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Application of a milk MIR methane prediction equation to Swiss dairy cattle population data

F. Grandl, A. Vanlierde, F.G. Colinet, M.-L. Vanrobays, C. Grelet, F. Dehareng, N. Gengler, H. Soyeurt, M. Kreuzer, A. Schwarm, A. Münger, F. Dohme-Meier, and B. Gredler

Qualitas AG, Walloon Agricultural Research Centre, University of Liège – Gembloux Agro-Bio Tech, ETH Zürich – Institute of Agricultural Sciences, Agroscope – Institute for Livestock Sciences

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Background

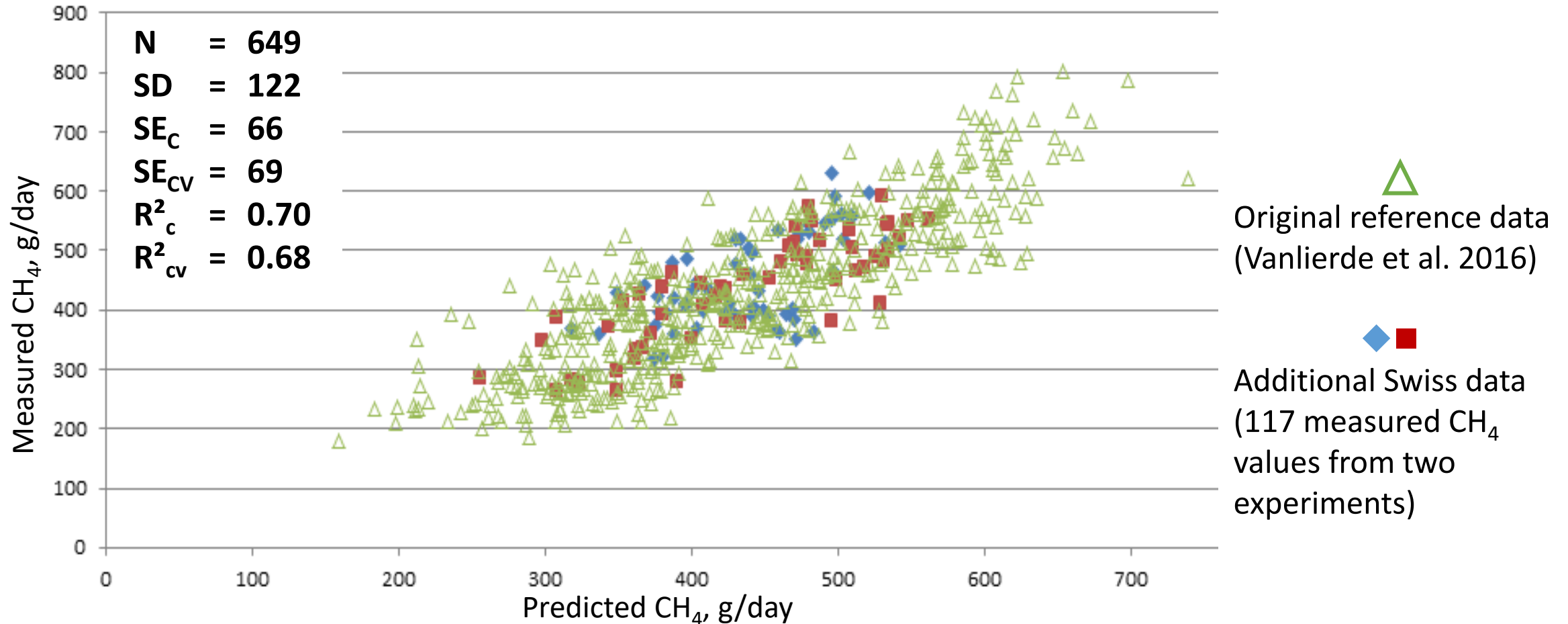
- Ruminants emit methane
 - Approaches to measure methane on a large scale are needed
 - Approach: predict methane emissions from milk MIR spectra (Dehareng et al., 2012; Vanlierde et al., 2016)
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Steps to predict methane from routine milk recording MIR spectra

- Inclusion of Swiss CH₄ reference values in the Belgian training data set and derive a new prediction equation
 - 3 regions of 1st order derivative spectra
 - Multiplication with modified Legendre polynomials to achieve lactation stage dependent predictions
 - Partial least squares regression and cross-validation



Including Swiss methane reference values in training data set



Steps to predict methane from routine milk recording MIR spectra

- Inclusion of Swiss CH₄ reference values in the Belgian training data set and derive a new prediction equation
 - 3 regions of 1st order derivative spectra
 - Multiplication with modified Legendre polynomials to achieve lactation stage dependent predictions
 - Partial least squares regression and cross-validation
- Apply prediction equation to Swiss milk MIR spectra
 - Standardised spectra from Swiss HOL cows from analyses of routine milk recording
- Descriptive analyses of predicted values
 - Use of herd book database information of cows and farms

