



## Signature of molecular hydrogen emissions from tropical biomass burning

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In this study we identify a biomass-burning signal in molecular hydrogen ( $H_2$ ) over the Amazonian tropical rainforest. To quantify this signal, we measure the mixing ratios of  $H_2$  and several other species as well as the  $H_2$  isotopic composition in air samples that were collected in the BARCA (Balanço Atmosférico Regional de Carbono na Amazônia) aircraft campaign during the dry season. On the one hand, we derive the relative  $H_2$  emission ratio with respect to carbon monoxide (CO). On the other hand, we determine the  $H_2$  biomass-burning isotopic source signature from the isotopic composition of the samples. These two quantities serve as a basis to estimate the strength of the biomass-burning source for  $H_2$ , using indirect bottom-up and top-down approaches. Hitherto, values for the emission ratio and isotopic source signature of  $H_2$  from tropical biomass burning rely only on combustion experiments or on statistical relations, since no direct signal has been obtained from in-situ observations.

We detect a clear biomass-burning source signal with a  $\Delta H_2/\Delta CO$  emission ratio of  $0.31 \pm 0.04$  ppb/ppb and an isotopic source signature of  $-280 \pm 41$  ‰. In order to retrieve a clear source signal that is not influenced by the soil uptake of  $H_2$ , we exclude samples from the atmospheric boundary layer. This procedure is supported by data from a global chemistry transport model. The  $\Delta H_2/\Delta CO$  emission ratio is significantly lower than some earlier estimates for the tropical rainforest. Our results confirm the lower values of the previously conflicting estimates of the  $H_2$  isotopic source signature from biomass burning.