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Intraannual cycles of NMVOCs in the tropical troposphere and their use for interpreting seasonal variability in CO

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18 month's data of non-methane volatile organic compound (NMVOC) and carbon monoxide (CO) concentrations obtained from the Cape Verde Atmospheric Observatory (Observatório Atmosferico de Cabo Verde: Humberto Duarte Fonseca CVAO, 16,848°N, 24.871°W) in the tropical Atlantic Ocean are presented here. The CO measurements demonstrate the expected sinusoidal curve driven by its loss reaction with OH, but with a smaller amplitude than modelling studies would suggest for this region. Simultaneous ethane measurements were used to derive the seasonal variation in the "nominal hydroxyl radical (OH) concentration (n[OH])" experienced along the air mass trajectory of ethane, by assuming a fixed ethane emission rate. The n[OH] represents the variability in OH concentration assuming there are no intraannual changes in ethane emissions, and was subsequently used to create seasonal fits of CO concentrations, allowing interpretation of differing sources and sinks from those of ethane. Deviation of the measured CO concentrations from their "n[OH] fit" indicates that summer sources of CO are approximately 60% higher than winter, assuming that ethane is not lost through reactions with chlorine or bromine atoms. Evidence suggests that the production of CO from the oxidation of CH4 and NMVOC and in particular from methanol, acetone and acetaldehyde (from both terrestrial and oceanic sources) is increased in this region in summer and this could be an explanation for the observations. Other NMVOC measurements are presented here as indicators of potential conflicting halogen chemistry and of alternative emission sources. Longer-term measurements of NMVOC and CO, such as those presented in this paper, are essential for our understanding of the oxidation capacity, atmospheric processes and composition of the atmosphere.