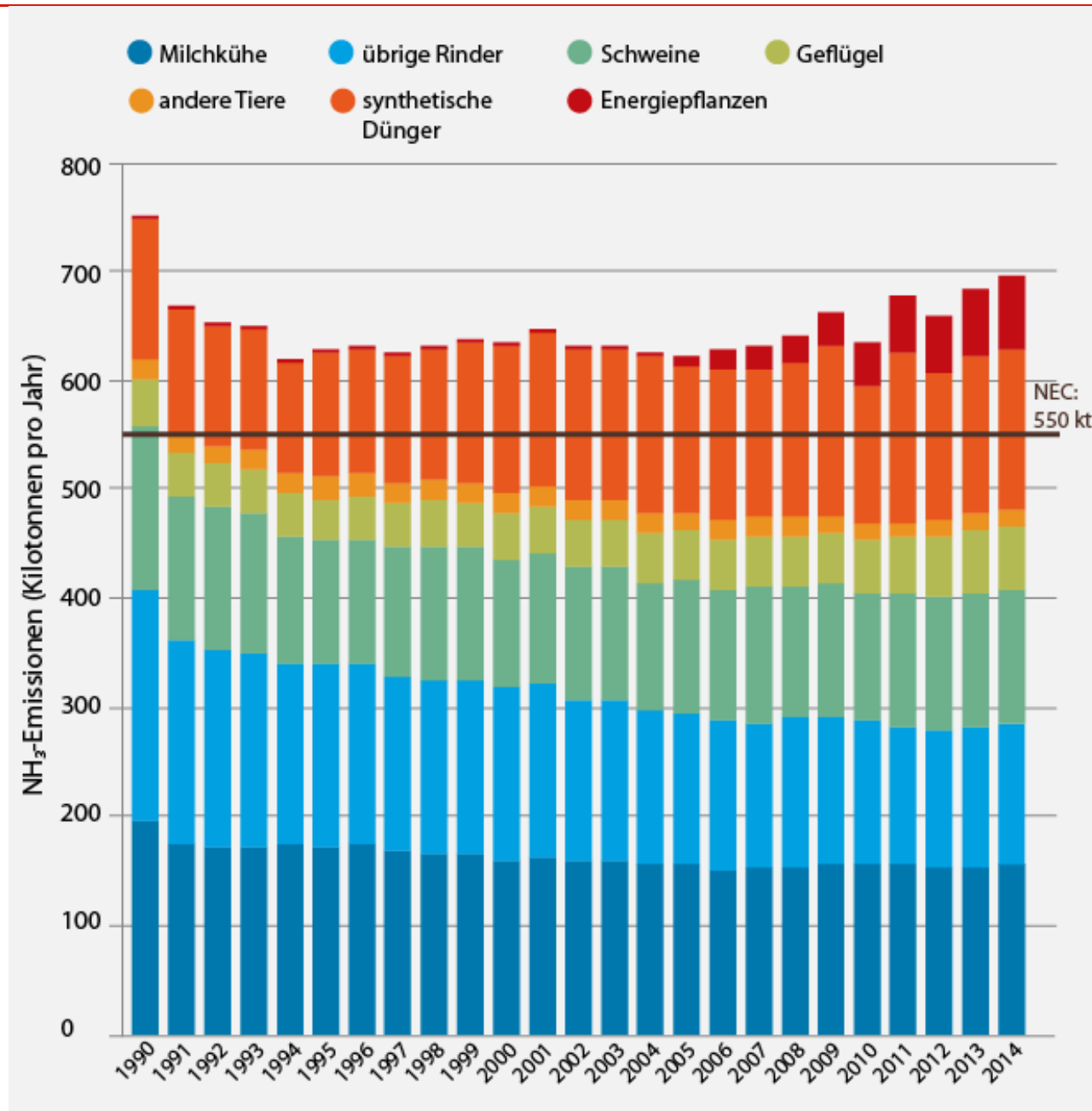


Assessment of emission factors for different dairy cattle housing systems in Germany – Measurement approach and first results

