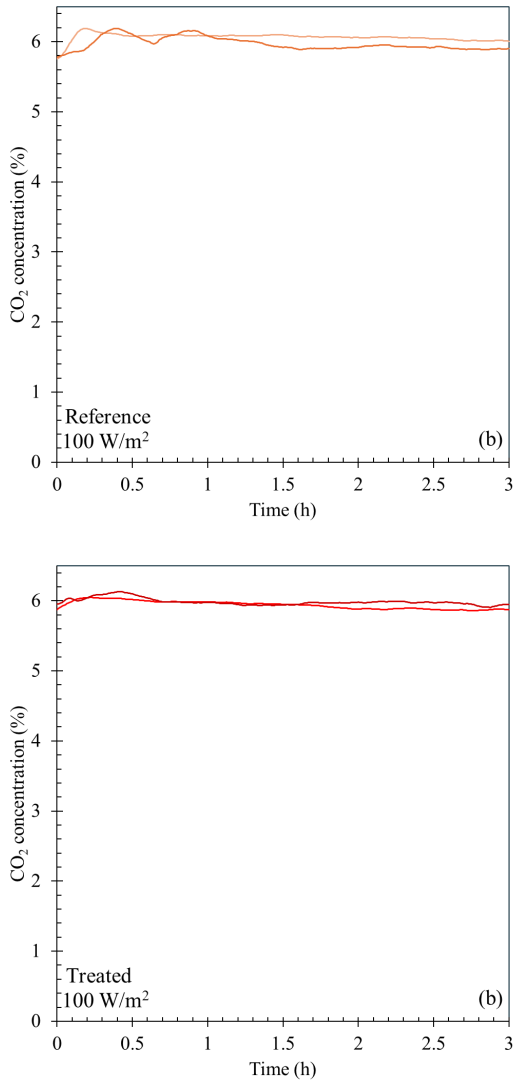


Figure S.6. CO_2 reduction tests raw data for the two TiO_2-treated samples exposed to 6% CO_2 initial concentration: (a) under 23 W/m^2, and (b) under 100 W/m^2.

S.2. CO_2 reduction results

Figure S.7. shows the CO_2 photoreduction experiments results in a graphical format. The error bars correspond to the minimum and maximum values for each condition studied. Figure S.7. (a) corresponds to the tests at 100% CO_2 initial concentration, Figure S.7 (b) to the tests under 12% CO_2 initial concentration, and Figure S.7. (c) to the tests at an initial CO_2 concentration of 6%.

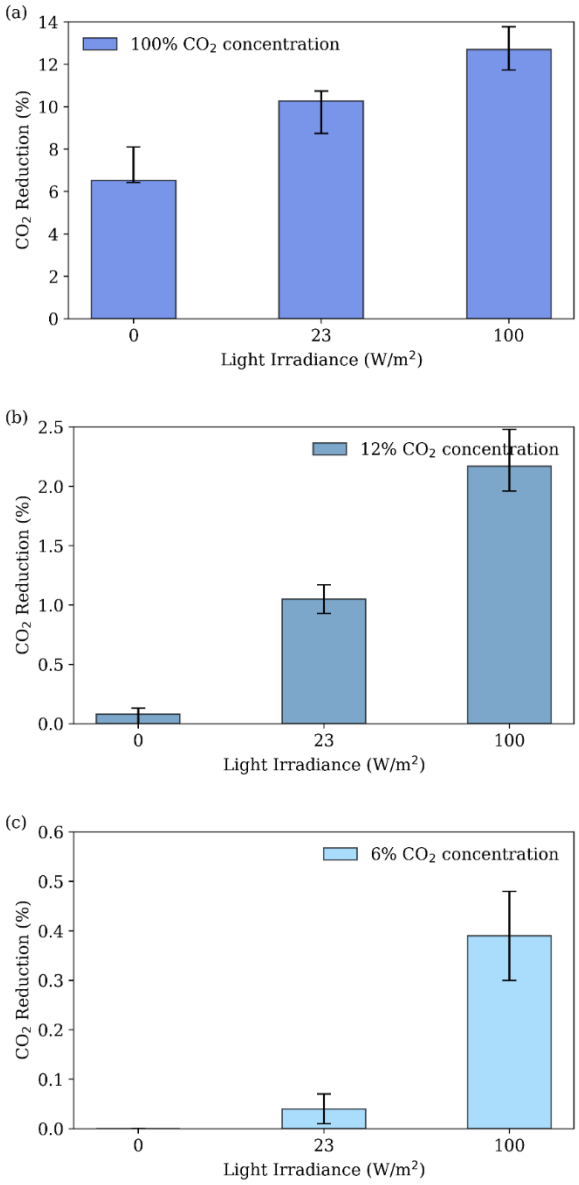


Figure S.7. Results from the 3-hour CO_2 reduction experiments under different light irradiances: (a) samples exposed to 100% CO_2; (b) samples exposed to 12% CO_2; and (c) samples exposed to 6% CO_2.

