

Pilot investigation of a mobile sampling system
for methane emissions from ruminants

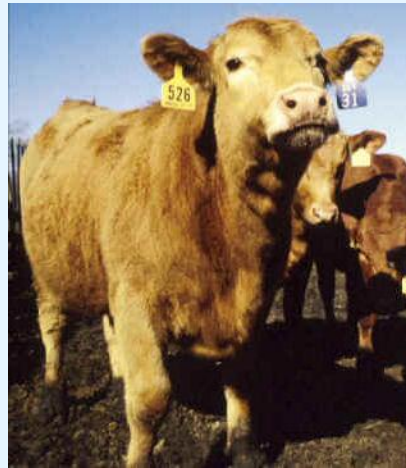
Dave Ross, Lesley Deans, Carol-Anne Duthie, Mintu Nath,
Craig Michie

Dave.ross@sac.ac.uk

CH₄ measures



est CH₄ c500l/day?



c250l/day?



c30l/day?

Eructed Ch4



- Tracer method does not give temporal resolution of emissions
- Requires bolus administration

Space model and initial spec



- Animal-mounted
- Front end sampling similar to SF₆ method
- Attempt to measure CH₄ 24/7
- Wireless automatic upload to dbase (free space range up to 80metres)

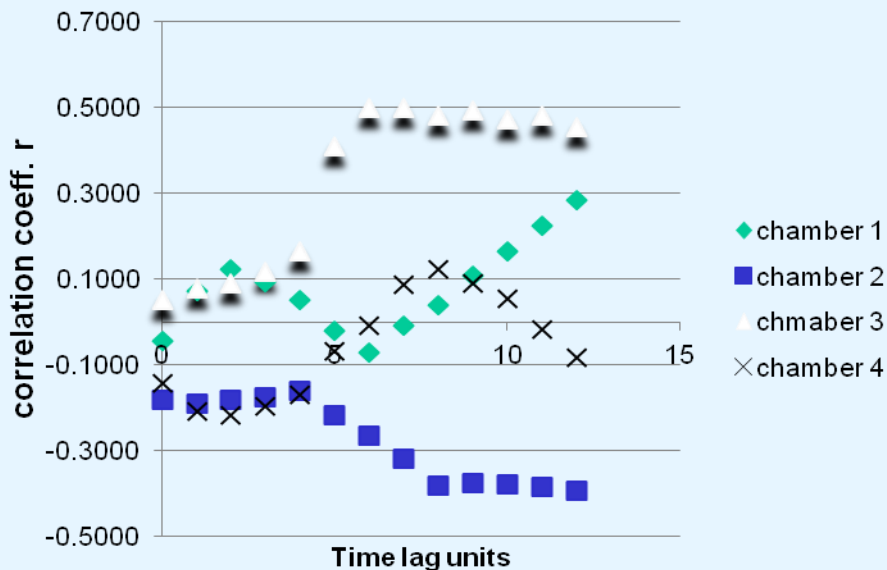
Initial trial - sheep



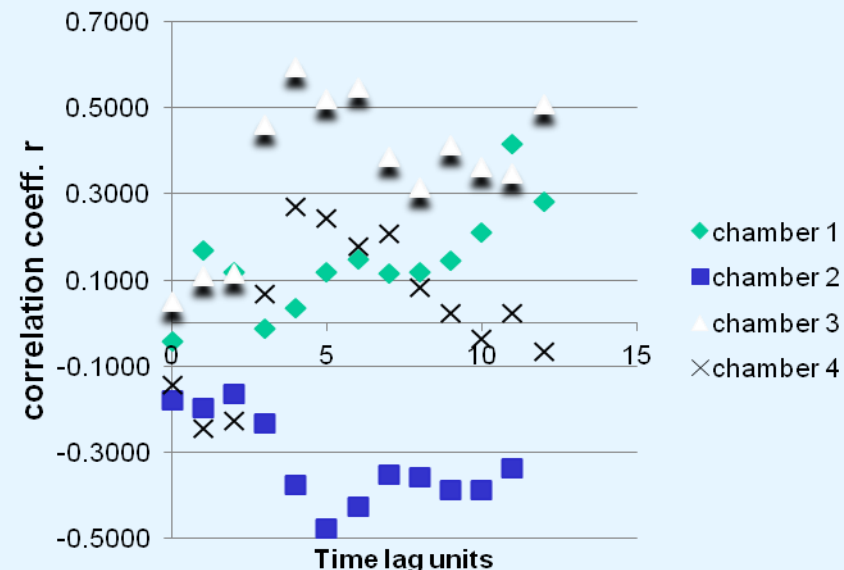
- IBERS methane chamber facility
- 4 animals in parallel
- Wireless automatic upload to dbase
- Daytime data collection
- Chamber data point collection 1 reading/minute for 4 minutes in every 25 minutes
