Characterization of Methane Emissions in Los Angeles with Airborne Hyperspectral Imaging

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As urban areas develop regulations to limit atmospheric methane (CH_4), accurate quantification of anthropogenic emissions will be critical for program development and evaluation. However, relating emissions derived from process-level metadata to those determined from assimilating atmospheric observations of CH_4 concentrations into models is particularly difficult. Nonmethane hydrocarbons (NMHCs) can help differentiate between thermogenic and biogenic CH_4 emissions, as they are primarily co-emitted with the former; however, these trace gases are subject to the same limitations as CH_4. Remotely-sensed hyperspectral imaging bridges these approaches by measuring emissions plumes directly with spatial coverage on the order of 10 km^2 min^{-1}. We identify the sources of and evaluate emissions plumes measured by airborne infrared hyperspectral imagers flown over the Los Angeles (LA) metropolitan area, which encompasses various CH_4 sources, including petroleum and natural gas wells and facilities. We quantify total CH_4 and NMHC emissions, as well as their relative column densities, at the point-source level to create fingerprints of source types. We aggregate these analyses to estimate the range of variability in chemical composition across source types.

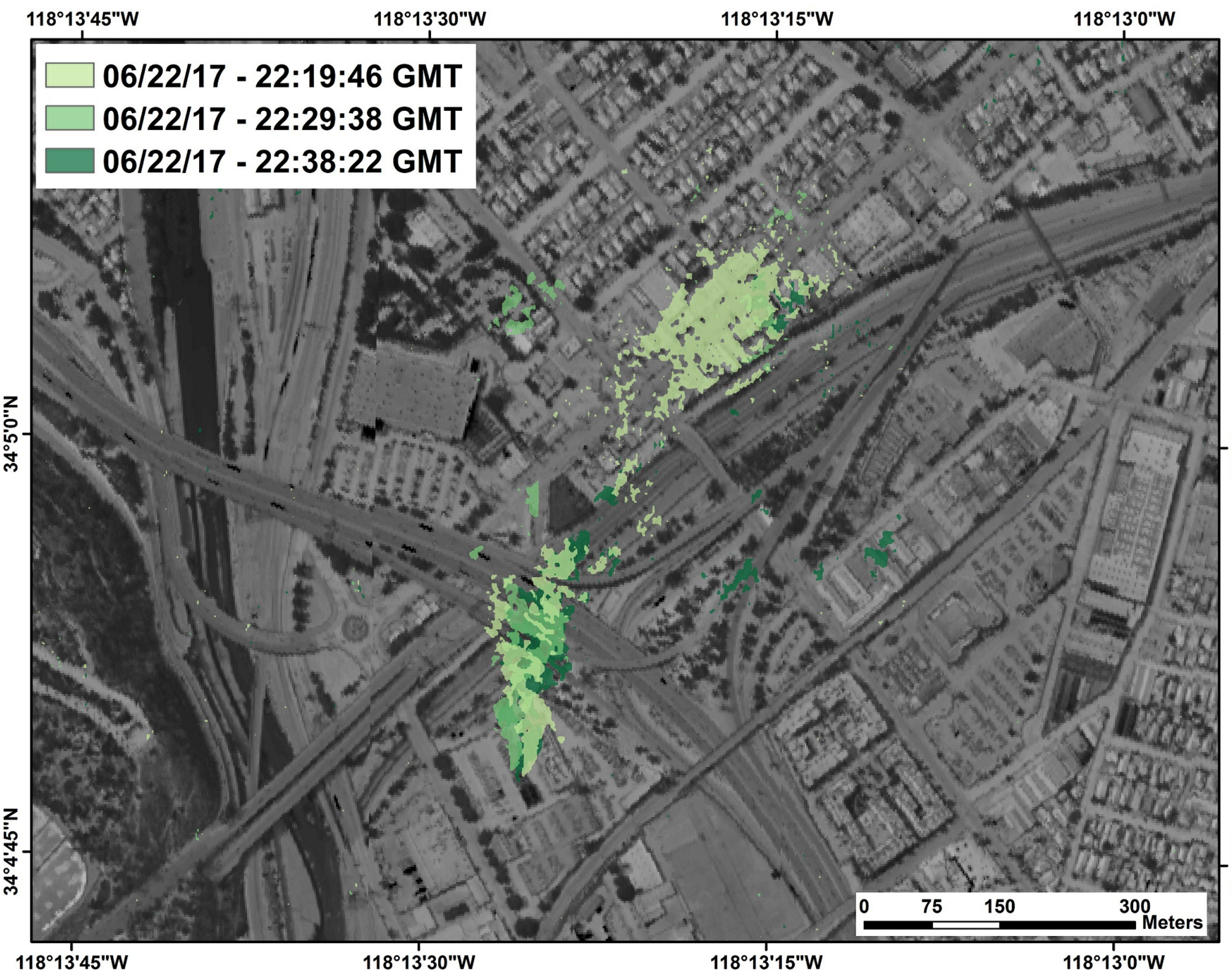

Figure 1. Methane plume from a liquefied-compressed natural gas fueling station in Los Angeles, imaged three times 10 minutes apart, by the Mako hyperspectral sensor.