

Dear Laurens,

Thank you for reviewing our manuscript so carefully. We revised it according to your suggestions:

- 1) You propose this parameterization of OH reactivity using Temperature as the main dependent parameter rather than PAR; this feature is also brought up by the reviewers and have carefully read your response; you indicate that there is also a whole range of significant OH reactivity measurements at night when PAR=0 and which seems to result in a less strong correlation between OH reactivity and PAR than between reactivity and T. If was though wondering if you actually considered, also based on some of the known causal links here between OH reactivity and PAR to only use the daytime data on PAR and OH reactivity and split this from the nocturnal OH reactivity data and how these correlate with T?

We followed your proposition and tried the parameterization only using daytime data. The dependence of OH reactivity on PAR did not become much more visible by using only daytime data, the correlations are very weak (r^2 between 0.01 and 0.14) and the slope of the fit is, especially in the wet season, barely above zero:

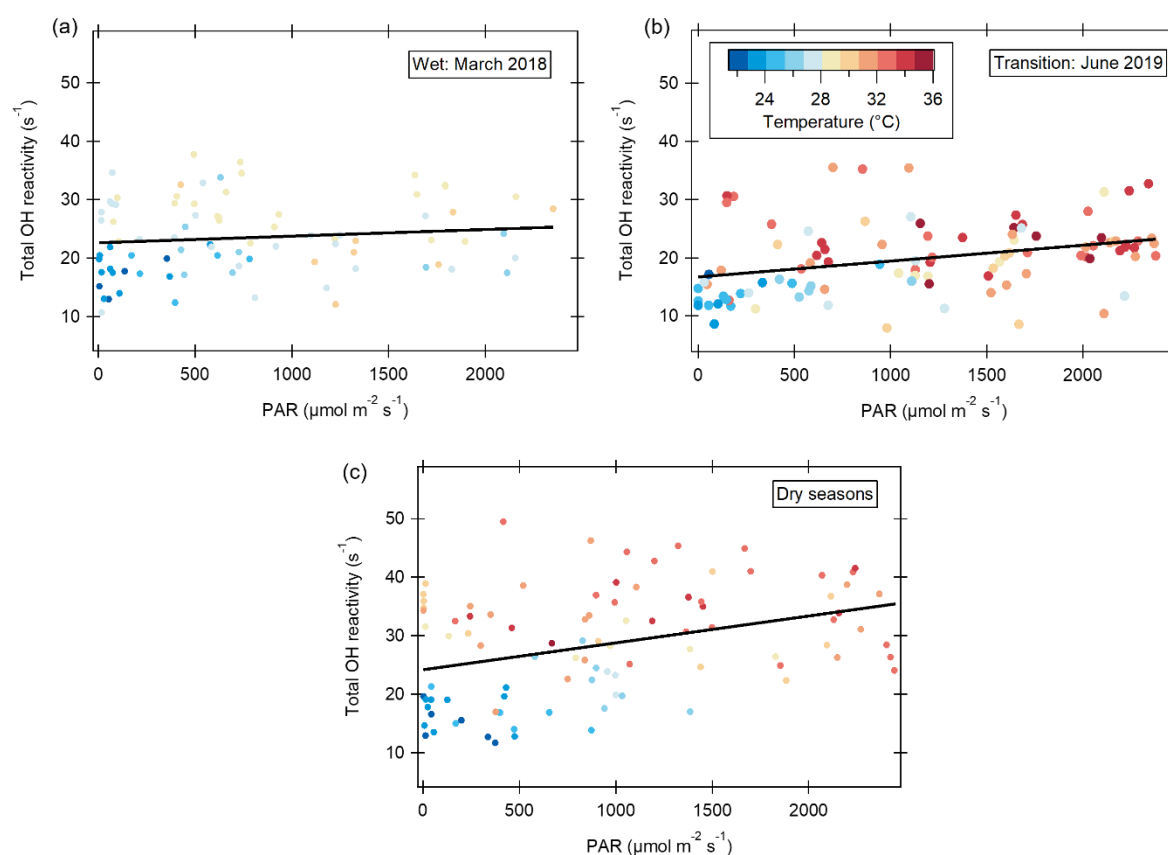


Fig. Hourly averages of total OH reactivity at 80 m a. g. l. at the ATTO tower as a function of photosynthetically active radiation (PAR). Temperature color scale shown in (b) for all panels. (a) Wet season (March 2018), fit function: $R = 22.6 + 0.0011 * [PAR]$, $r^2 = 0.01$ (b) Transition season (June 2019), fit function: $R = 16.7 + 0.0027 * [PAR]$, $r^2 = 0.12$ (c) Dry seasons (October 2018 and September 2019), fit equation: $R = 24.2 + 0.005 * [PAR]$, $r^2 = 0.14$.