- Chamber flow-rates virtually identical, so correlations done with concentration (ppm) values

Initial trial – results

Chamber and collar cross correlations for given time lag - median of 5 values



Chamber and collar cross correlations for given time lag – single value



Time lag units – 5 secs

Initial trial – results



- Correlations reasonable in some but unit 2 results were poor
- Because of high chamber flow-rates, animal movement will compromise this method of comparative analysis
- Animals free-stalled so significant movement was possible

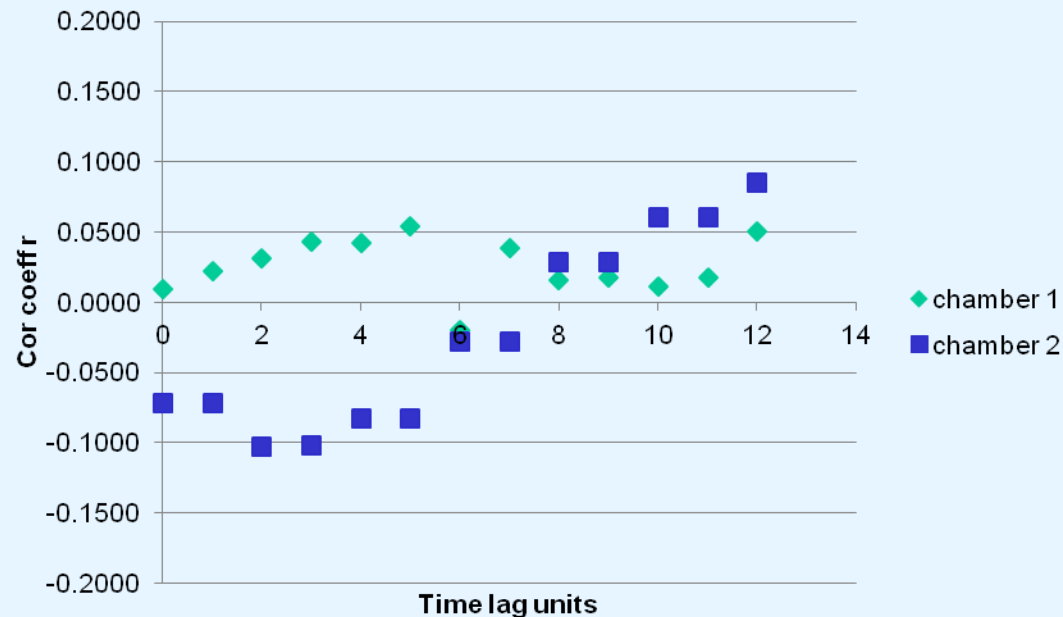
Trial - cattle



- AFBINI respiration chamber facility
- 2 (beef) animals in parallel (crated)
- Wireless automatic upload to dbase
- Data collected daytime and overnight
- Chamber data collected, 1 reading every 4 minutes continuous
- Chamber flow-rates virtually identical, so correlations done with concentration (ppm) values

