A MULTI-SEASON STUDY OF WHOLE LANDFILL METHANE EMISSIONS AND THE INFLUENCE OF ATMOSPHERIC PRESSURE

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ABSTRACT

Landfills are the largest sources of anthropogenic methane (CH_4) emissions to the atmosphere in the United States. However, few measurements of whole landfill CH_4 emissions have been reported. Here, we present the results of a multi-season study of whole landfill CH_4 emissions using atmospheric tracer methods at the Nashua, New Hampshire Municipal landfill in the northeastern United States. Measured emissions were negatively correlated with surface atmospheric pressure and ranged from 7317 to 21937 l CH_4 min^{-1} (Figure 1). A simple regression model of these results was used to calculate an annual emission rate of 8.4 x 10^6 m^3 CH_4 year^{-1}. A reported gas collection rate of 7.1 x 10^6 m^3 CH_4 year^{-1} and an estimated annual rate of CH_4 oxidation by cover soils of 1.2 x 10^6 m^3 CH_4 year^{-1} resulted in a calculated annual CH_4 production rate of 16.7 x 10^6 m^3 CH_4 year^{-1}. Estimated annual CH_4 emissions from this landfill, based on an empirical regression model of landfill emissions created by USEPA, are 8.0 x 10^6 m^3 CH_4 year^{-1}. These results stress the need for an improved model of landfill CH_4 emissions to the atmosphere.
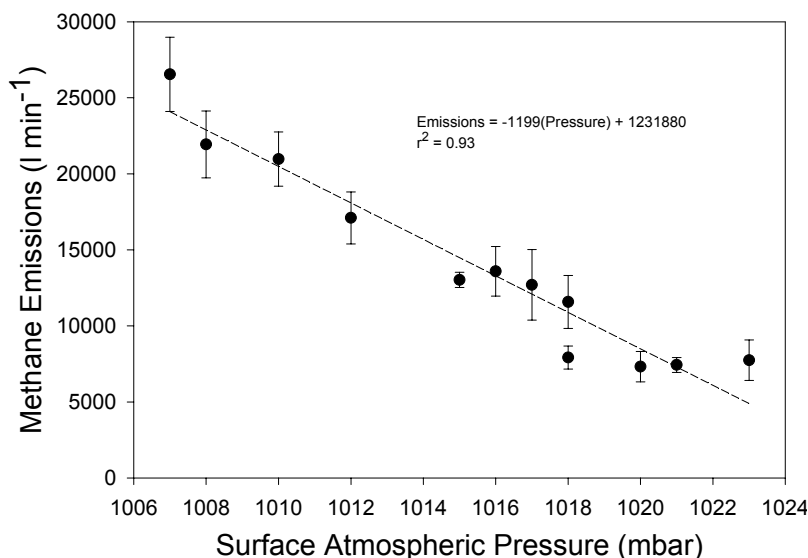
Figure 1 - CH_4 emissions as a function of atmospheric pressure measured during each test. The error bars represent the coefficient of variation of each measurement. The dashed line is the linear regression of these data. The equation of the regression line and r^2 are also presented.