This behavior reflects the trends shown in the diel cycle plots, where OH reactivity lags approximately one hour behind PAR. Then, we also tested how much the fit changes for OH reactivity in dependence of temperature when only using daytime data. See the following two tables:

Day and Night: Table 2. Parameterization of total OH reactivity in dependence of temperature: Coefficients for the equation $R = R_s \exp(\beta[T-T_s])$, with R = total OH reactivity, T = temperature in °C, T_s = standard temperature (25 °C), R_s = total OH reactivity at standard temperature, and β is an empirical coefficient.

| Season | R_s | β | r^2 of fit |
|-------------------|----------------|-------------------|--------------|
| Dry | 19.9 ± 0.4 | 0.076 ± 0.004 | 0.68 |
| Wet | 20.8 ± 0.4 | 0.066 ± 0.008 | 0.33 |
| Transition | 14.4 ± 0.4 | 0.051 ± 0.005 | 0.33 |

NEW Parameterization of total OH reactivity in dependence of temperature, daytime data only: Coefficients for the equation $R = R_s \exp(\beta[T-T_s])$, with R = total OH reactivity, T = temperature in °C, T_s = standard temperature (25 °C), R_s = total OH reactivity at standard temperature, and β is an empirical coefficient.

| Season | R_s | β | r^2 of fit |
|-------------------|----------------|-------------------|--------------|
| Dry | 20.3 ± 0.9 | 0.072 ± 0.007 | 0.60 |
| Wet | 20.1 ± 0.8 | 0.074 ± 0.013 | 0.31 |
| Transition | 14.9 ± 0.9 | 0.050 ± 0.008 | 0.30 |

The fit functions did not change significantly (all changes are within the uncertainty of the previous, day and night, fits). Also, the r^2 values decreased, which is not surprising, because the nighttime data showed the same temperature dependent trends as the daytime data. Therefore, we consider the nighttime data relevant for the parameterization and would rather not change this in the manuscript.

2) Reading over the discussion about the connection between OH reactivity and the role of rain but also that nocturnal measurements indicate a generally a profile on OH reactivity expressing the potentially important role of in-canopy deposition, I checked out about including a reference to the study by Yanez Serrano, ACP, 2018, <https://doi.org/10.5194/acp-18-3403-2018> on analysis of seasonal and diurnal cycles in monoterpenes at the ATTO site. This paper also discusses about the potentially important role of in-canopy removal of these monoterpenes also as a function of canopy wetness, etc. Some of those findings seem to directly connected to the study you present in your paper.

Thank you for pointing out the related findings in the 2018 Yanez-Serrano paper, which we added as a reference accordingly:

In the section on vertical profiles (3.1.1)

“A study conducted at the ATTO site found strong nighttime canopy deposition of monoterpenes which was a function of surface wetness (Yáñez-Serrano et al., 2018). Deposition can thus partly explain the weaker vertical gradients in the wet season, when the overcast conditions led to weaker irradiation and therewith lower OH levels, while deposition continued or was even increased due to precipitation.”

And in the section on precipitation effects (3.3.3):

Stable thermal stratification close to the ground can stop soil emissions from reaching higher altitudes in the rainforest (Kruijt et al., 2000; Gerken et al., 2017; Santana et al., 2018; Pfannerstill et al., 2018), and it has been shown that in-canopy chemistry already strongly decreases reactant levels before they reach the canopy top (Jardine et al., 2011; Jardine et al., 2015; Bourtsoukidis et al., 2018; Yáñez-Serrano et al., 2018).

“Additionally, terpenes can be subject to deposition on wet rainforest surfaces (Yáñez-Serrano et al., 2018).”