S.3. 2023 Global Horizontal Irradiance data set

The complete 2023 Global Horizontal Irradiance (GHI) in W/m^2 per hour data set, obtained from National Solar Radiation Data Base (NSRDB) provided by the National Renewable Energy Laboratory (NREL) is presented below, for each location considered, separated by quarters: (i) Phoenix, AZ (Figure S.8), (ii) Seattle, WA (Figure

S.9); (iii) Charlotte, NC (Figure S.10); and (iv) Indianapolis, IN (Figure S.11). These data was used to compute the yearly CO_2 reduction using the proposed models.

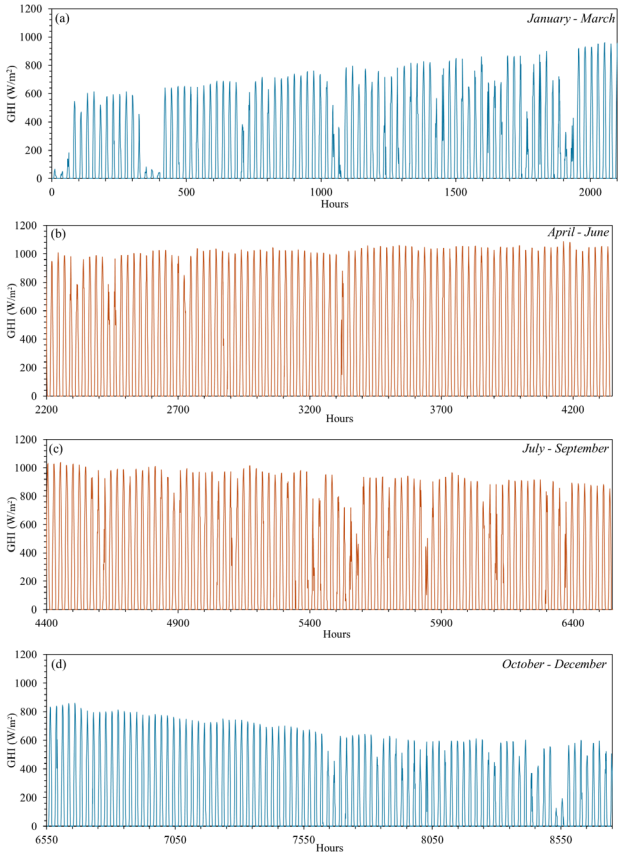
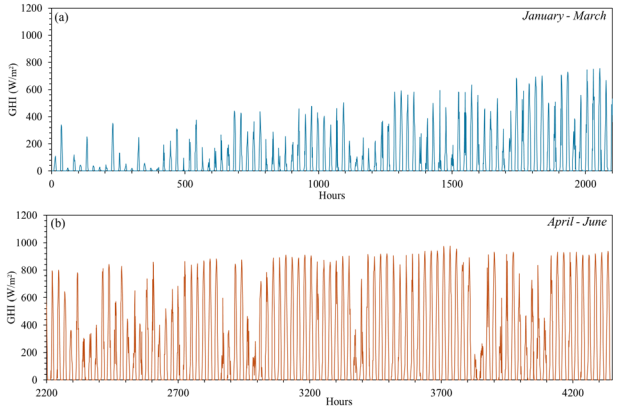


Figure S.8. GHI data from the NREL database for the 2023 year in Phoenix, AZ: (a) January to March; (b) April to June; (c) July to September; and (d) October to December.



