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# Estimation of nocturnal boundary layer height in the central Amazon, supported by gas concentration profiles

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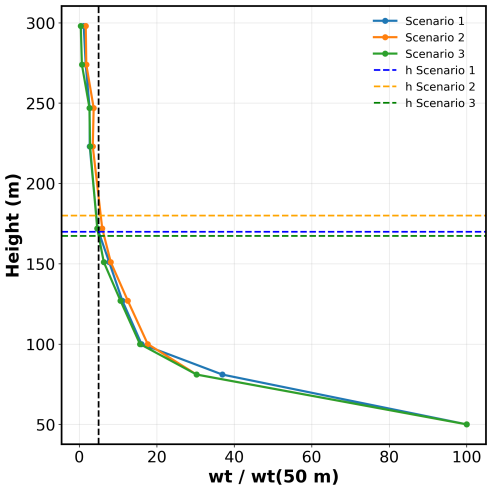


**Figure S1.** Sensitivity analysis of the filtering thresholds applied to the sensible heat flux ($H$). The normalized profiles ($H/H_{50} \times 100$) are shown for three scenarios: the original thresholds ($-50$ to 0 W m$^{-2}$ for 50–81 m, $-30$ to 10 W m$^{-2}$ for 100–151 m, and $-20$ to 10 W m$^{-2}$ for 172–298 m; Scenario 3), a more permissive scenario ($-60$ to 20, $-45$ to 25, and $-35$ to 15 W m$^{-2}$; Scenario 2), and a more restrictive scenario ($-30$ to 0, $-20$ to 5, and $-10$ to 5 W m$^{-2}$; Scenario 1). Dashed horizontal lines indicate the corresponding $h_n$ values.

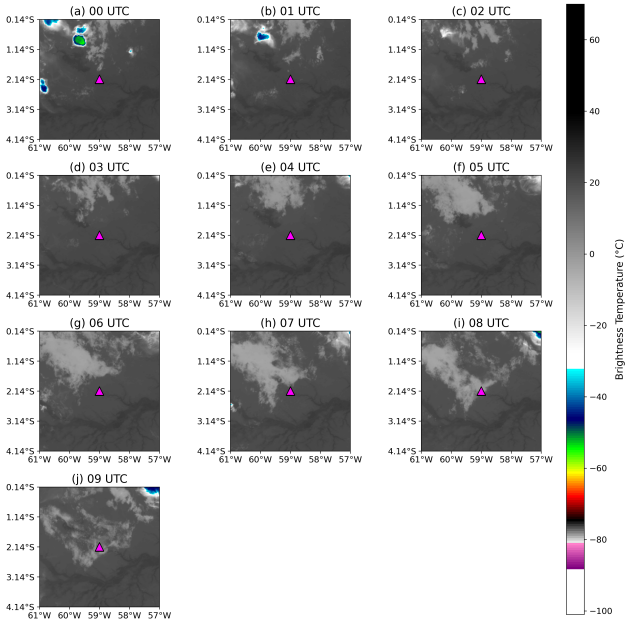


**Figure S2.** GOES-16 IR Channel 13 (10.3 $\mu$m) brightness temperature over the ATTO site on 18 August 2022. Panels (a–j) show hourly images from 00 to 09 UTC. The magenta triangle marks the location of the ATTO tower.

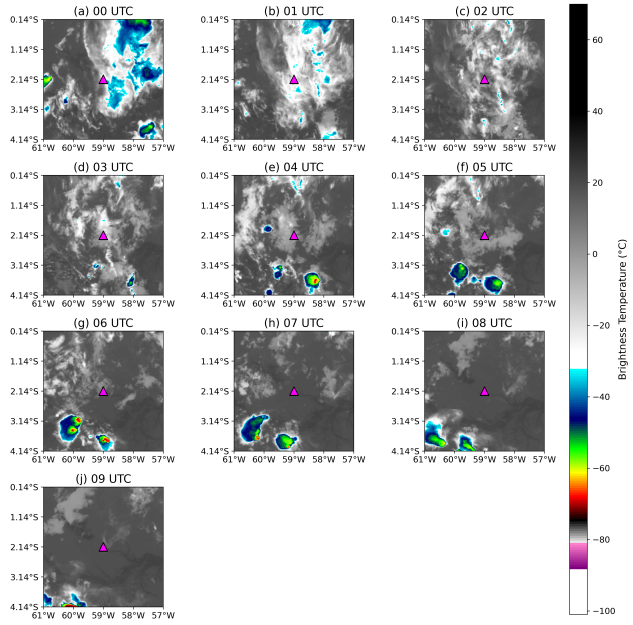


**Figure S3.** GOES-16 IR Channel 13 (10.3 $\mu$m) brightness temperature over the ATTO site on 25 August 2022. Panels (a–j) show hourly images from 00 to 09 UTC. The magenta triangle marks the location of the ATTO tower.

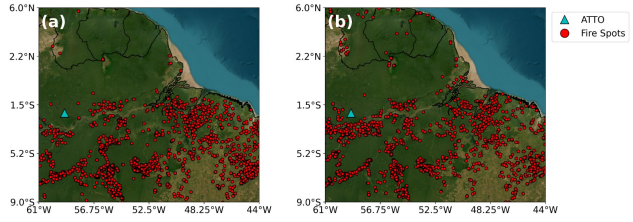


**Figure S4.** Fire hotspots detected with the satellites: GOES-16, AQUA, NPP-375, NOAA-20, TERRA, NPP375D, METOP-C, and METOP-B, for the period of a) 16 UTC on 17/08/2022 to 09 UTC on 18/08/2022 and b) 16 UTC on 24/08/2022 to 09 UTC on 25/08/2022.