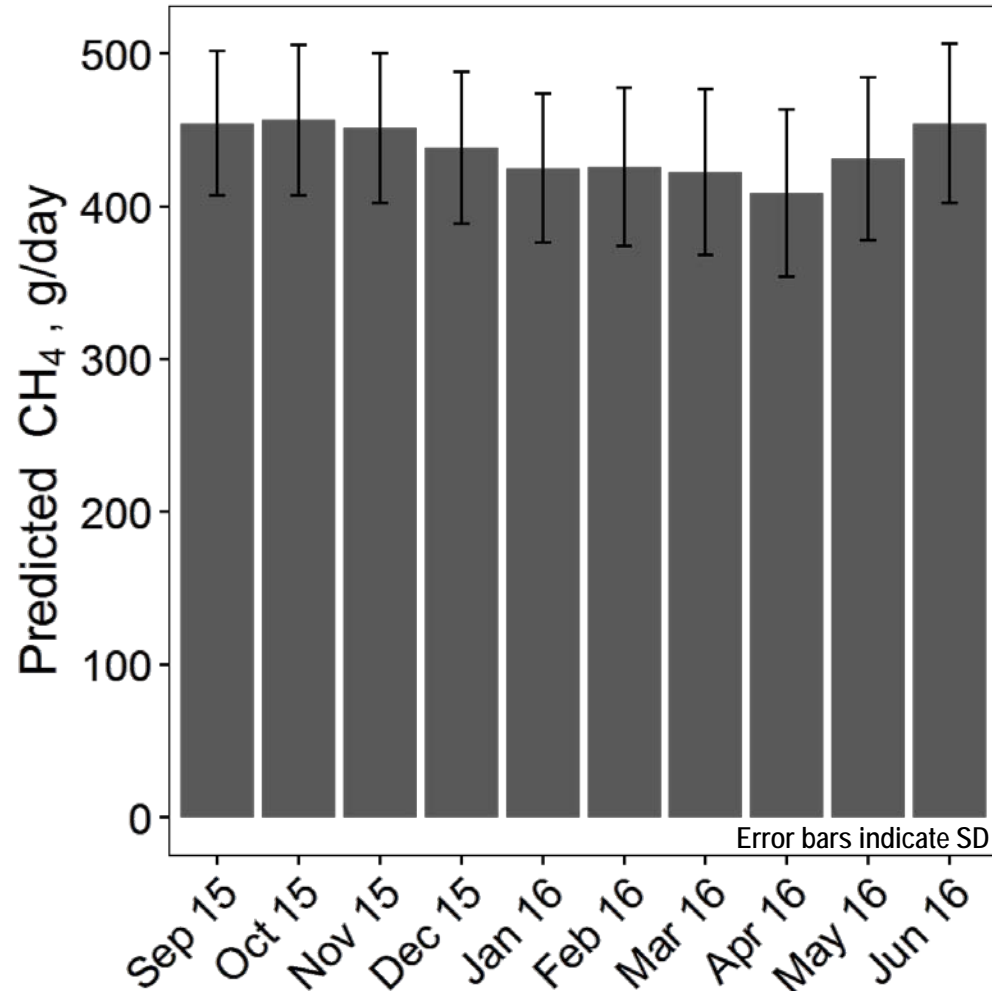


Apply prediction equation to Swiss routine milk MIR spectra

- MIR spectra from routine milk recording for Swiss Holstein cows from September 2015 – June 2016
- Very different spectra (stand. Mahalanobis distance ≥ 3) were excluded
- Only animals in 1st to 4th lactation between 5 and 305 days in milk
- Further restrictions:
 - Milk yield between 5 and 60 kg/day
 - At least 6 milk recordings from each cow in the period
 - No milk recordings from alpine summer pastures



