Poznań University of Life Sciences
FACULTY OF VETERINARY MEDICINE
AND ANIMAL SCIENCES
Department of Genetics
and Animal Breeding

Methane emission collected on Polish commercial dairy farm

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NATIONAL SCIENCE CENTRE
POLAND GRANT NO: OPUS 2013/09/B/NZ9/03179

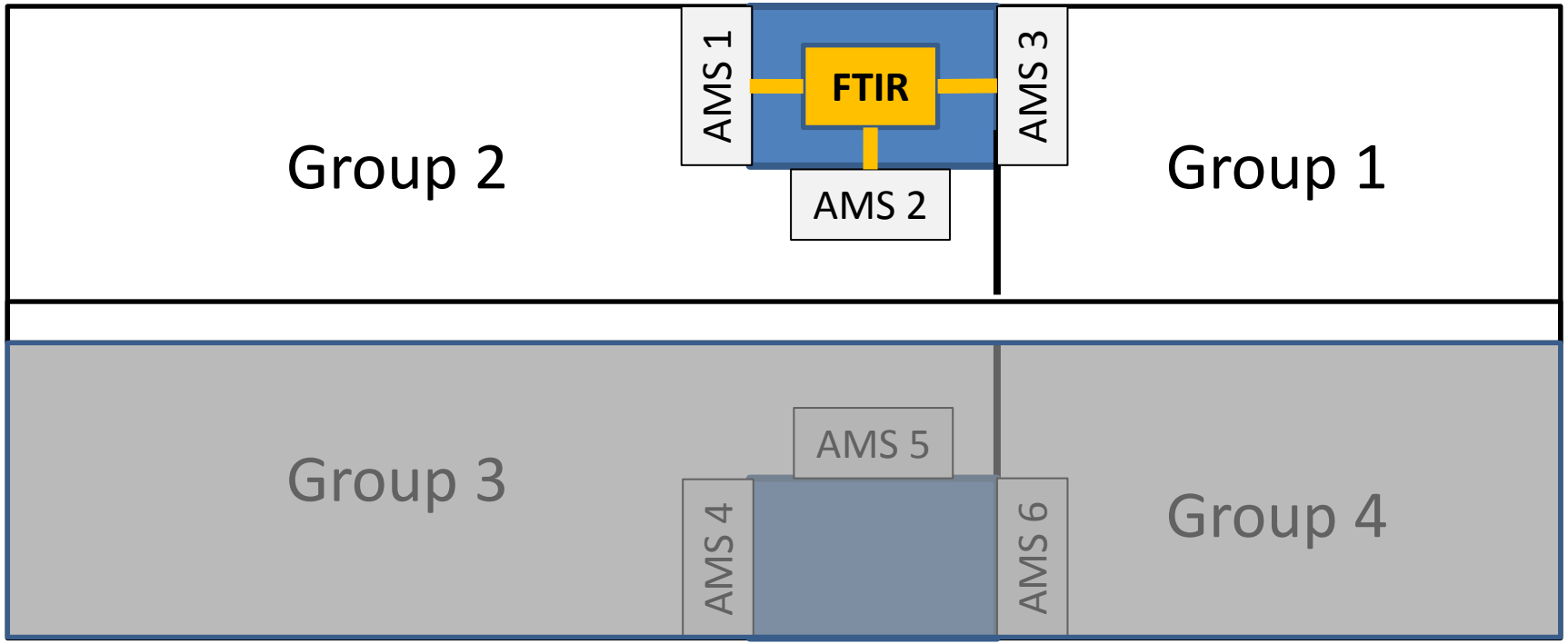
Polish Methane Project goal:

Determine (non)genetics factors affecting CH_4 emissions

The farm

300 HF cows on farm

3 AMS measured 24hrs each



Non-CH_4 data:

AMS recorded data (milk, weight, activity, etc.)

Group nutrition

Health data (own application)

Routine recording data (milk, type traits, etc.)

Genotypes (coming soon)

Nutrition:

PMR for all cows

Concentrate in AMS based on production level

Collected CH_4 data

Period 12 Jan-10 Aug 2015

33 806 milking visits

294 cows measured

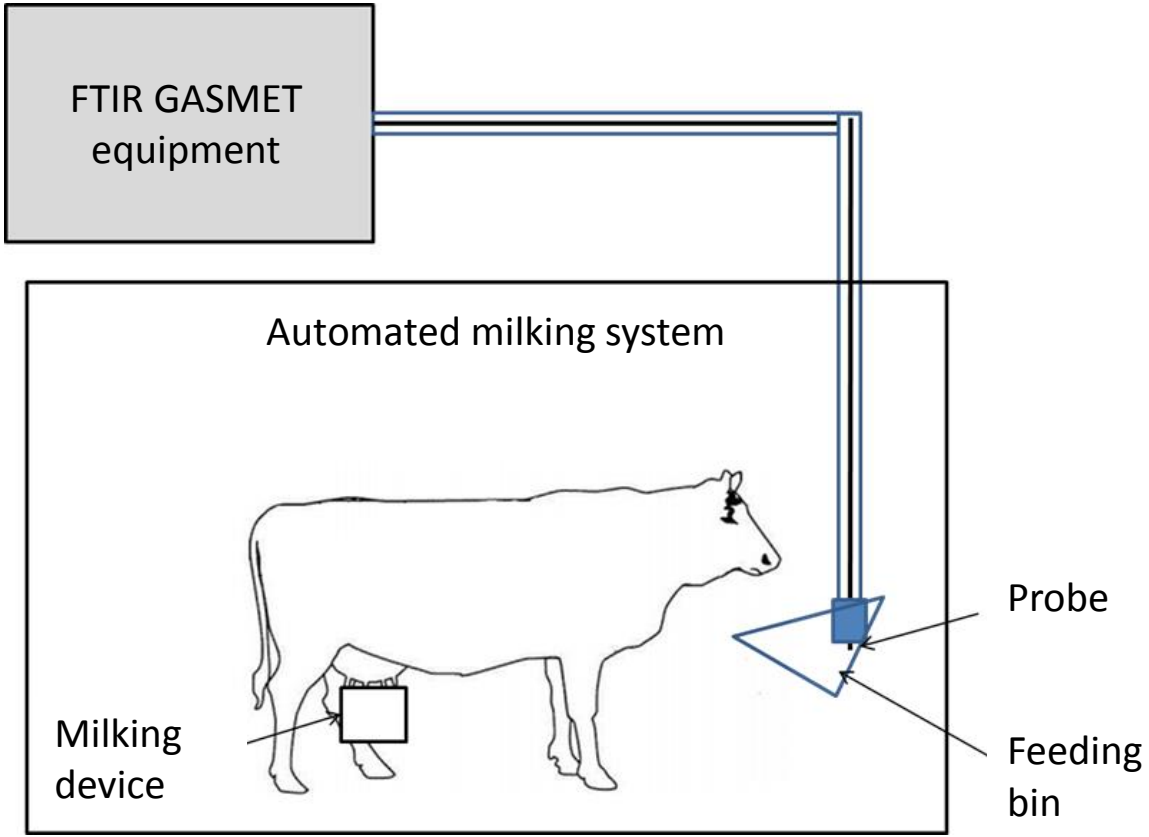
137 visits / day

1.73 visits / day / cow

135 (±85) visits / cow

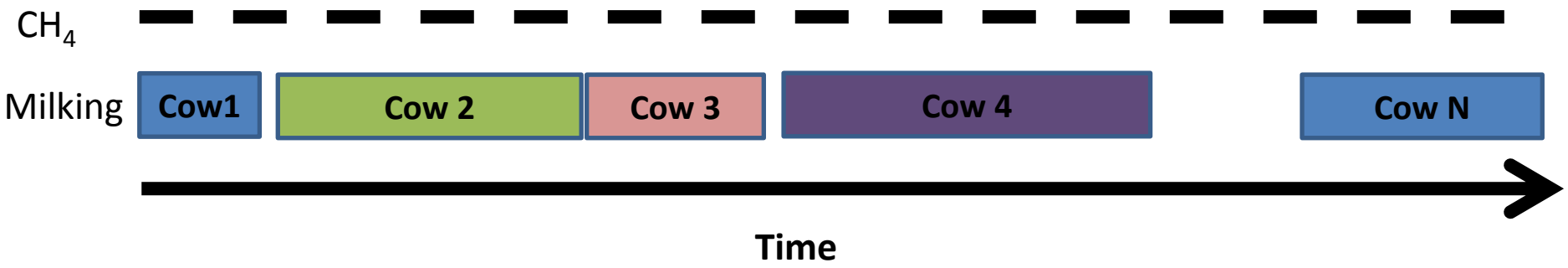
Lactation number	No. of records
1	22 054
2	11 311
3	382
4	59

