Gases emissions from an intensive vegetable farm measured with slant-paths FTIR technique

Dr. Mei Bai[1], Dr. Helen Suter[1], Dr. Shu Kee Lam[1], Dr. Thomas Flesch[2], Mr. Rohan Davies[3], Professor Deli Chen[1]
[1]Faculty Of Veterinary And Agricultural Sciences, The University Of Melbourne, [2]Department of Earth and Atmospheric Sciences, University of Alberta, [3]BASF Australia Ltd.

An open-path Fourier transform infrared (OP-FTIR) spectroscopy system was deployed in a modified flux gradient (FG) technique to give open-path line-average concentrations from vertically separated slant-paths. Fluxes of ammonia (NH3), nitrous oxide (N2O), carbon dioxide (CO2), and methane (CH4) were measured simultaneously following chicken manure application to a vegetable farmland in autumn for three weeks. The FG/OP-FTIR technique detected the temporal variability in all gases fluxes during the experimental period, and NH3 emissions showed the quickest response to manure addition and increased substantially within six days. In contrast, fluxes of CO2 and CH4 strongly correlated to N2O emissions (R2 > 0.5), and respected to air temperature and precipitation events. Daily emission rates of NH3, N2O, CH4, and CO2 (mean ± SE) were 10.9 (± 0.6), 6.9 (± 0.5), 23.6 (± 3.8) mg m-2 h-1, and 4.2 (± 0.9) g m-2 h-1, respectively. We extrapolated these results to national vegetable industry across Australia, and found that fertilized/irrigated vegetable lands contribute 34.2% of agricultural sector emissions, and 5.1% of national GHG emissions. The latter is comparable to a previous estimate of 5%.