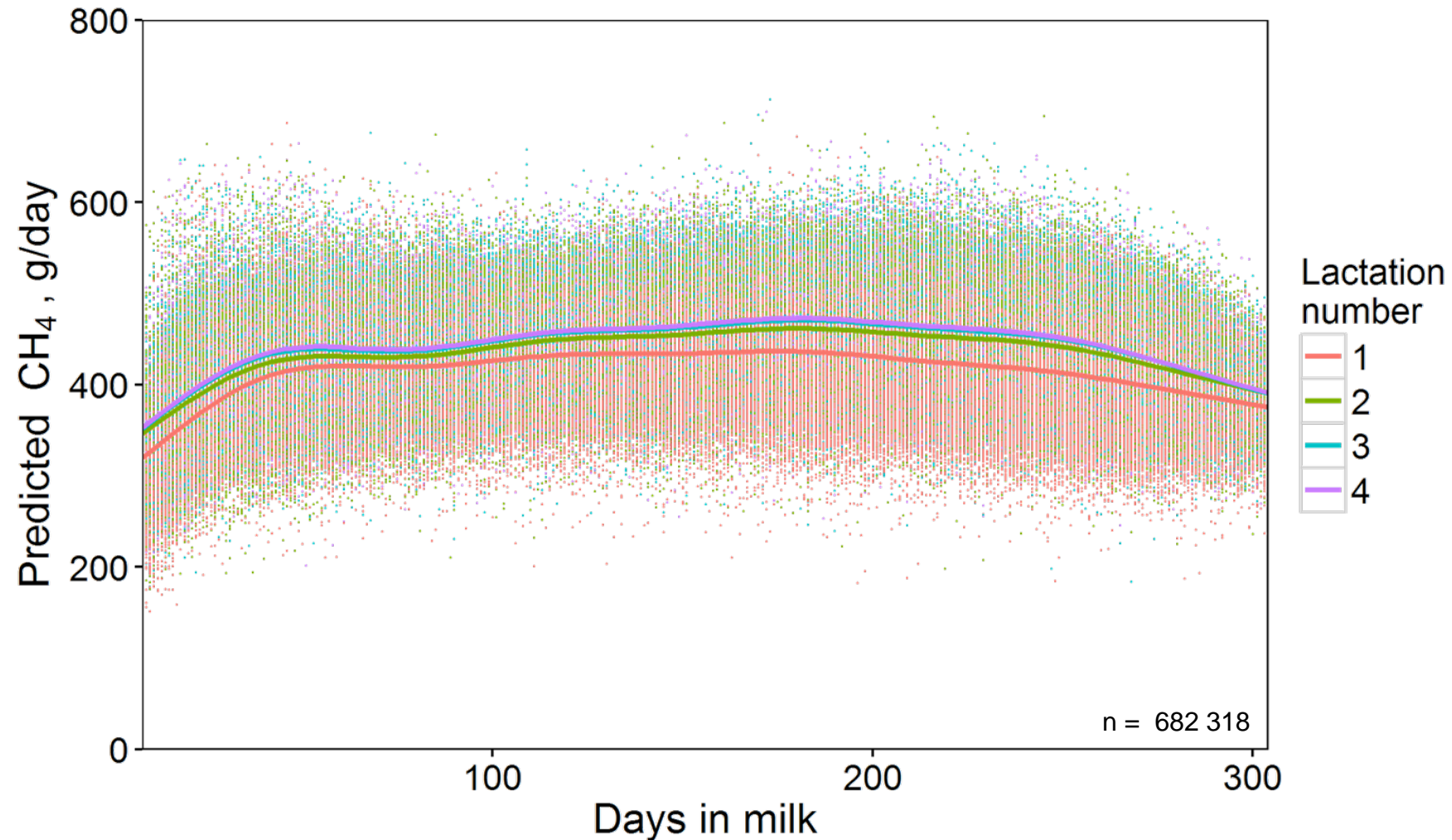
Results: Average predicted CH₄ values



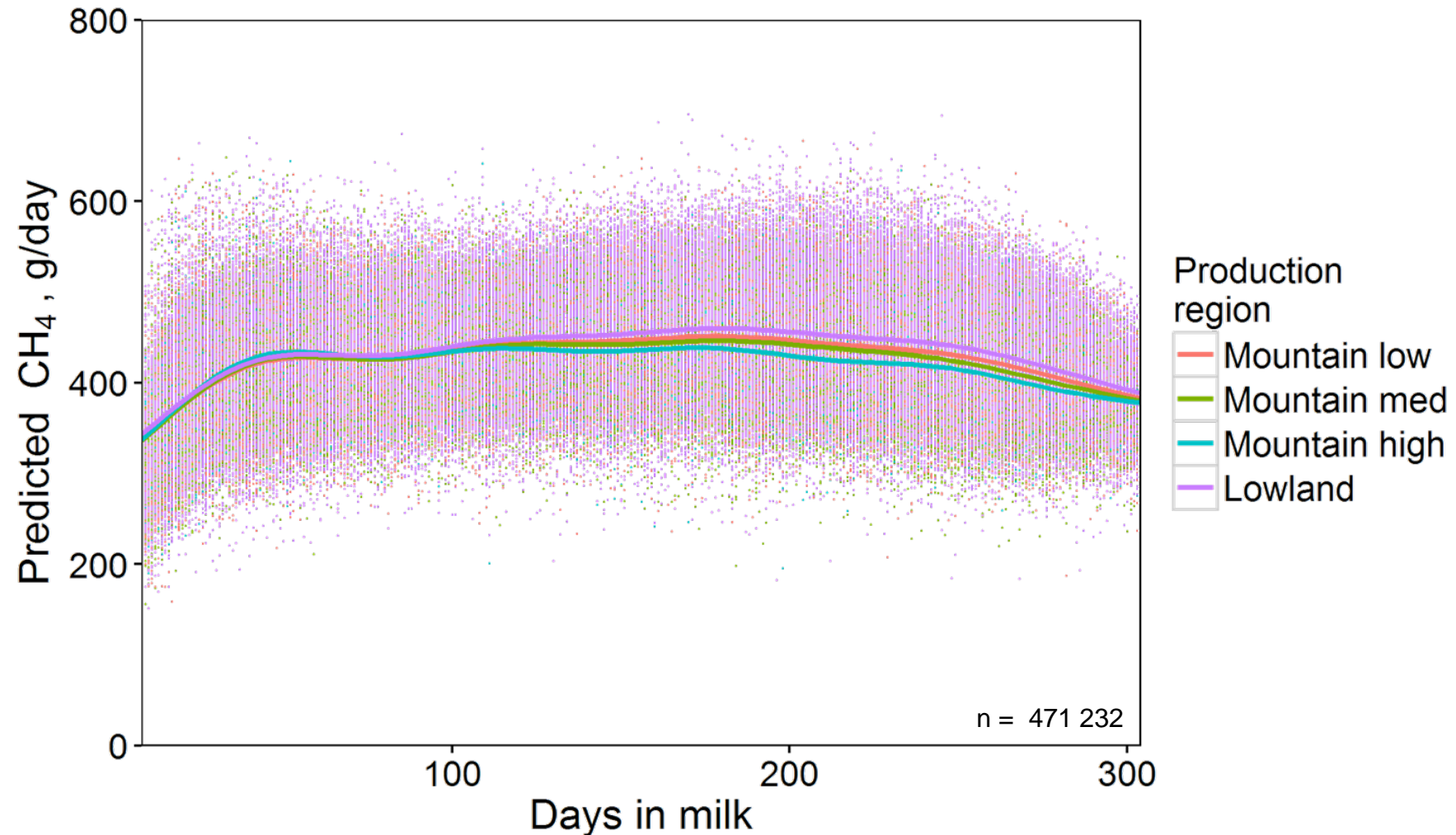
Lactation number	Predicted CH ₄ , g/day	
	Mean	SD
1	420	50.6
2	439	51.9
3	446	51.7
4	448	51.7