Measuring scheme

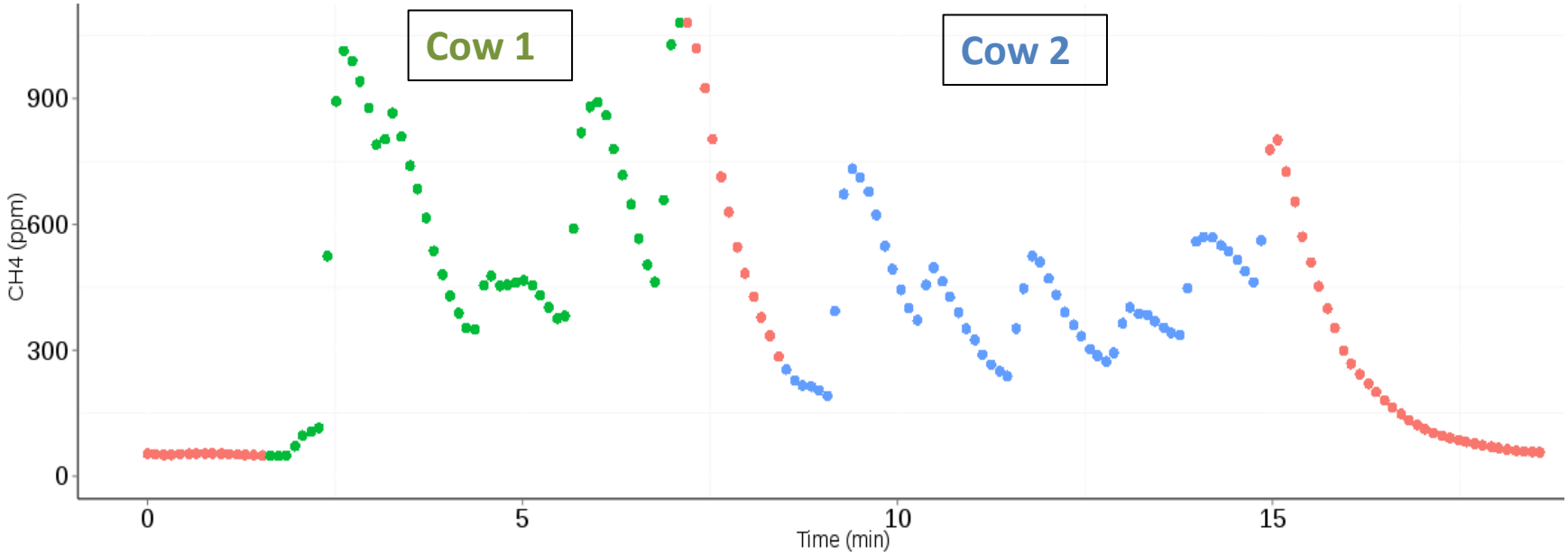


Measuring scheme

- CH_4 averaged every ~5 secs; Continues measurements



Measurements



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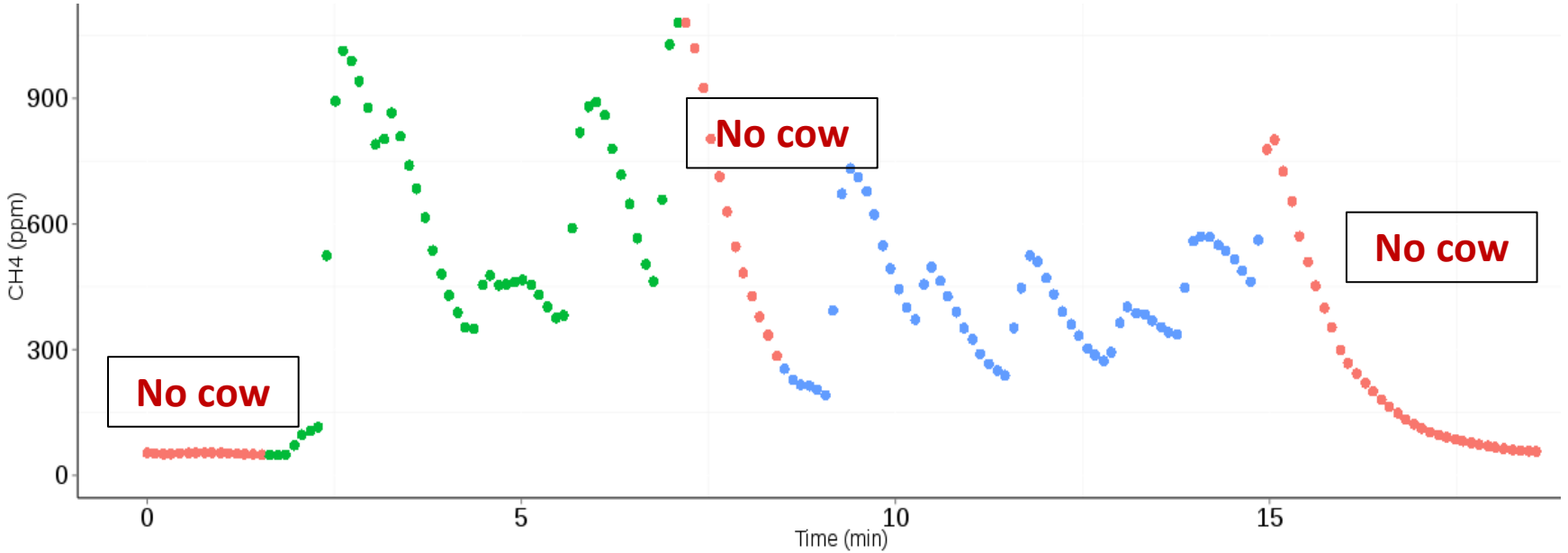

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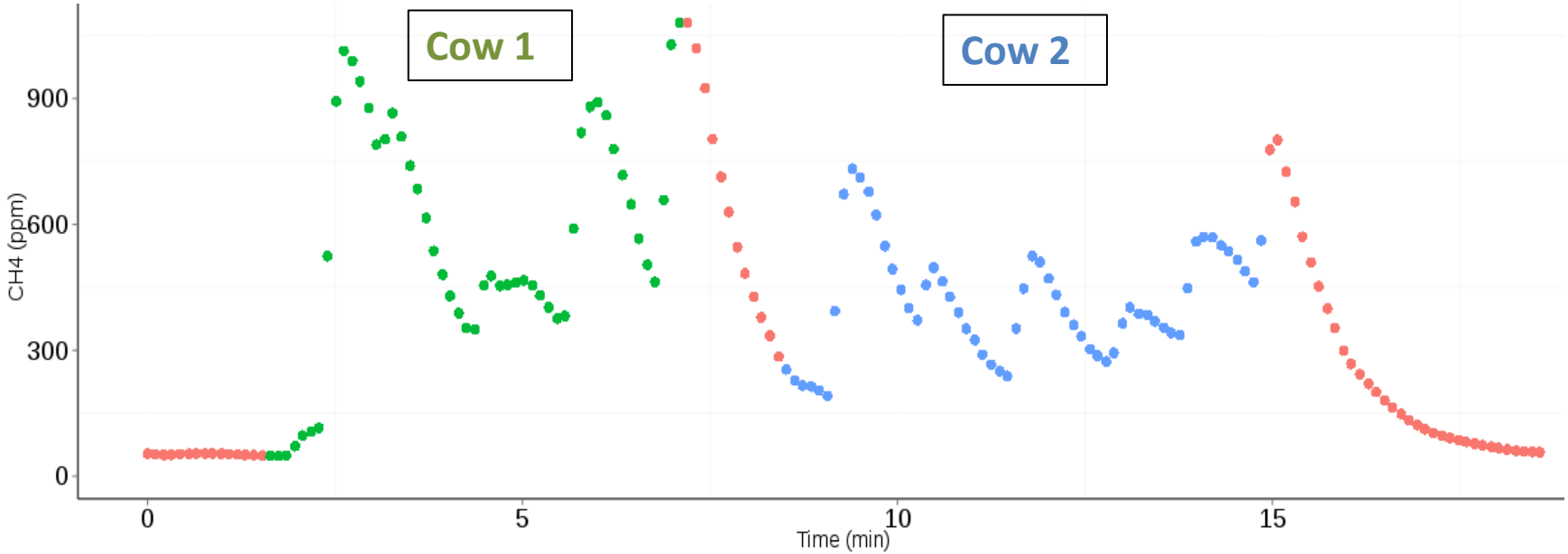