Brigitte Eurich-Menden, Ulrike Wolf,
Sebastian Wulf, Ewald Grimm

KTBL Darmstadt

Ammonia emissions in Germany



Aim of the project

Emission data is needed for:

- the national inventory
- authorization processes – e. g. animal friendly housing systems with outdoor access/yard
- data platform with representative and consistent data basis on emission factors from livestock

- Duration of the project 2015 – 2018
- KTBL (Association for Technology and Structures in Agriculture) is coordinating the project
- Scientific input via two groups – what, where and how to measure
- In addition: practice farms, measuring institutes

Measuring program

- **animal categories:**

dairy cows (DC), fattening pigs (FP)

- **housing systems:**

DC: naturally ventilated systems

FP: naturally ventilated with yard

- **measurments:**

4 practice barns for each housing system

- **emissions:**

ammonia, methane, nitrous oxide, dust, odour

- **measurement duration:**

6 measurement periods at each location/barn, 1 week each period, over one year (summer, winter, between seasons)

Measuring methods

- According to the VERA protocol „Test Protocol für Livestock Housing and Management Systems“ (www.veracert.eu)



Verification of Environmental Technologies
for Agricultural Production

- CO₂ balance method for calculating the ventilation rate
- NH₃, CH₄, CO₂ concentration: measuring with FTIR
- Backup for NH₃ with impinger
- Other parameters: e.g. wind speed, wind direction, temperature, feed and manure composition, milk yield, milk urea.....

Emission factor for dairy housings



$$4 \text{ kg NH}_3\text{-N}/(\text{TP a}) \xrightarrow{\times 3} 12 \text{ kg NH}_3\text{-N}/(\text{TP a})$$

Four different types of cubicle housings

1. Walking area solid floor – external slurry storage
2. Walking area slatted floor – external slurry storage
3. Walking area slatted floor – slurry storage beneath the floor, slurry pit
4. Cubicle housing with grazing (min. 120 days grazing, min. 6 h/d)

