Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05733, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05733
EGU General Assembly 2008

Nocturnal pollution in a Caribbean island: A new approach of the FTIR spectroscopy in tropical strong humidity environment

J. Jock, J. Molinié, F. Bade and R.-H. Petit

Laboratoire de Physique de l'Atmosphère Tropicale, Université des Antilles et de la Guyane, Campus de Fouillole, 97157 Pointe-à-Pitre Cedex (joel.jock@univ-ag.fr/ 590 590 483106)

From December to March, people living around Pointe-à-Pitre, a Guadeloupe island city (French West Indies, 16,2˚N, 61,5˚W), in the urban area near a landfill suffer at night from the presence of a smelly polluted air.

The odorous gases responsible of this poor quality air take place five or six hour after sunset and disappear in the morning, when the trade winds come back.

The gas concentrations measurements were made with an open-path Fourier transform infra-red (FTIR) spectrometer in the urban zone air at night. This measurement technique allows to detect several compounds simultaneously (N. Pické et al., 2007). It uses the absorbance properties of gases in the air in order to identify and quantify them (Autoquant description, 2002). The absorbance is deduced from the transmittance T(λ). A transmittance spectrum T(λ) is the ratio of the intensity which crosses the air containing pollutants to the incident intensity. A background spectrum is obtained with a non polluted air.

In the context of our experiences, the measurement of this background spectrum in situ is problematic since the atmosphere surrounding the measurement site contains pollutants, even with lower concentrations

We measure a background spectrum in the neighborhood of the polluted site. We choose a place where the humidity is nearly identical. In the classical analysis method (Autoquant description, 2002) the ratio of each measured transmittance spectrum to

this measured background spectrum is calculated. The absorbance of the pollutant gases is deduced. This absorbance is compared to a library of reference spectra supposed to be present in the site. A calculation of their respective concentrations is made by computing what portion of each of the reference spectra must be added to reproduce the absorbance spectrum (Autoquant description, 2002). This method cannot be used for tropical latitudes where the water vapor is high particularly at night. Now the water vapor has high absorbance peaks overlapping nearly all the pollutant infrared peaks. The corresponding results are biased for those gases. In order to eliminate the influence of water vapor, we propose to build a particular background spectrum. In the measured background transmittance spectrum we cut the signals at wavelengths corresponding to absorption of water vapor and eventual pollutants. The obtained signal corresponds to an air without water vapor and pollutants. It is, more or less, the incident signal. Using this artificial background we must add the water vapor absorbance into the list of the gases spectrum of the library. This method calculates the concentration of the gases and of the water vapor.

The gases detected at night in the city have been identified as landfill emission gases: methane, traces of trichloromethane, p-xylene, tetrachloromethane, and trichloroethylene added to the classical urban pollutants CO2, CO and NOx. These last gases are considered as toxic and have ill effects (particularly cancer) according to health organizations (P. Montague, 1991).

References

P. Montague, “Toxic gases emitted from landfills”, Environmental Research Foundation, Annapolis, March 27, 1991.

Autoquant description, Draft 5, Midac Corporation, 2002.

B. Caron, F. Gimenez, N. Aumercier, “Spectroscopie par transformée de Fourier, méthode d’analyse”, December 2002.

N. Pické, G. Guelachvili, « la spectroscopie par transformation de Fourier », *Laboratoire de photophysique moléculaire, CNRS, université de Paris-Sud*, Juin 2007.