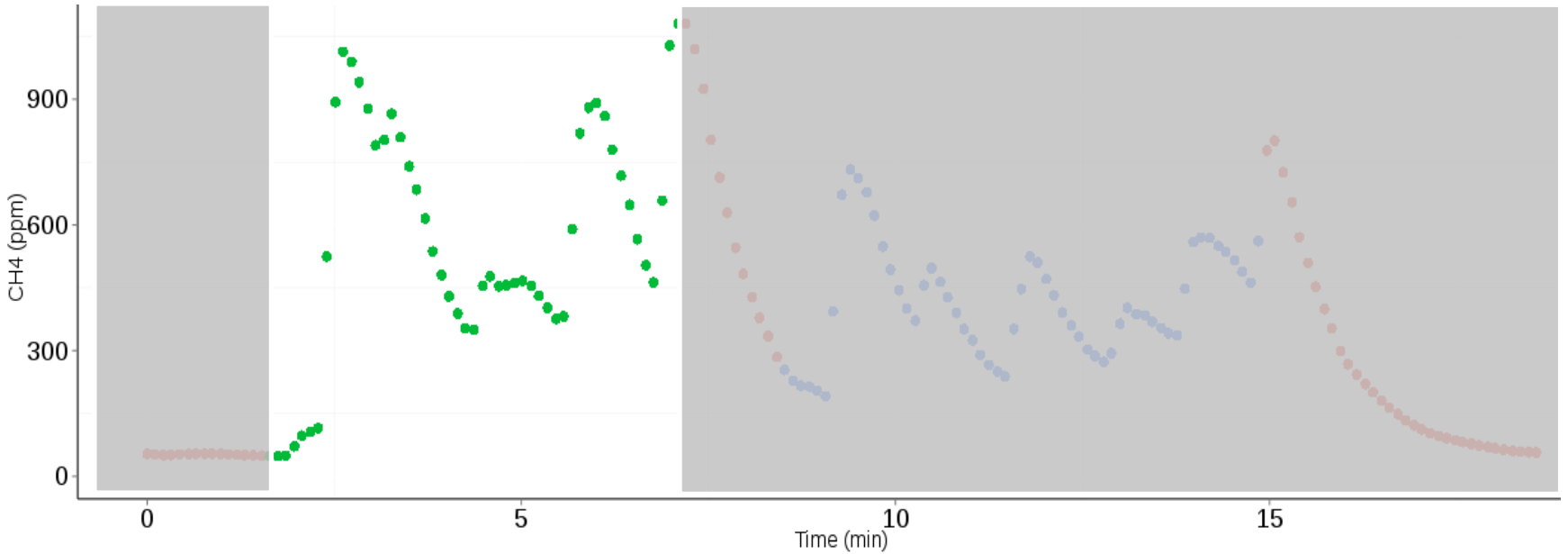
Phenotypes per milking visit

Mean [ppm] = Mean CH_4

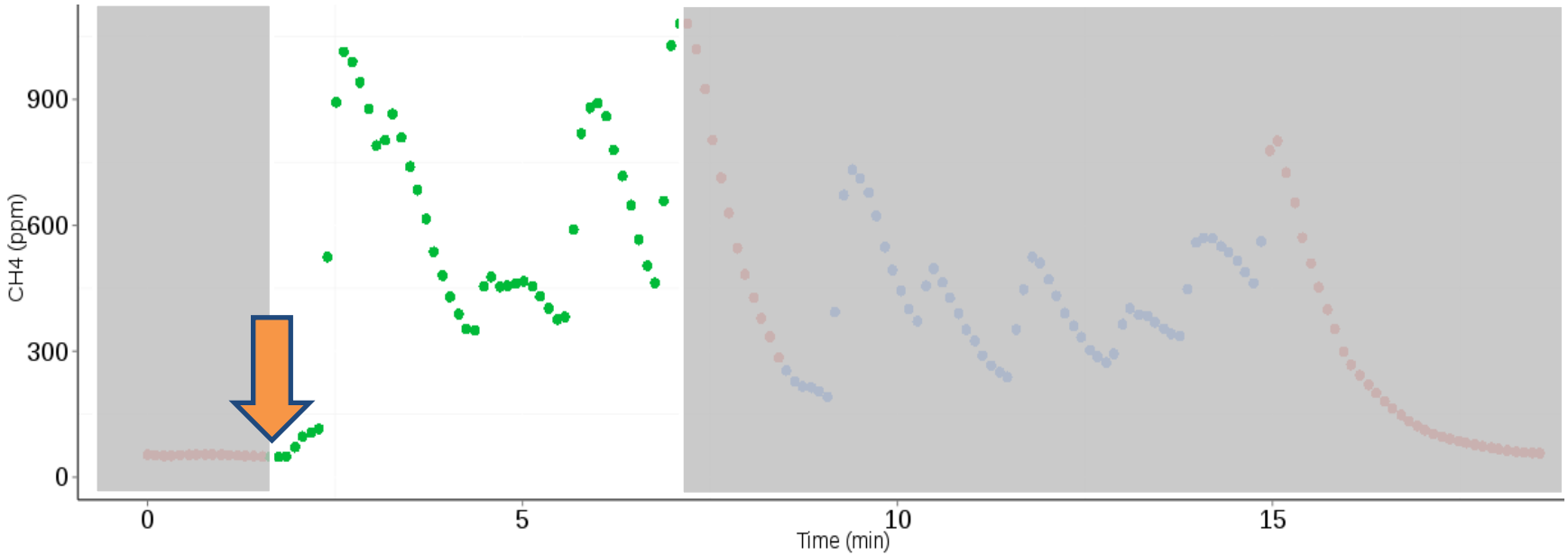
MeanStart [ppm] = Mean CH_4 - CH_4@milking start