Trial - results

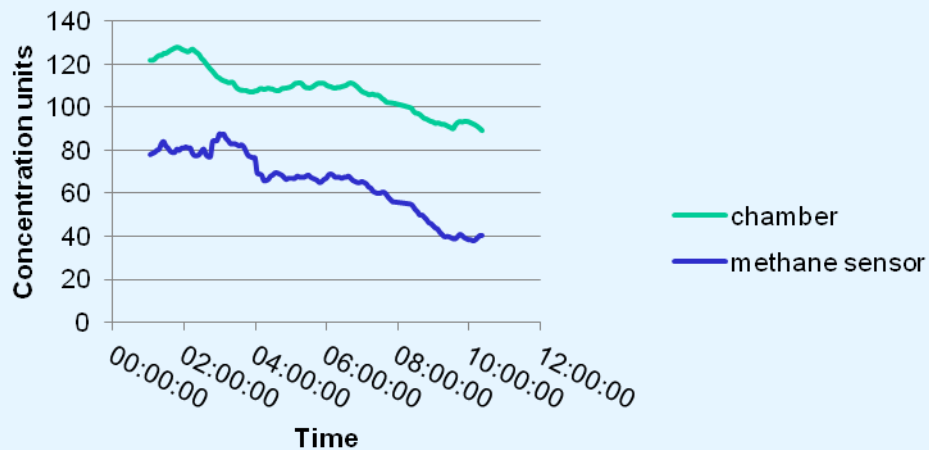
Chamber and collar cross correlations for given time lag
– spot readings



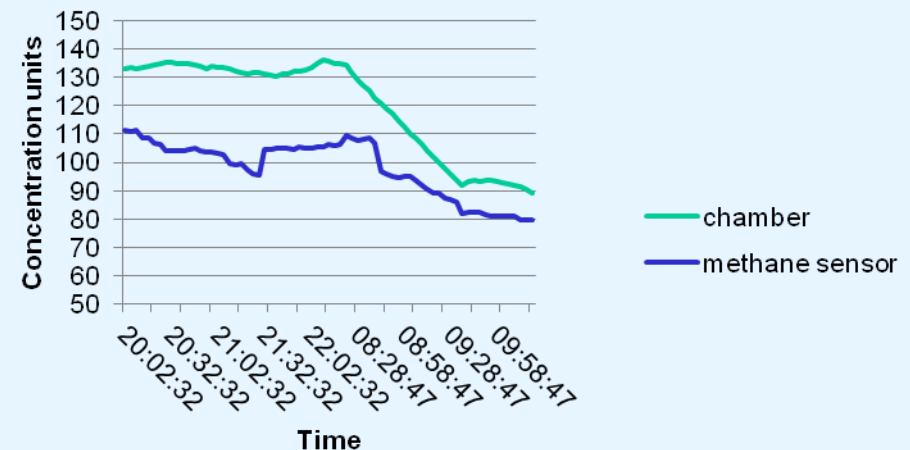
Trial - results

- What if animal position e.g. feed bin proximity influenced results?)
- Take night-time data only – where animal resting in “open” area
- Take rolling mean of temporal data-stream after optimal time matching

