# Minimizing Field Time to Get Reasonable Greenhouse Gas Flux Estimates from Many Chambers


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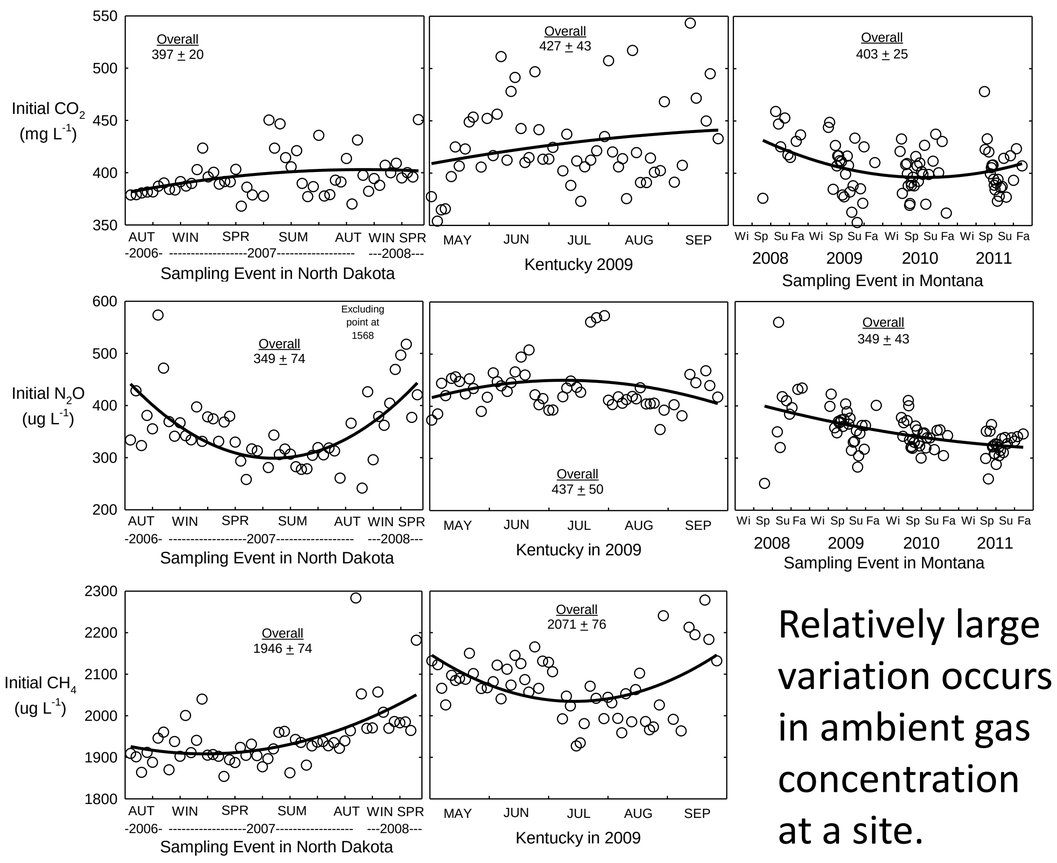
## 1. Problem statement

Greenhouse gas measurements from soil are typically derived from static chambers placed in several replicate field plots and in multiple locations within a plot. Inherent variability in emissions is due to a number of known and unknown factors. Getting robust emission estimates from numerous chambers should therefore minimize time of researchers in the field to avoid unnecessary diurnal variations caused by long hours within the day in the field.

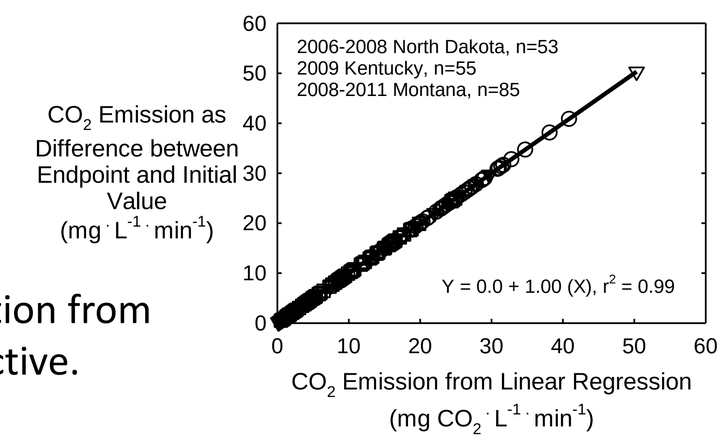
## 2. Ambient air concentrations



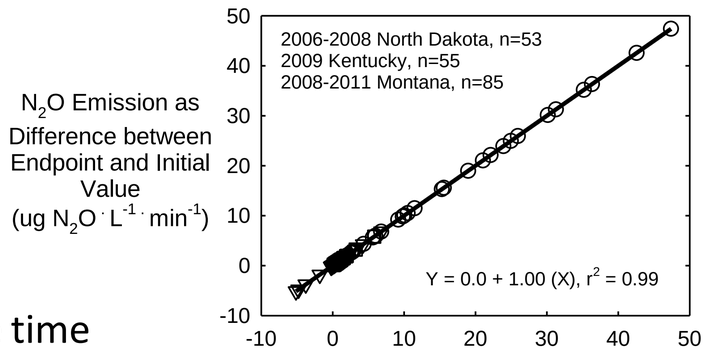

Relatively large variation occurs in ambient gas concentration at a site.