MeanBckg [ppm] = Mean CH_4 - CH_4@background

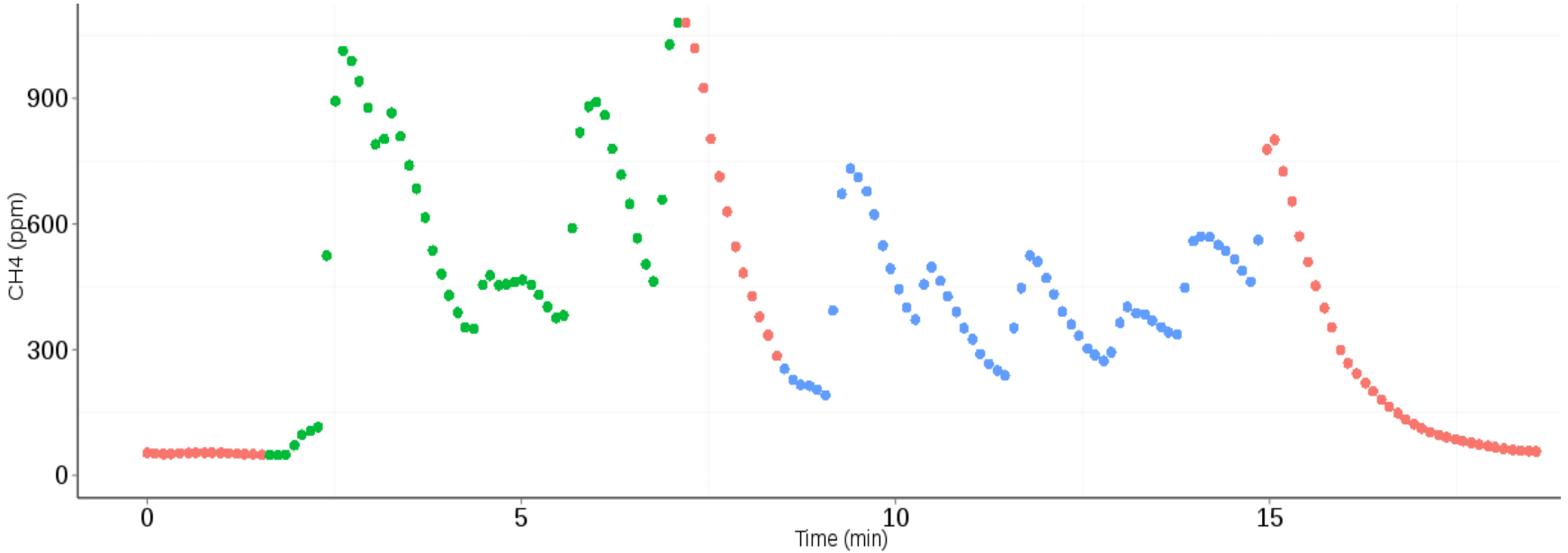
Mean = ∑measurements/N



MeanStart = ∑measurements/N - start



MeanBckg = ∑measurements/N - background



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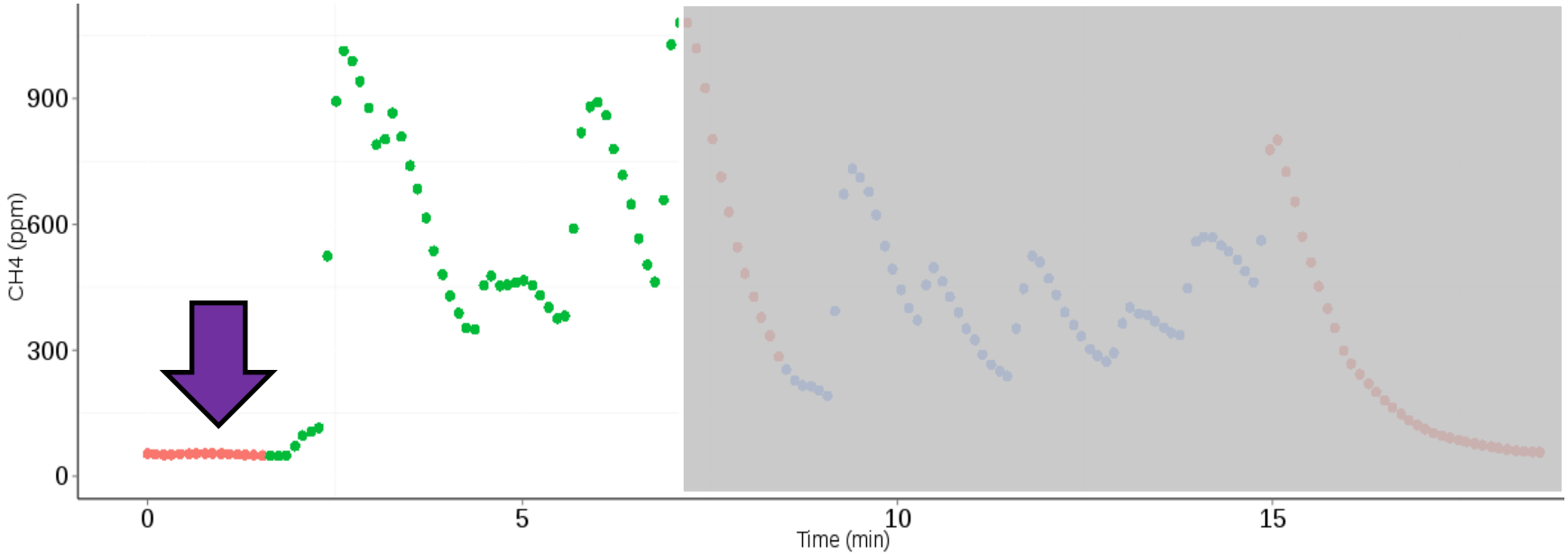

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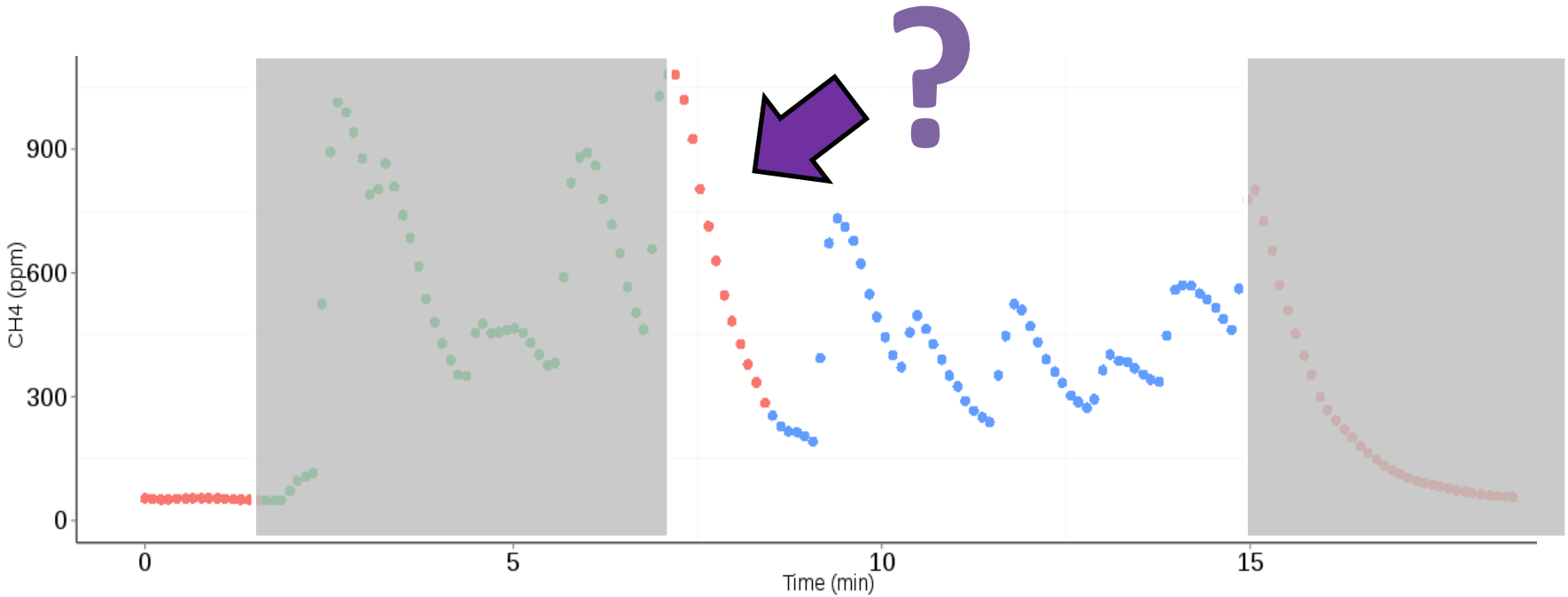