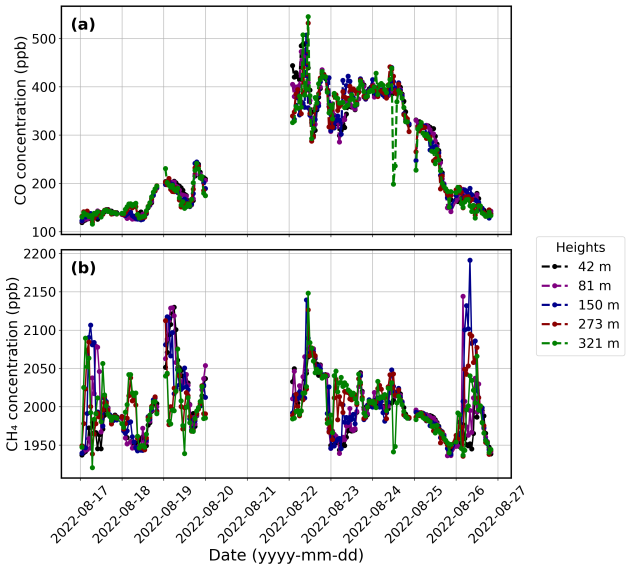


**Figure S5.** Concentration profiles of a) CO and b) $CH_4$ for the period from 17 to 25 August 2022.

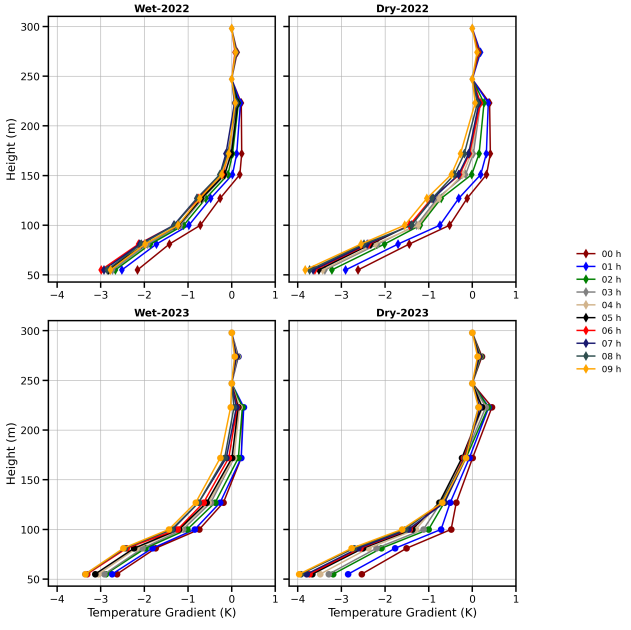


**Figure S6.** Hourly mean profiles of the potential temperature gradient for a) and c) the Wet season and b) and d) the Dry season, during a) and b) 2022 and c) and d) 2023. The different colors represent the different hours during the night from 00 UTC to 09 UTC (local time: 20:00 to 05:00).

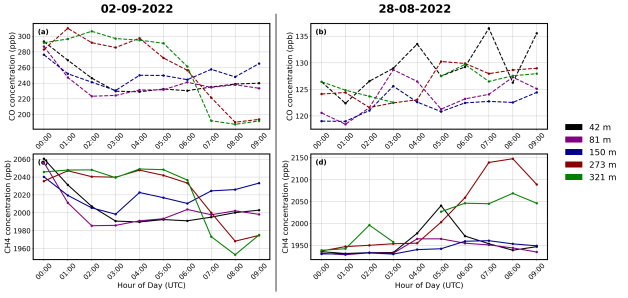


**Figure S7.** Hourly mean vertical profiles of CO and $CH_4$ concentrations during two additional nocturnal case studies: 02 September 2022 and 28 August 2022. Panels (a) and (b) show CO and $CH_4$, respectively, for 02 September 2022, while panels (c) and (d) show CO and $CH_4$, respectively, for 28 August 2022.

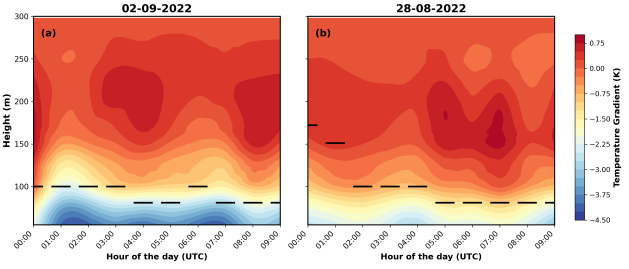


**Figure S8.** Time-height evolution of the vertical potential temperature gradient during the nights of 02 September 2022 and 28 August 2022. Panels (a) and (b) show the respective nights, with dashed black lines indicating the estimated nocturnal boundary-layer height $h_n$.

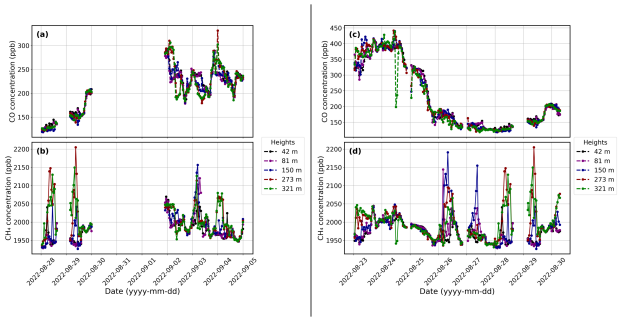


**Figure S9.** Multi-day evolution of CO and $CH_4$ concentrations at different sampling heights before and during the selected nocturnal case studies. Panels (a) and (b) show CO and $CH_4$, respectively, for the period including 02 September 2022, while panels (c) and (d) show CO and $CH_4$, respectively, for the period including 28 August 2022.