Chamber 1 vs methane sensor

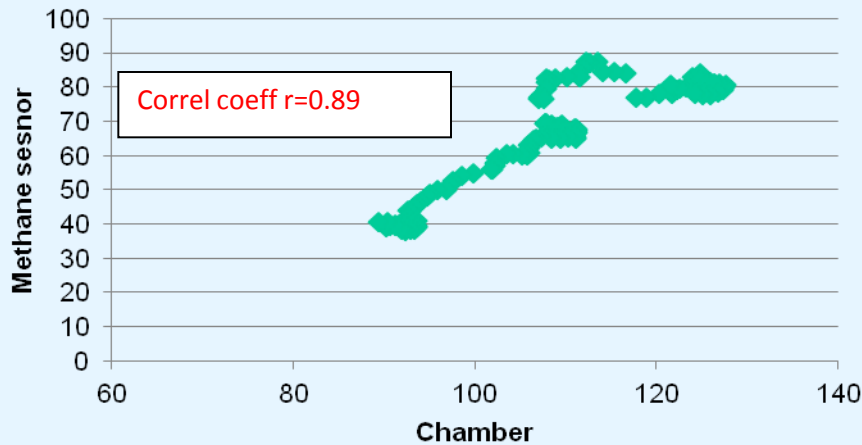


Chamber 2 vs methane sensor

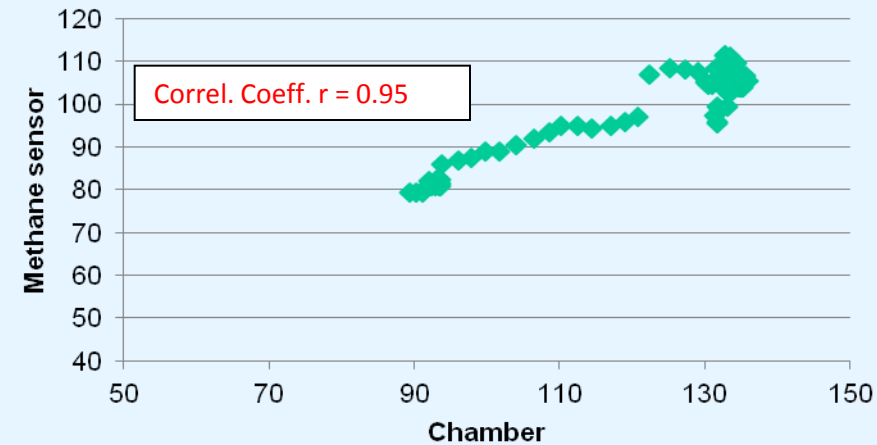


Trial - results

Chamber 1 vs methane sensor



Chamber2 vs methane sensor



- Above are independent data-streams of chamber output vs collar output
- Possible explanation of discontinuities might be animal feeding or nose piece moved substantially
- Methodology to correct for this can be explored further in later trials

Next steps??

- Aspiration to conduct further pilot trials using SAC “Greencow” facility
- 6 respiration chambers and associated penning for cattle (and sheep)
- If results successful, then re-package to pre-production spec and allow third party beta-testing?
- Design refinements : on-board storage and auto download where proximal to base station
- Testing with other complimentary methods (laser gun etc/ feed sniffers etc)



Acknowledgements



Sponsors:-

Genomia fund



DEFRA GIN



People:-

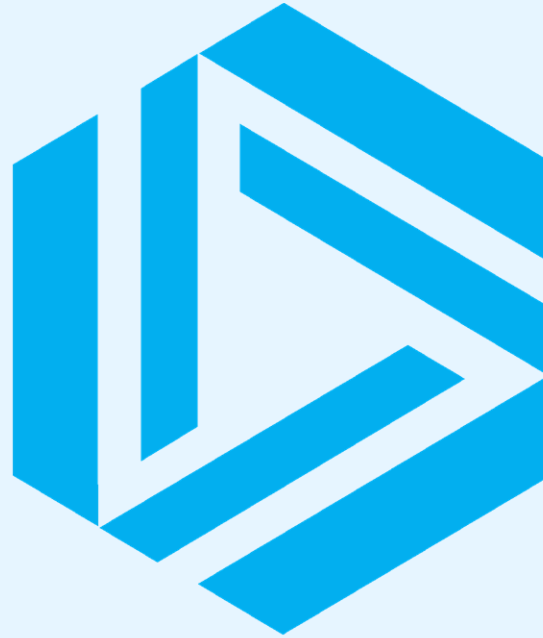
AFBINI – Tianhai Yan, David Wills and the “team”

IBERS – Jamie Newbold, Neil McEwan, Hilary Worgan, Gary Easton, Jamie Leigh-Douglas

SAC – John Rooke



DEMO



SAC

S✓**ccess** through **Knowledge**