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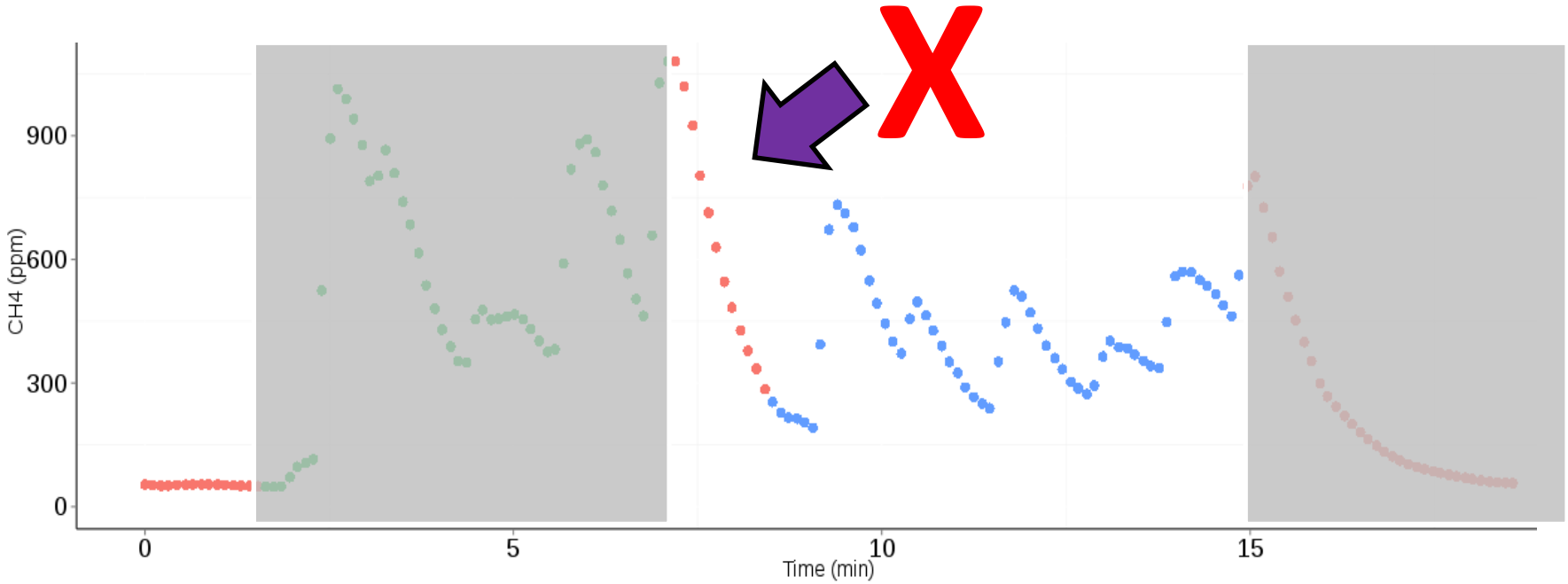

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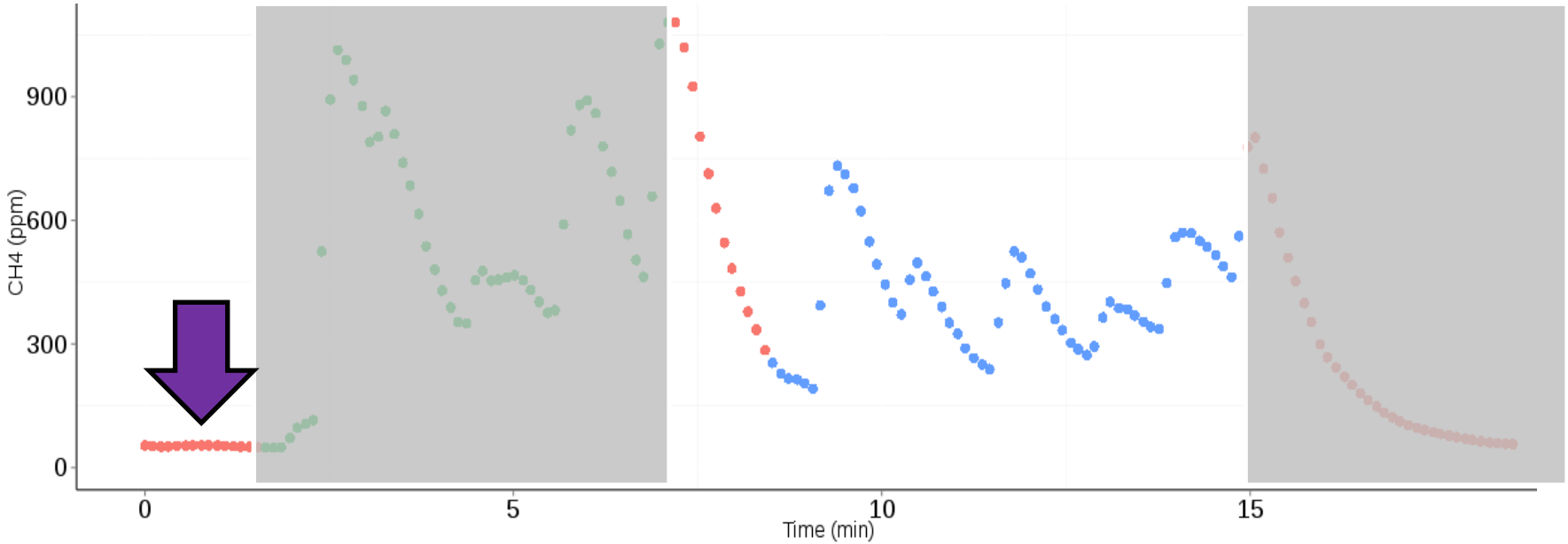

Basic statistics of 3 methane phenotypes

	Phenotype [ppm]		
	Mean	MeanStart	MeanBckg
Average	**510.19**	**268.70**	**469.64**
Min	0.04	-1484.74	-467.57
Max	1606.87	1417.02	1568.61
S.D.	201.45	278.12	203.81

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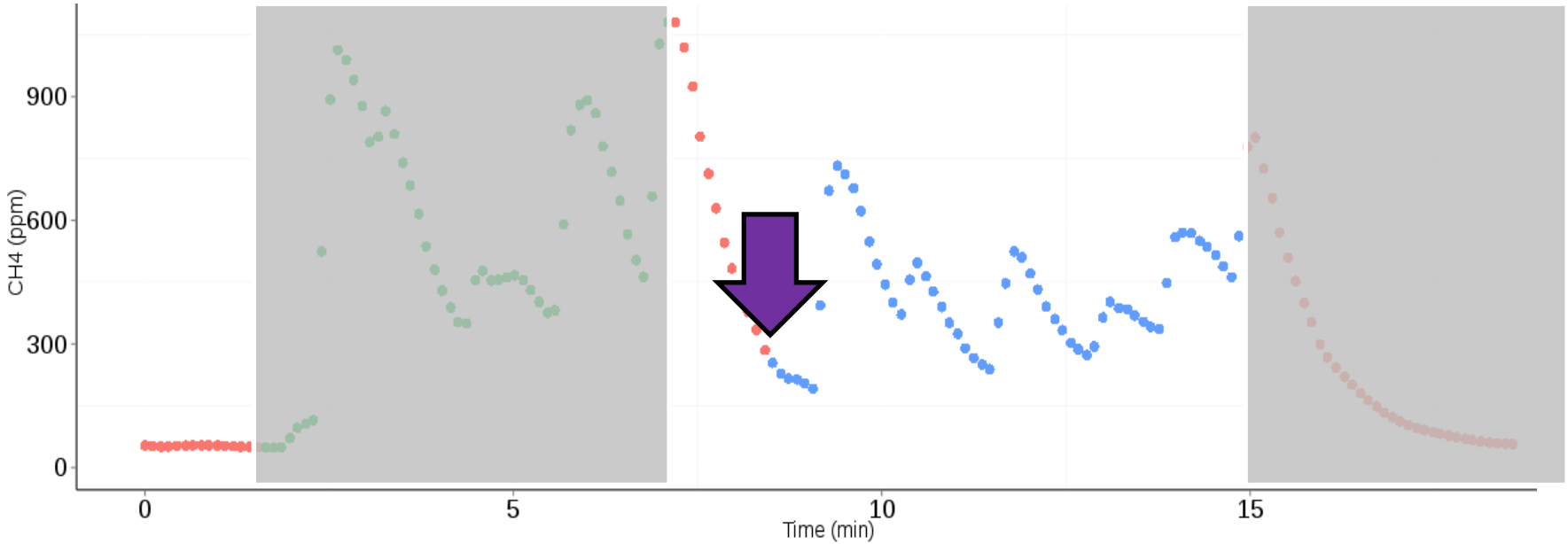
MeanStart – wrong starting point