100 – 200 animals per barn

Not older than 10 years

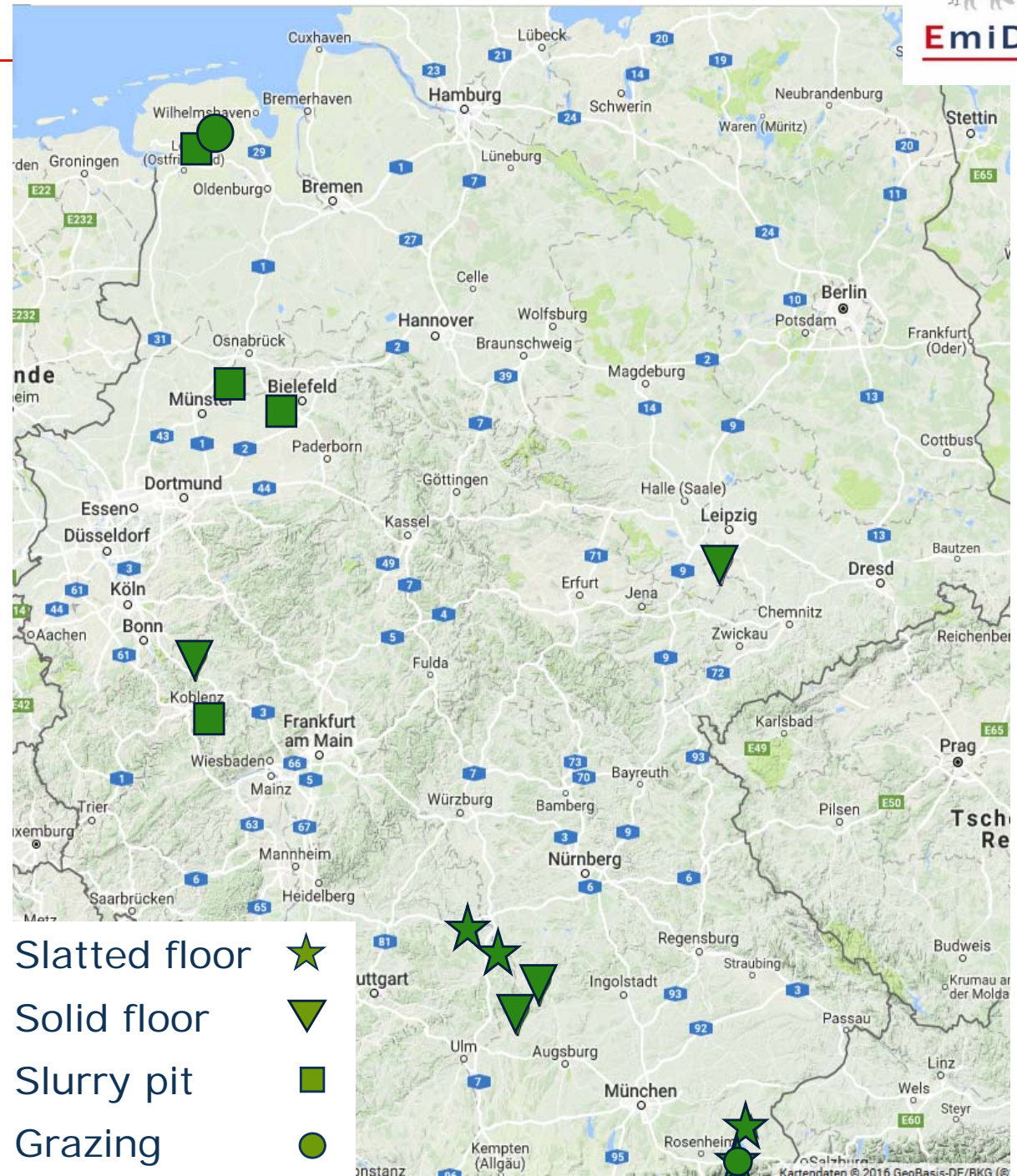
No other barns or emission sources in the way of the air flow

Distribution

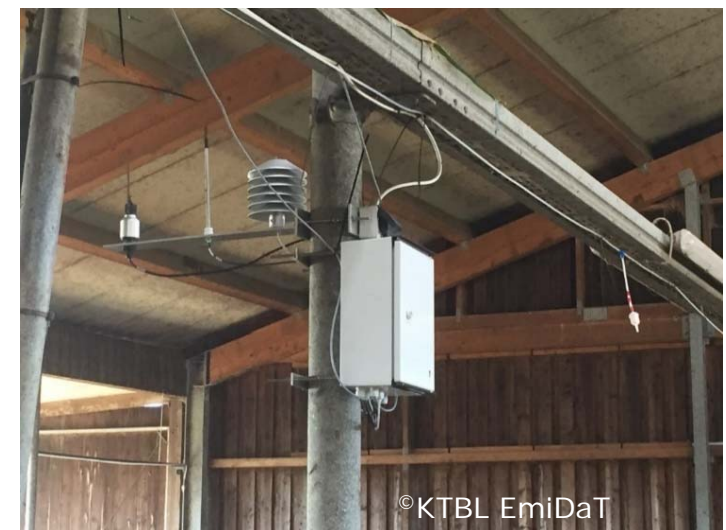
- 4x slatted floor with ext. storage
- 4x solid floor with ext. storage
- 4x slurry pit (slatted floor)
- 1x grazing

