INITIAL REVIEW OF THE INFLUENCE OF WIND SPEED AND ATMOSPHERIC PRESSURE ON FUMIGANT AIRBORNE FLUX

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Landfills and fumigant applications have much in common. Both emit pollutants to the atmosphere from gas-forming substances within the soil environment. Both also share a common need for flux study research. As part of research into landfill gas flux it has long been recognized that there is preferential release of gases from the soil to the atmosphere as wind speed increases (turbulent pumping) (REF) and during periods with rapidly falling atmospheric pressure (REF). These factors have been found to be more pronounced in soil conditions with reduced air porosity.

Fumigant applications are typically conducted in prepared soil with relatively high field capacity, and thereby reduced air porosity. The obvious question relating to fumigants: do similar phenomenon occur for fumigants? This issue could be important for several reasons, including: (a) flux studies for fumigants should be conducted during conditions that are representative of typical farming practice (and not during extreme anomalies that could produce unrepresentative results, (b) if a factor such as wind speed's effect on flux rates could be approximated, the ability to extrapolate flux study results to less or greater windy conditions, for example, could be refined.

This paper is an initial exploratory paper that reviews normalized flux data from a range of applied fumigant studies to see if the fumigant flux data appear to be a function of wind speed and/or atmospheric pressure drop. Some examples will be provided that anectotally suggest that pressure drop in some cases may be associated with a secondary maximum flux rate. In general, this factor was not found to be generally related to secondary maximum flux rates for fumigants. If studies were conducted with the objective of collecting flux data during pronounced pressure drop periods a different result potentially could be found. Wind speed, on the other hand, was found to have a greater potential to explain the typical trend of higher afternoon flux rates. This phenomenon has been observed on many studies, and often has been attributed to vapor pressure increases. As will be explained in this paper, the relative change in vapor pressure as a function of temperature change at shank injection depths such as 12 inches is relatively small compared to the flux increases that are observed. While vapor pressure increases likely are a factor that contribute to flux increases during the afternoon, it is possible that the typical increases in afternoon wind speeds is a more significant factor.

This paper will conclude that this initial review is inconclusive but points to the benefit of further research, especially for the wind speed (turbulent pumping) factor. A greater understanding of this factor could lead to the collection of more representative flux data and data sets that could be potentially extrapolated to other regions and conditions with greater confidence.