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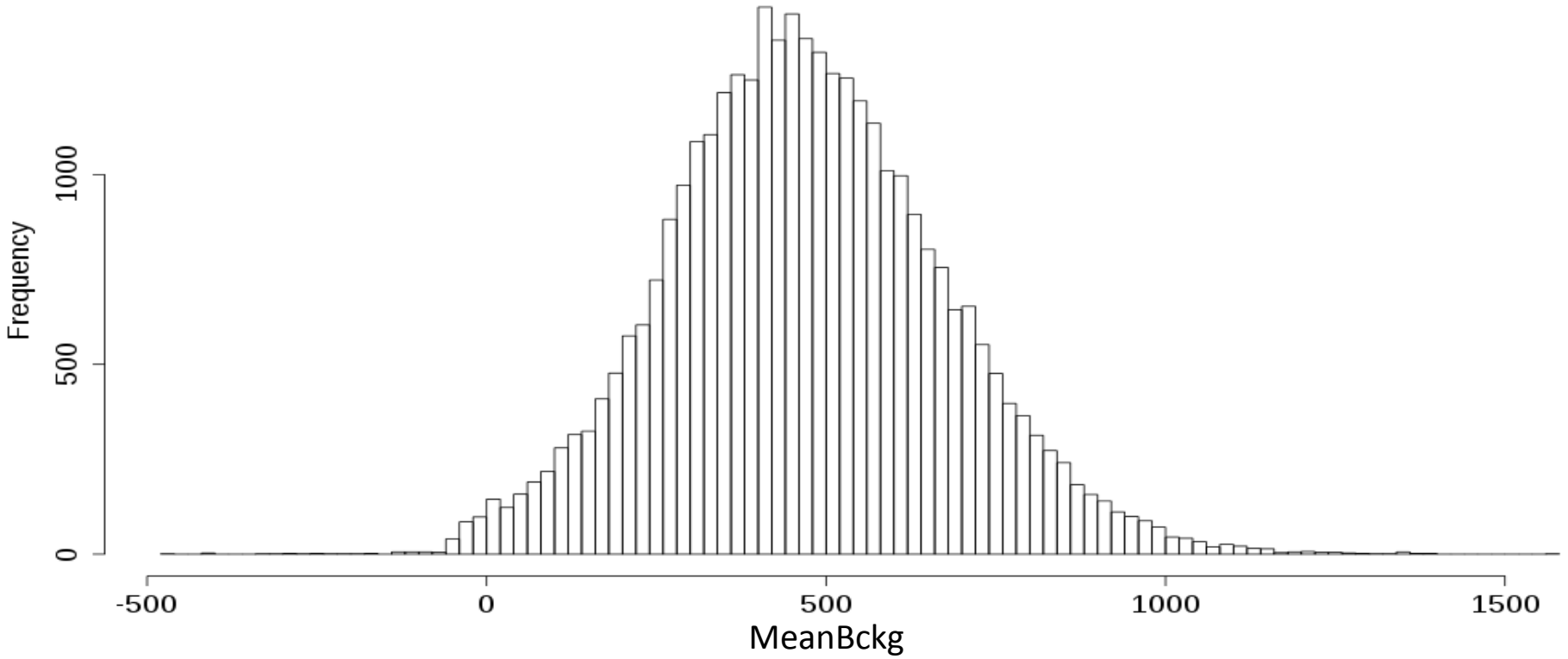
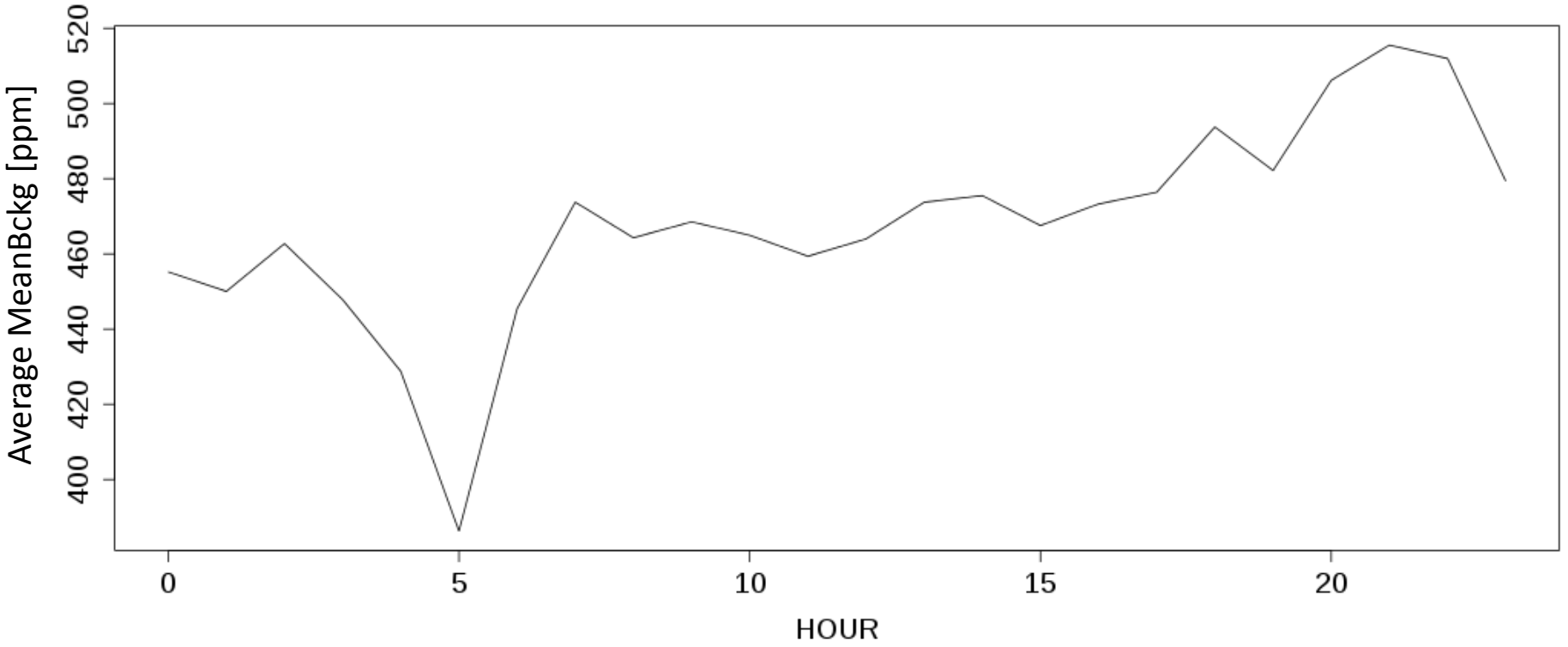
Methane MeanBckg Phenotype