n = 682 318

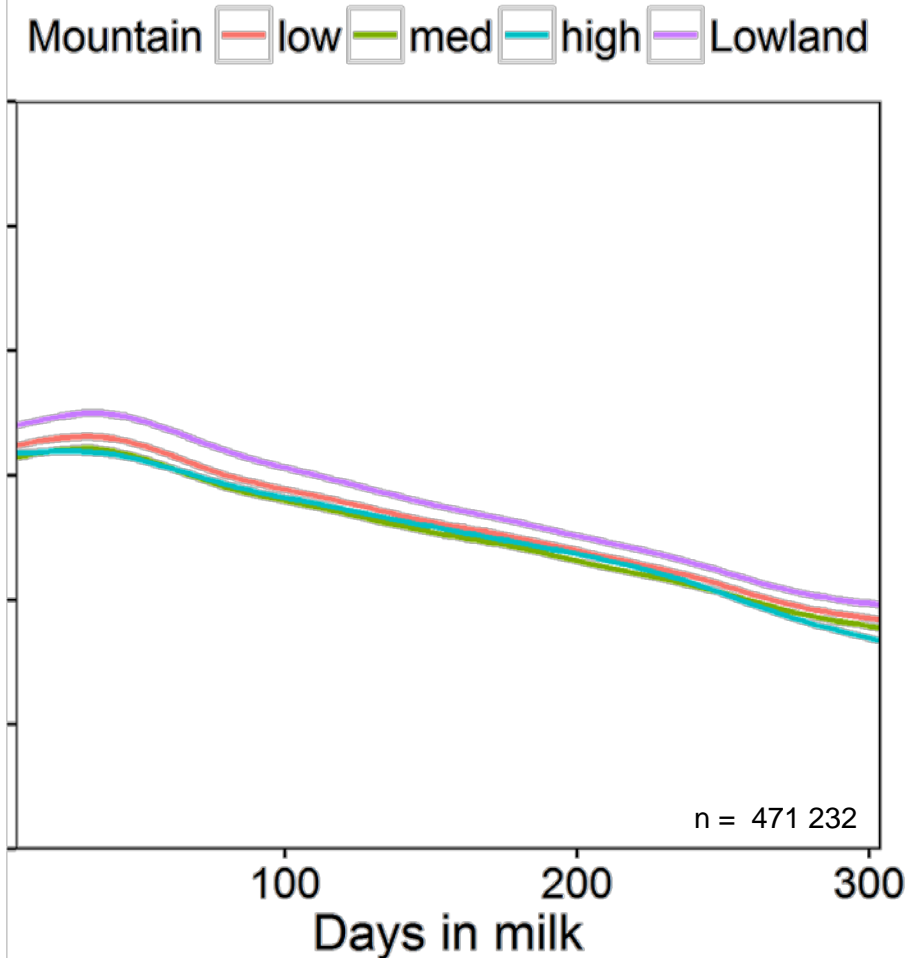
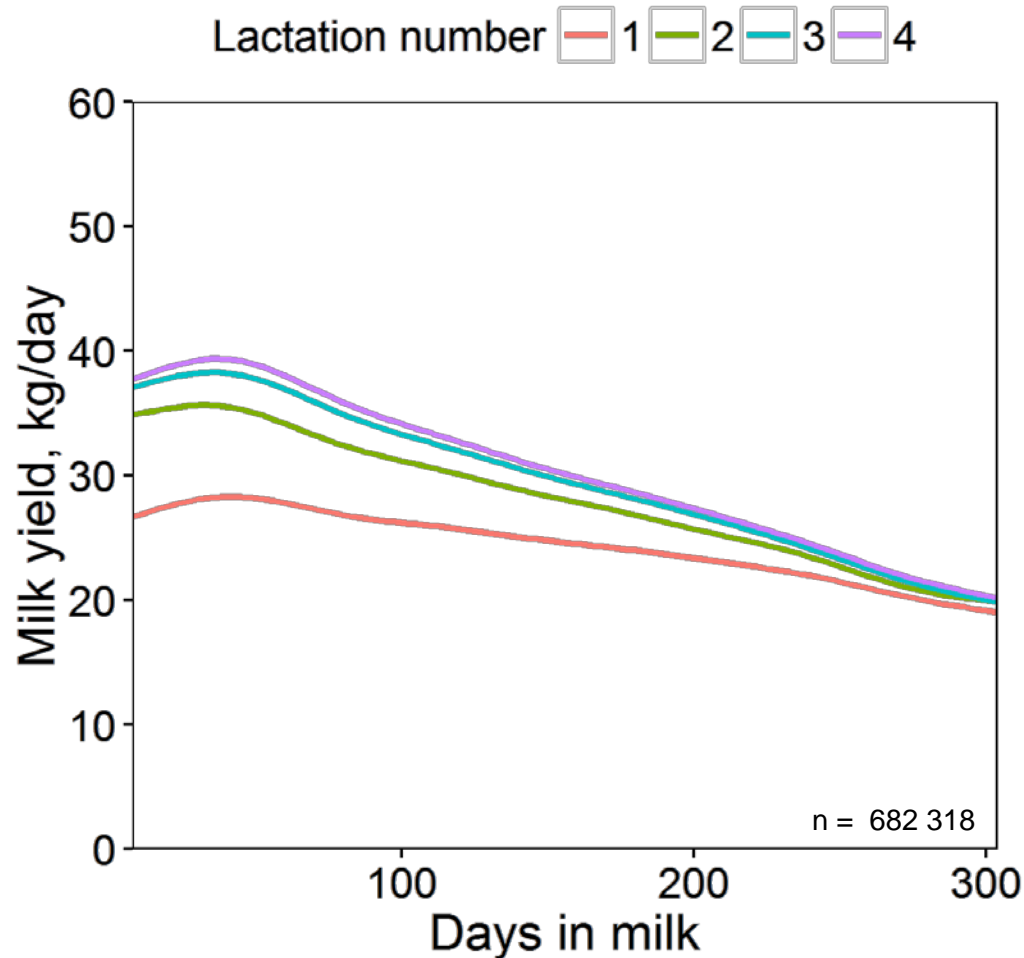
Predicted CH₄ through lactation