## 3. Impact of calculating endpoint minus ambient

Compared with linear regression of three points (e.g 0, 15, 30 min in KY and 0, 20, 40 min in ND and MT), the linear calculation from two points was just as effective.



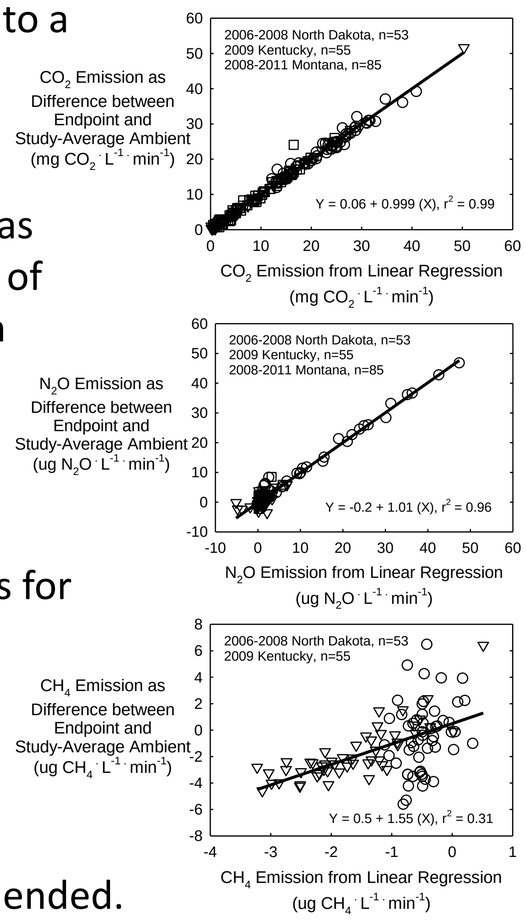

Close association between approaches occurred for all three GHGs.



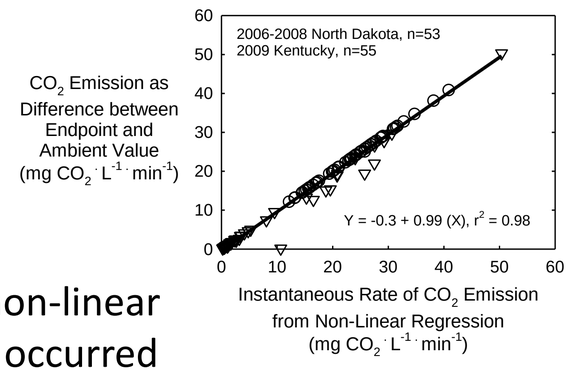

Importantly, reducing number of gas samples by ~60% (all of intermediate time point and 80% of initial points) reduced time in the field to a shorter window and need for more labor.

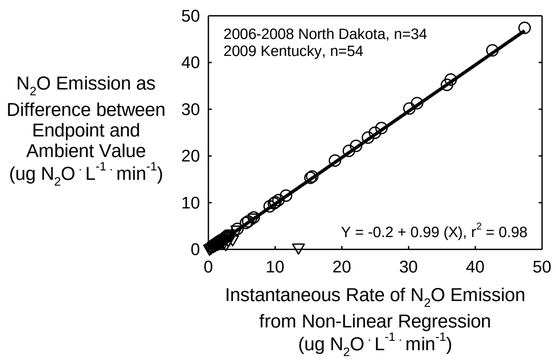
## 4. Impact of calculating endpoint minus ambient mean

Reducing gas sampling to a single endpoint only produced variable results due to variations in ambient gas concentration and rate of flux. The best situation occurred for $CO_2$, since ambient variation was low and flux was high. The worst situation was for $CH_4$, because flux was very low. At low $N_2O$ flux (<10 ug $L^{-1}$ $min^{-1}$), large variations also occurred. This strategy is not recommended.

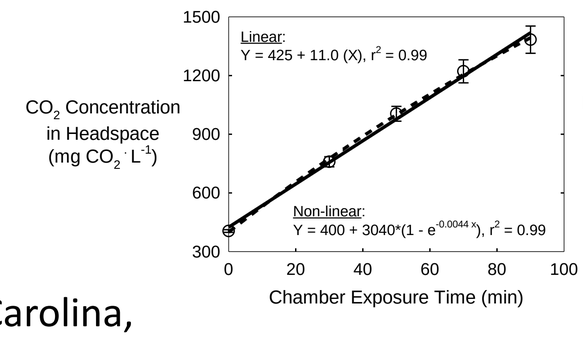


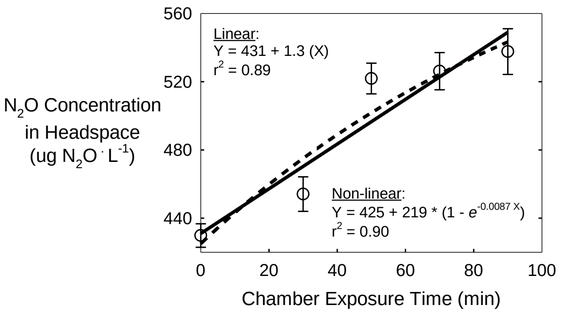

## 5. Non-linear vs linear responses




Very few non-linear responses occurred ($CO_2$ = 13% and $N_2O$ = 10% of observations >|10%| different). Overall, linear responses estimated with an endpoint value minus a few ambient samples would be sufficient.




In North Carolina, $CO_2$ and $N_2O$ fluxes were linear through 60 minutes (mean of 45 chambers).

**Assessing greenhouse gas emissions from field treatments could be more effective by reducing the number of samplings within a chamber and deploying more chambers.**

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