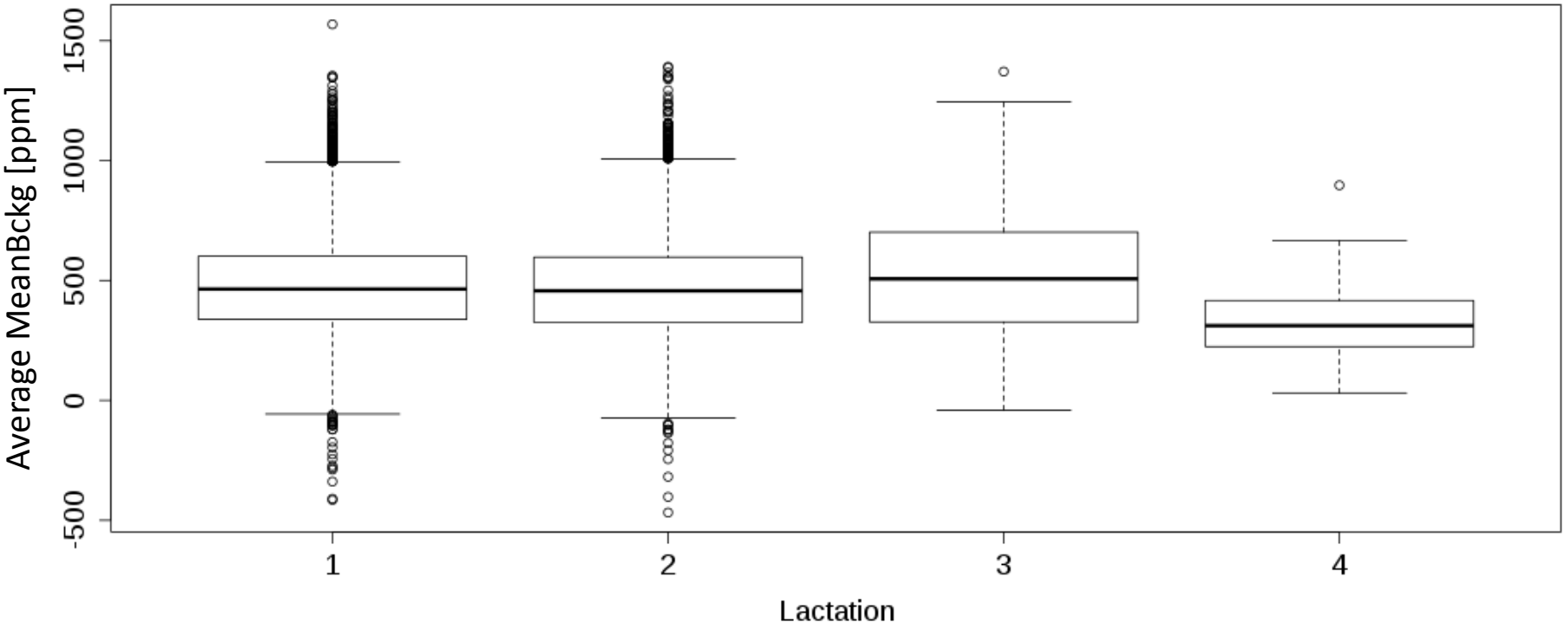
Correlations between 3 methane phenotypes

