Detecting Enhanced Levels of Atmospheric Methane Using Thermal Infrared Imagery

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Abstract: As the threat of climate change rises, so does the importance of monitoring the heat trapping, or greenhouse gases, that contribute to climate change. Methane is one such gas that naturally occurs in the atmosphere and has seen its presence increased due to human activity. We aim to determine the requirements needed for a relatively inexpensive thermal remote sensing imaging system to reproducibly detect enhanced levels of methane through Earth's atmosphere. In order to make accurate predictions of system requirements, we studied brightness temperature differences produced by a methane spectral feature observed in the thermal infrared utilizing radiative transfer models of typical atmospheres with the addition of a localized plume of methane. The use of MODTRAN 6 with our own post process models provided the ability to investigate the effects of background surface temperature, local plume temperature, and concentration of methane on observed brightness temperature. These models have been compared to airborne observations in order to assess their validity.

Keywords: atmospheric methane, radiative transfer models, thermal infrared imaging