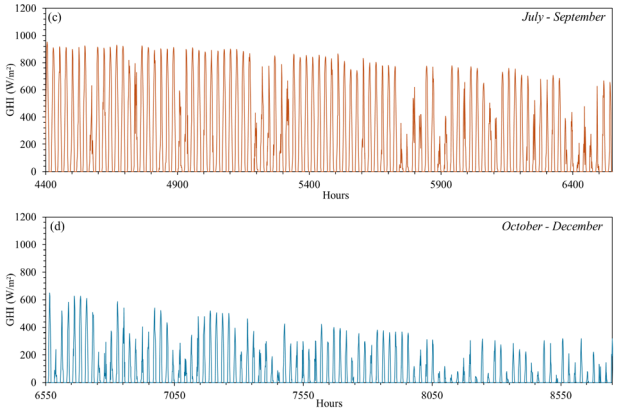


Figure S.9. GHI data from the NREL database for the 2023 year in Seattle, WA: (a) January to March; (b) April to June; (c) July to September; and (d) October to December.

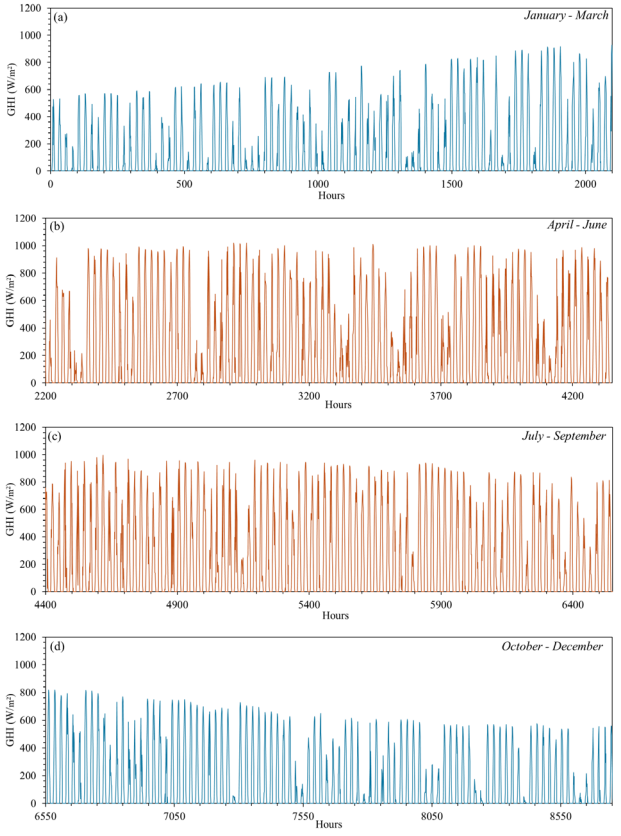


Figure S.10. GHI data from the NREL database for the 2023 year in Charlotte, NC: (a) January to March; (b) April to June; (c) July to September; and (d) October to December.

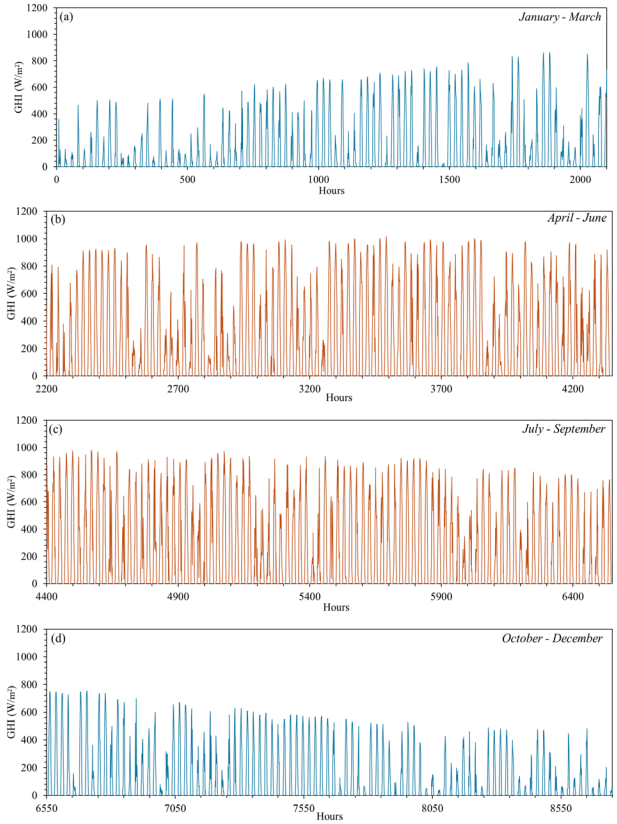


Figure S.11. GHI data from the NREL database for the 2023 year in Indianapolis, IN: (a) January to March; (b) April to June; (c) July to September; and (d) October to December.