	MeanStart	MeanBckg
Mean	0.51	0.98
MeanStart		0.51

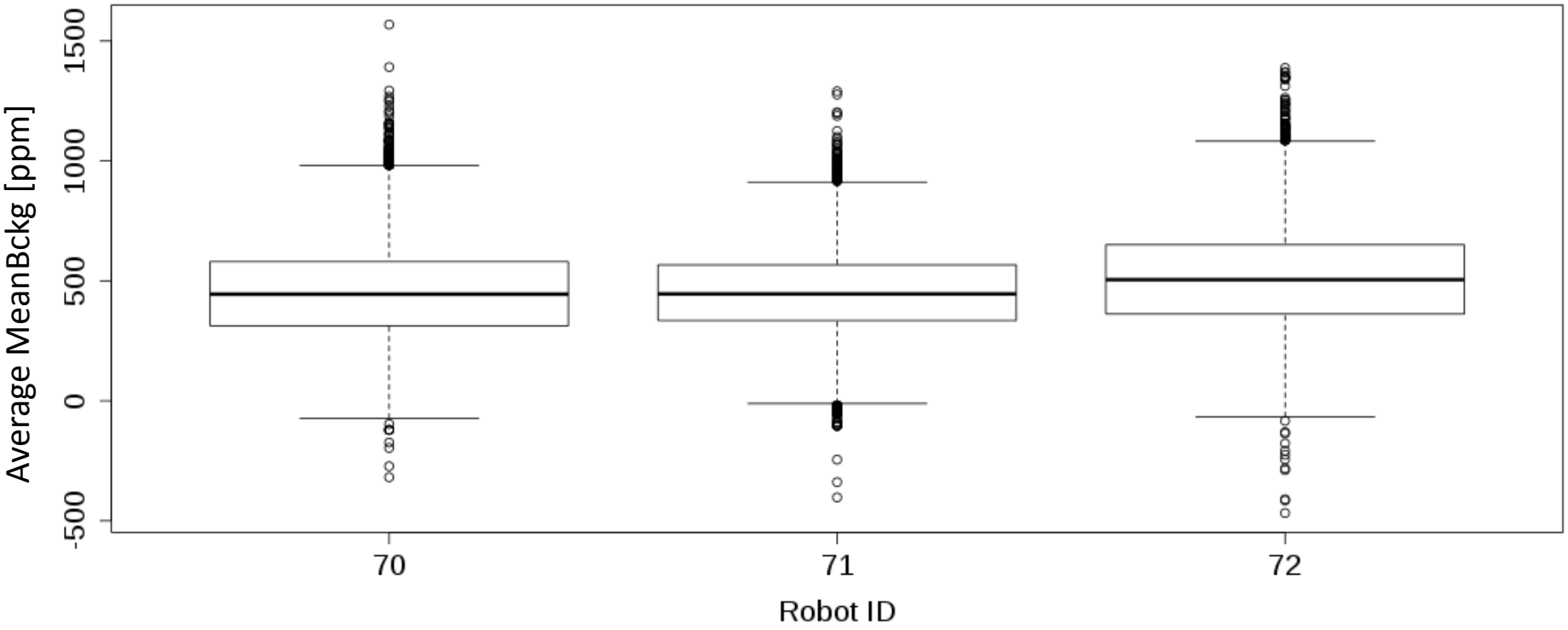
Hourly variation



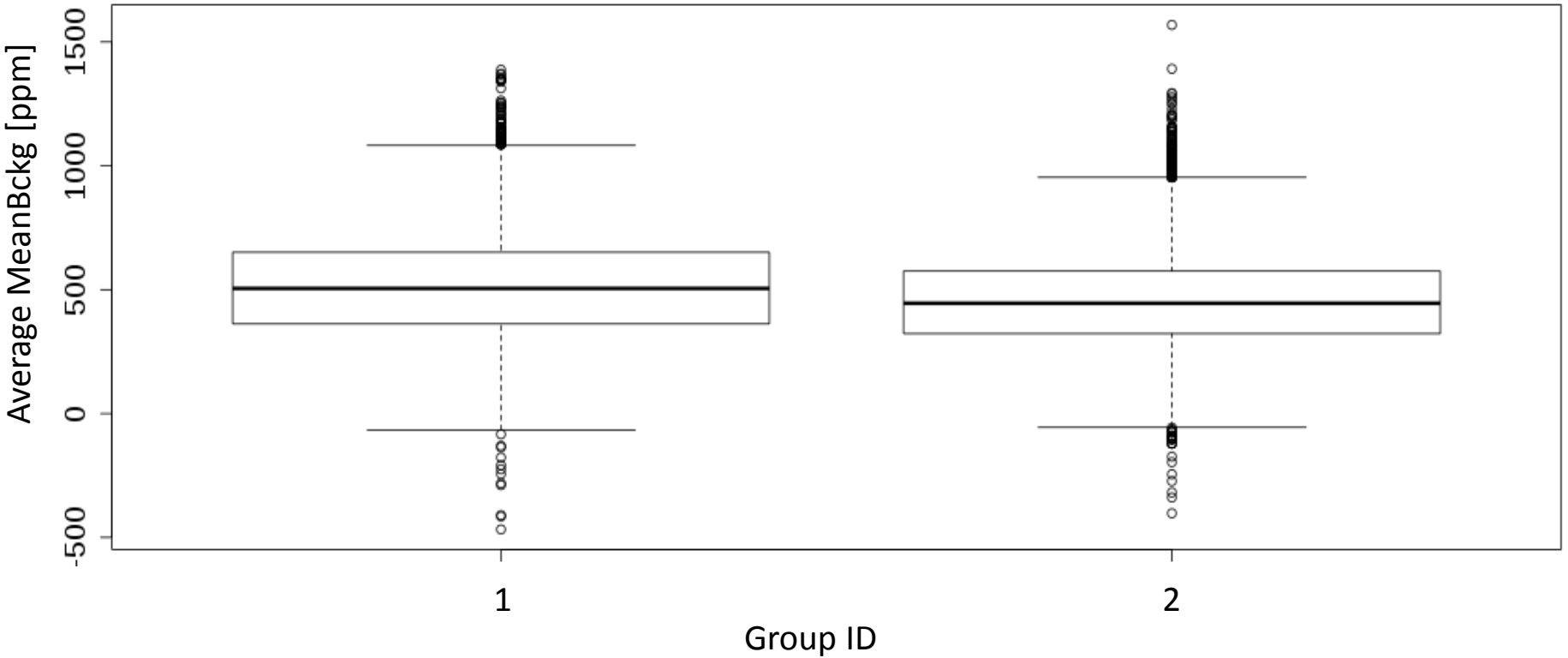
Lactation differences



Robot difference



Group differences



Repeatability

$$CH_4\, phenotype_{ijklmn} =$$

$$mean + \beta_1 \times \mathrm{dim_j} + lact_k +$$

$$group_m + hour_n + \boldsymbol{animal_i} + \boldsymbol{error}_{ijklmn}$$

Inspired by: Lassen et al. 2012

Repeatability

$$CH_4\,phenotype_{ijklmn} =$$

$$mean + \beta_1 \times \mathrm{dim_j} + lact_k +$$

$$\boldsymbol{cos2\theta\pi + sin2\theta\pi}$$

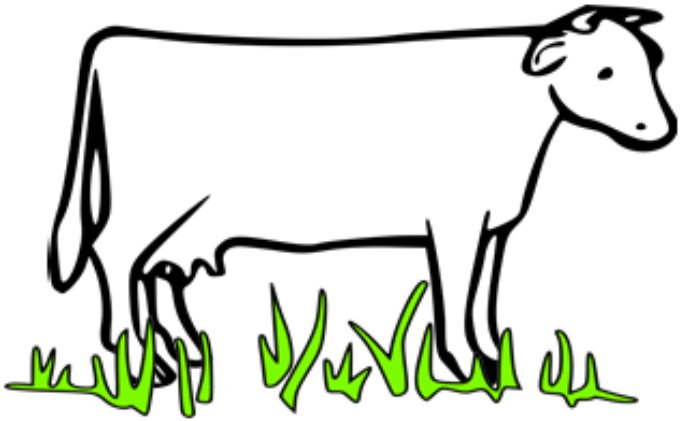
$$group_m + hour_n + \boldsymbol{animal_i} + \boldsymbol{error}_{ijklmn}$$

Inspired by: Lassen et al. 2012

Repeatability

	Phenotype [ppm]		
	Mean	MeanStart	MeanBckg
Repeatability	0.26	0.12	0.25

Thank you



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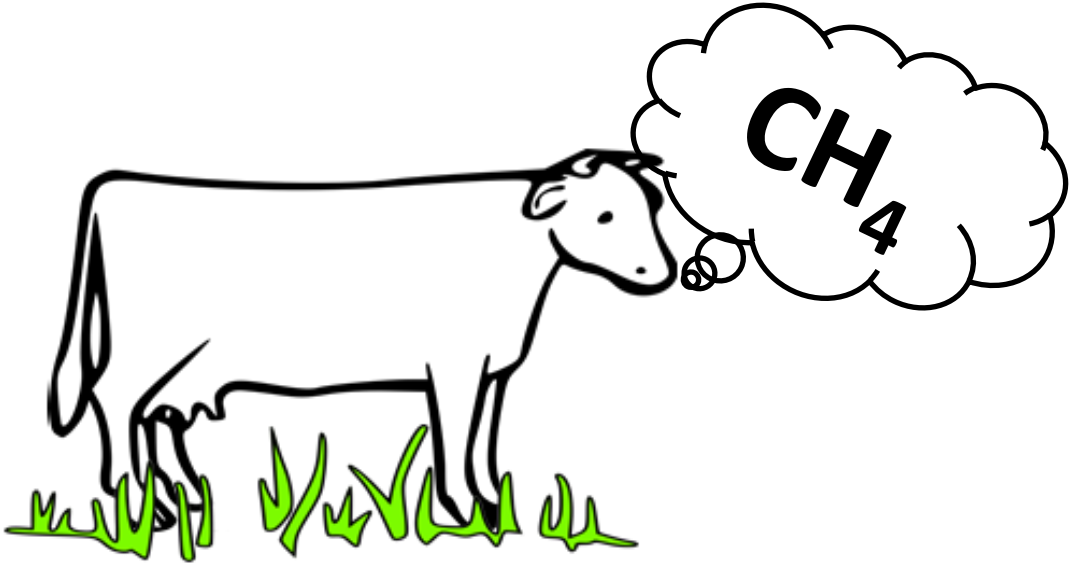
Thank you



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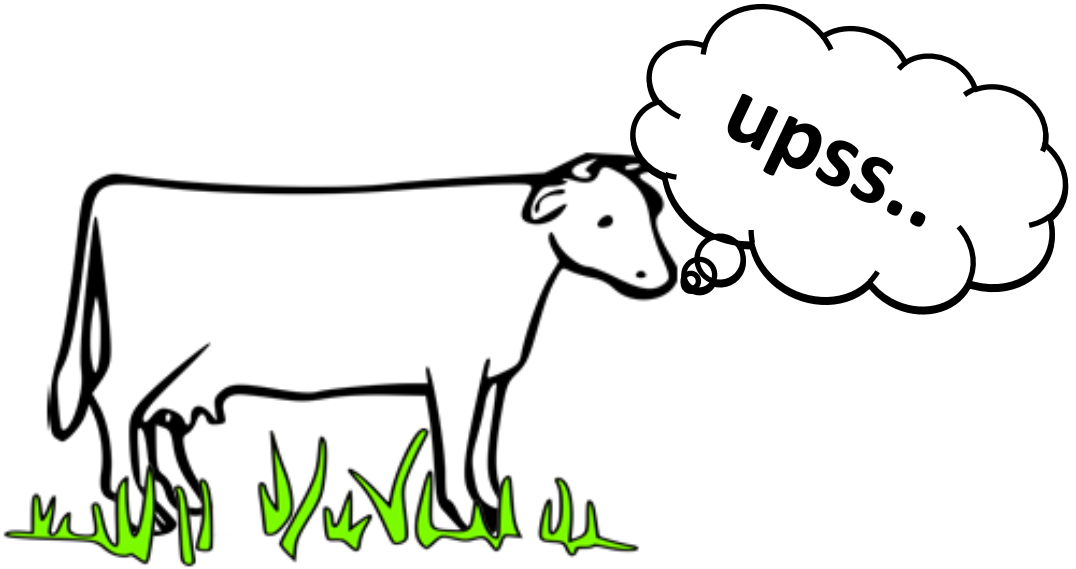

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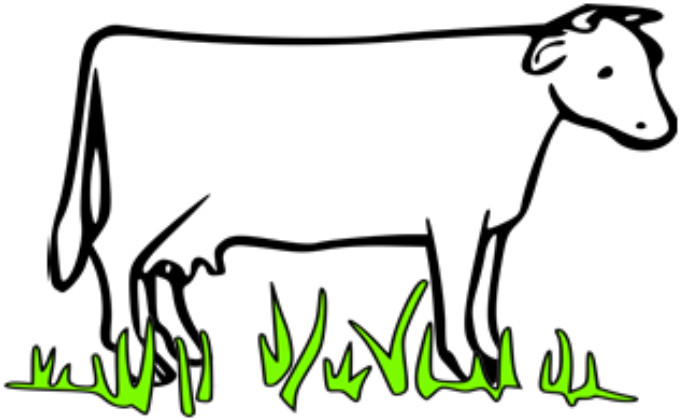

Don’t blame the cows!

Just do something about it!

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