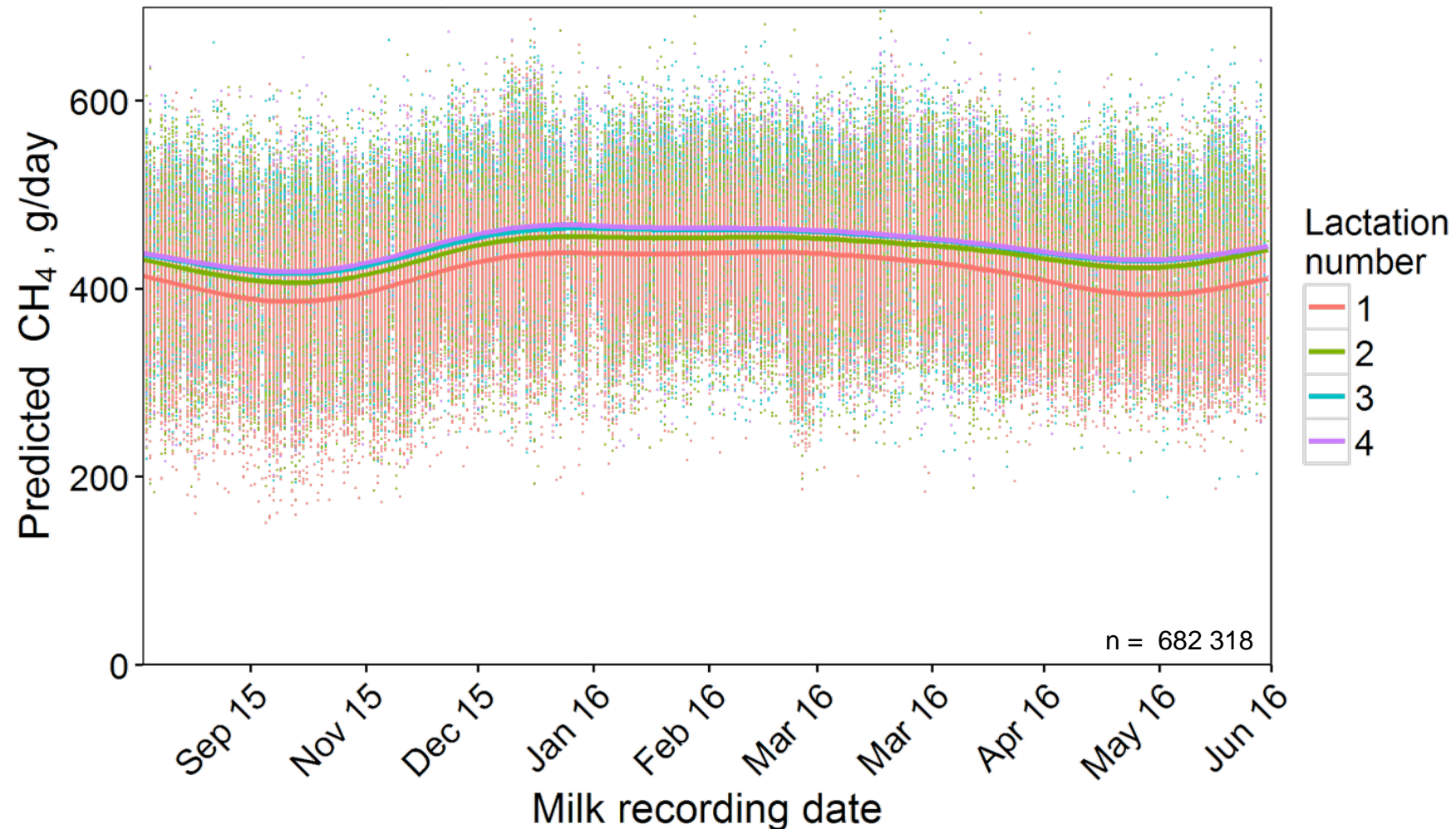
Predicted CH₄ through lactation



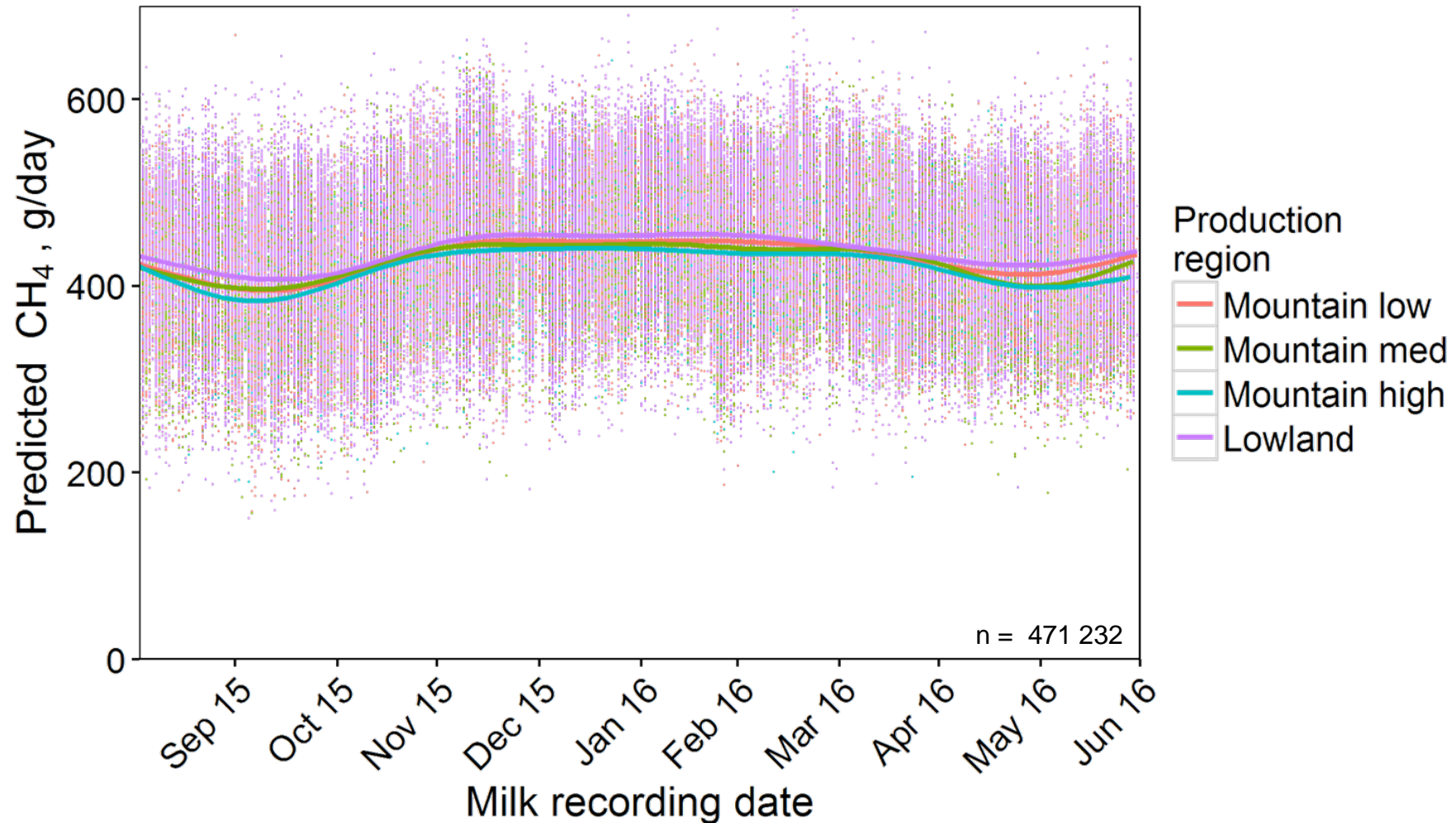
