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Climatology and Atmospheric Chemistry of Non-Methane Hydrocarbon Emissions over the North Atlantic

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Non-methane hydrocarbons (NMHC) spanning the C2-C7 volatility range have been monitored at the Pico Mountain Observatory, located at 2,225 m a.s.l., on Pico Island, in the Azores, Portugal, since 2004. Observations at this site, due to the topography, location, and height of the station, during most times reflect long-range transport of air from the continents bordering the North Atlantic. The multi-year data records show that NMHC mole fractions exhibit regular annual cycles with winter maxima and summer minima. Short-term variability of the data is driven by transport events typically lasting 2-5 days. During these events NMHC absolute levels show significant increases over their seasonal background. NMHC ratios were applied to estimate the degree of photochemical processing and transport time to the station. Transport events identified from the NMHC data were then analyzed for emission source region and transport pathway using HYSPLIT model outputs. The multi-year observations were applied to develop a seasonality of the pollution transport to Pico and contributing source regions. These analyses show that emissions from the North American continent are the primary cause for elevated NMHC levels observed at the station. Most identified transport events originate from urban areas; biomass burning transport from boreal North America was identified in a few selected cases during late summer. Emissions in air transported from Europe and Africa were encountered only on a few occasions.