Milk yield through lactation



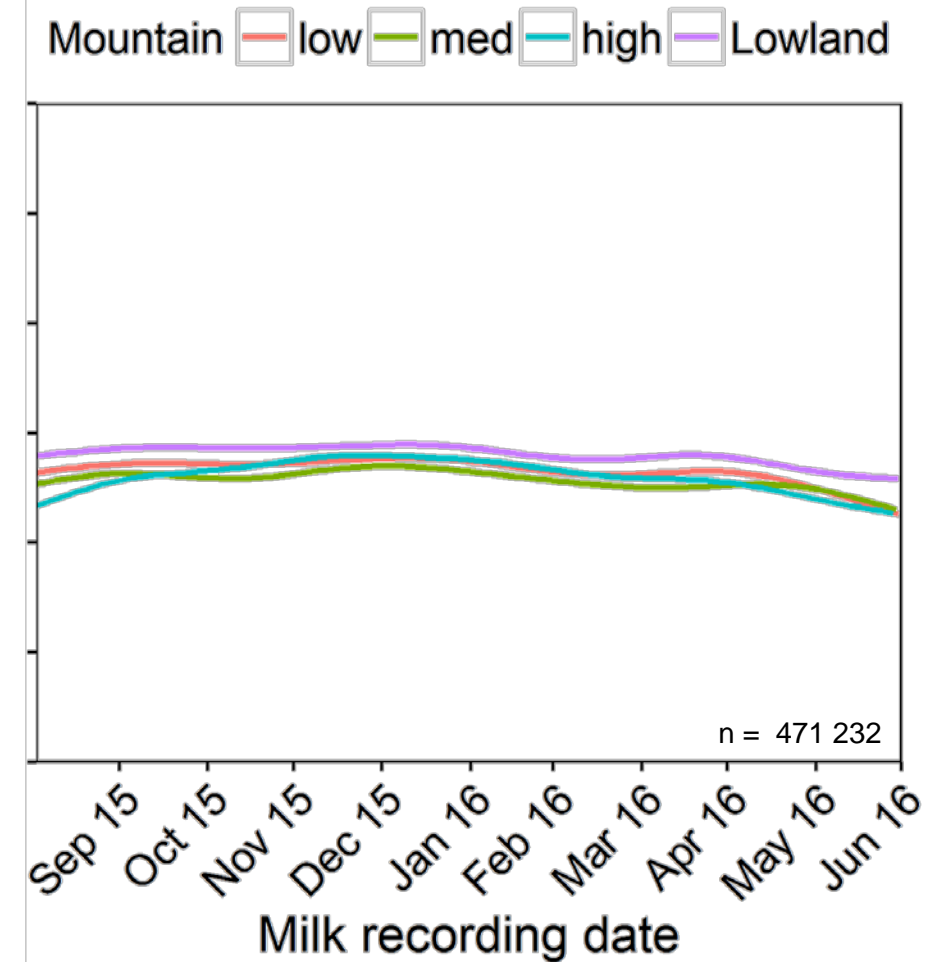
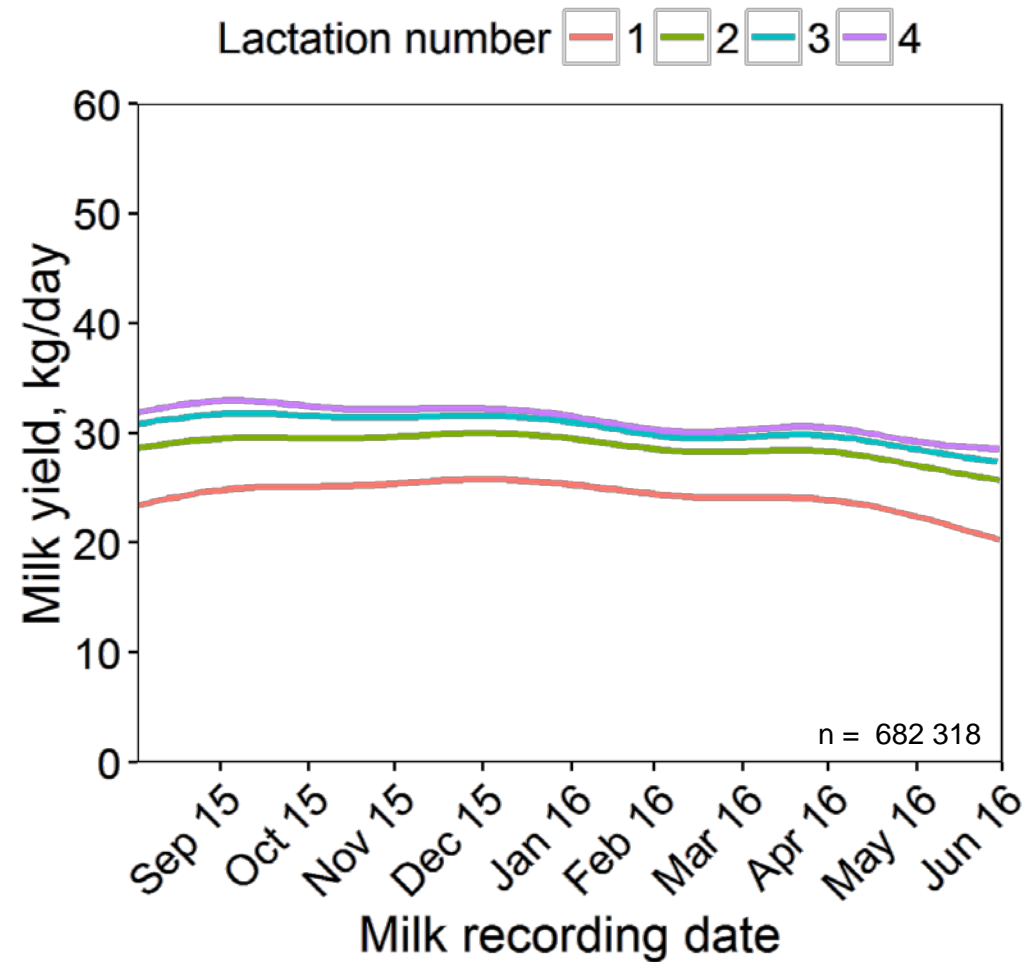
Seasonal trend of predicted CH₄



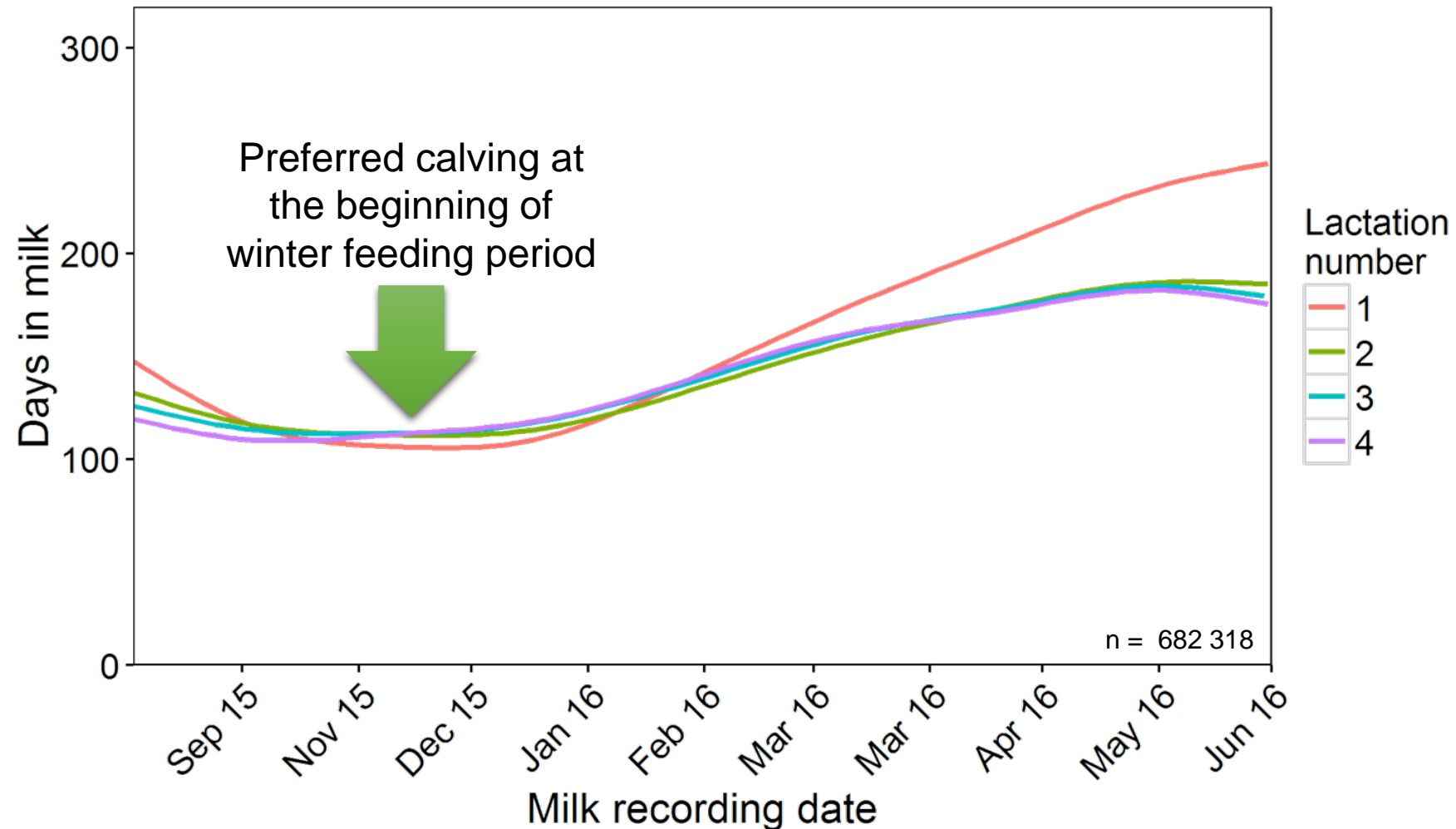
Seasonal trend of predicted CH₄



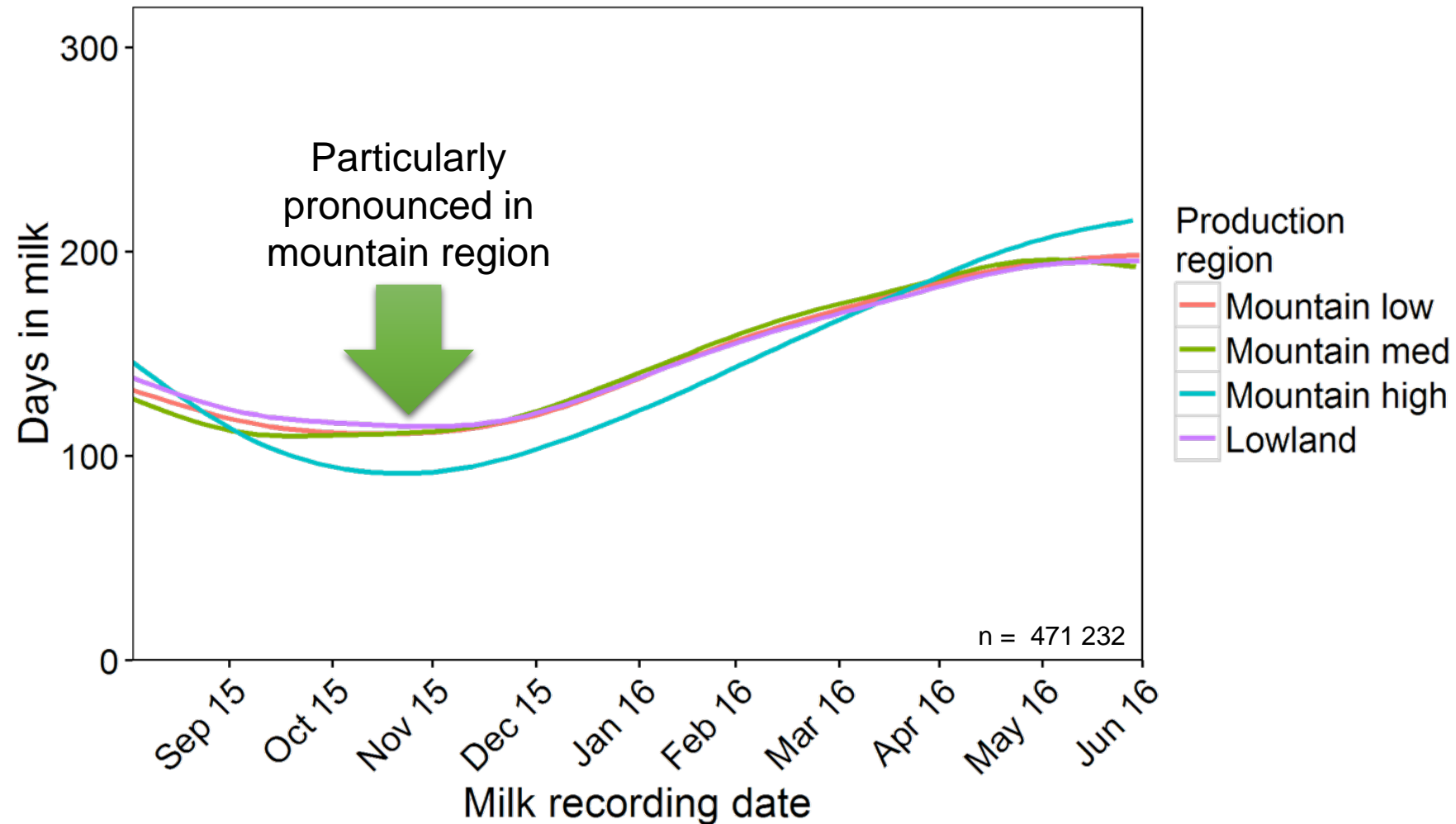
Seasonal milk yield



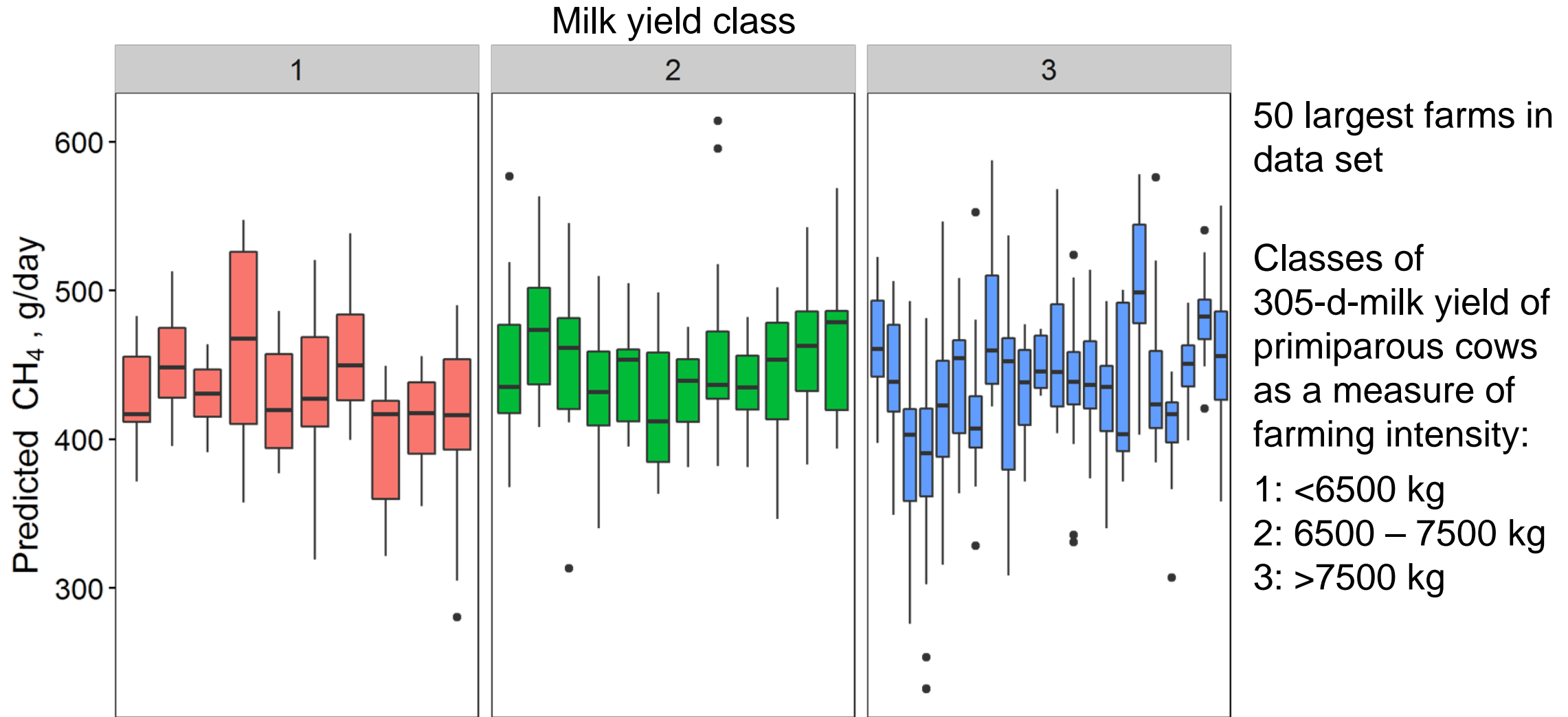
Seasonal calving patterns



Seasonal calving patterns



Variation of predicted methane across farms



Discussion and outlook

- Variation in methane emissions could be identified
 - Many influencing factors – more analyses are needed
 - Expected key factors of influence are partially confounded
- Production region and farm management are relevant
- Between farm variation and within farm variation in predicted methane is considerable



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Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Federal Department of Economic Affairs,
Education and Research
Agroscope

 To identify high or low emitters on an animal level, a lot of information on environmental conditions are needed

Thank you ...

- to the big number of persons involved in this work
- COST Action FA1302 METHAGENE
- **for your attention!**



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Florian Grandl
 florian.grandl@qualitasag.ch