Measuring instituts

- DLG
- LUFA Nord-West
- SGS Fresenius
- Müller BBM



Measuring installation at one barn



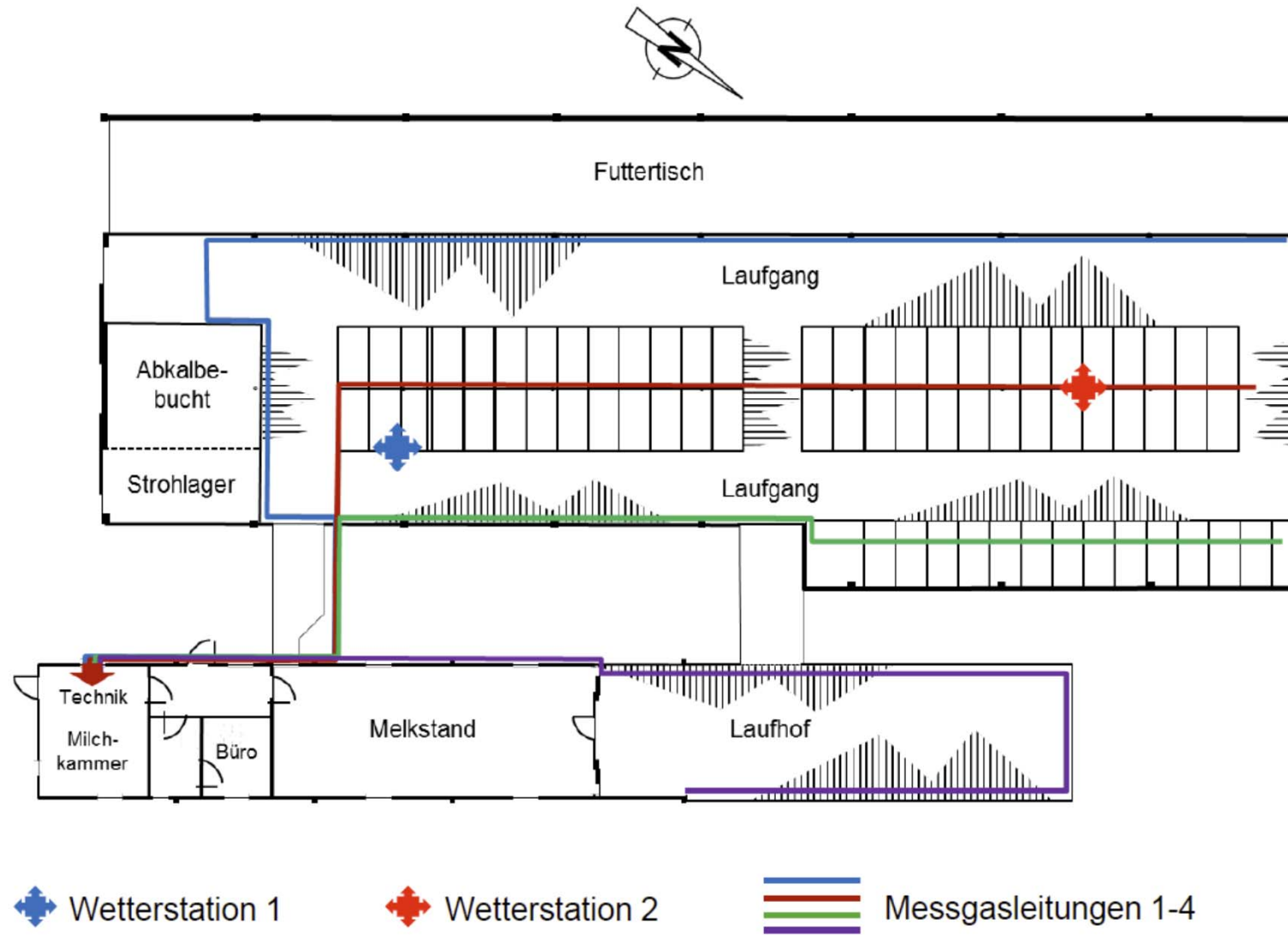
very closed housing



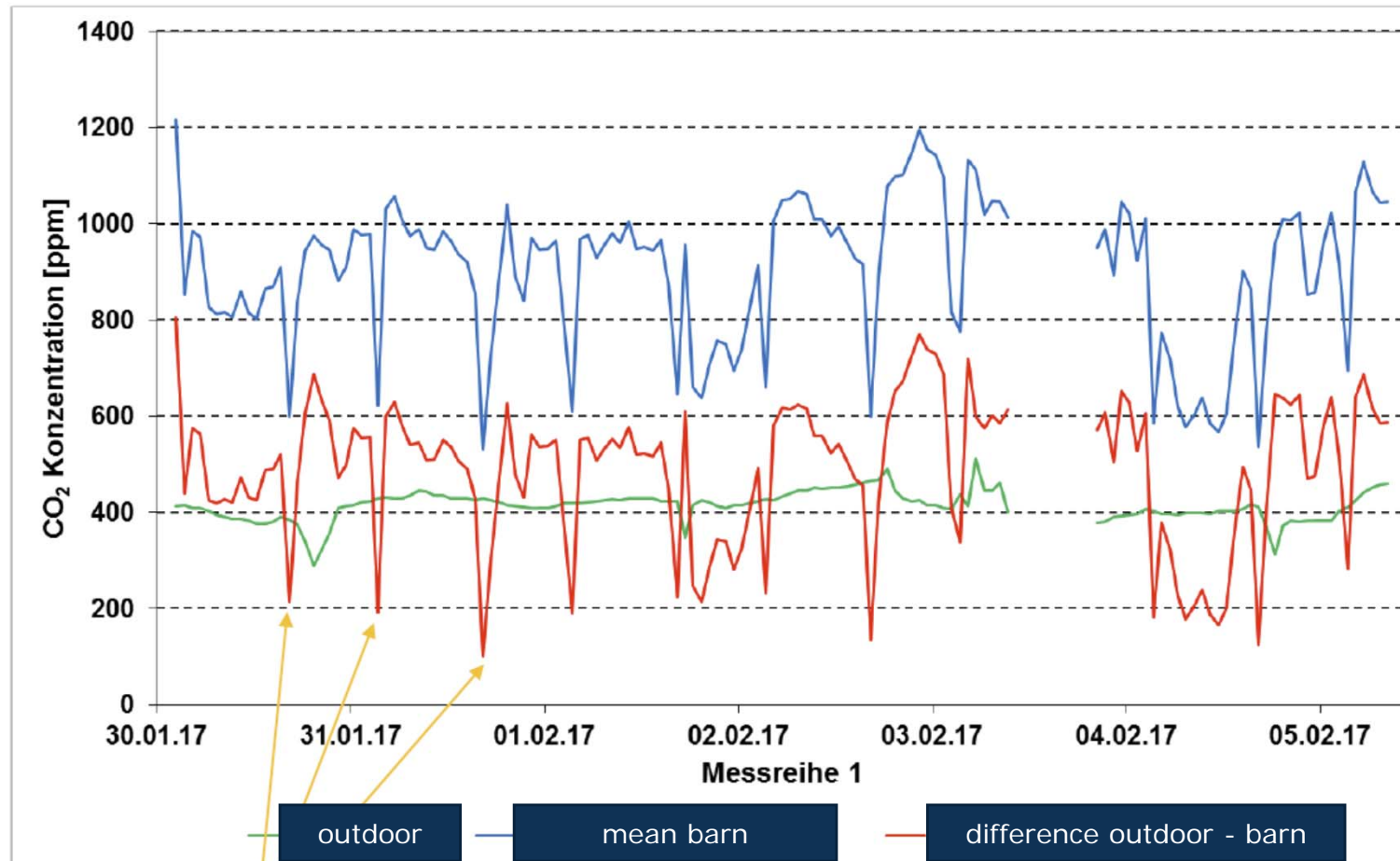
Outdoor area



Where to put the lines?

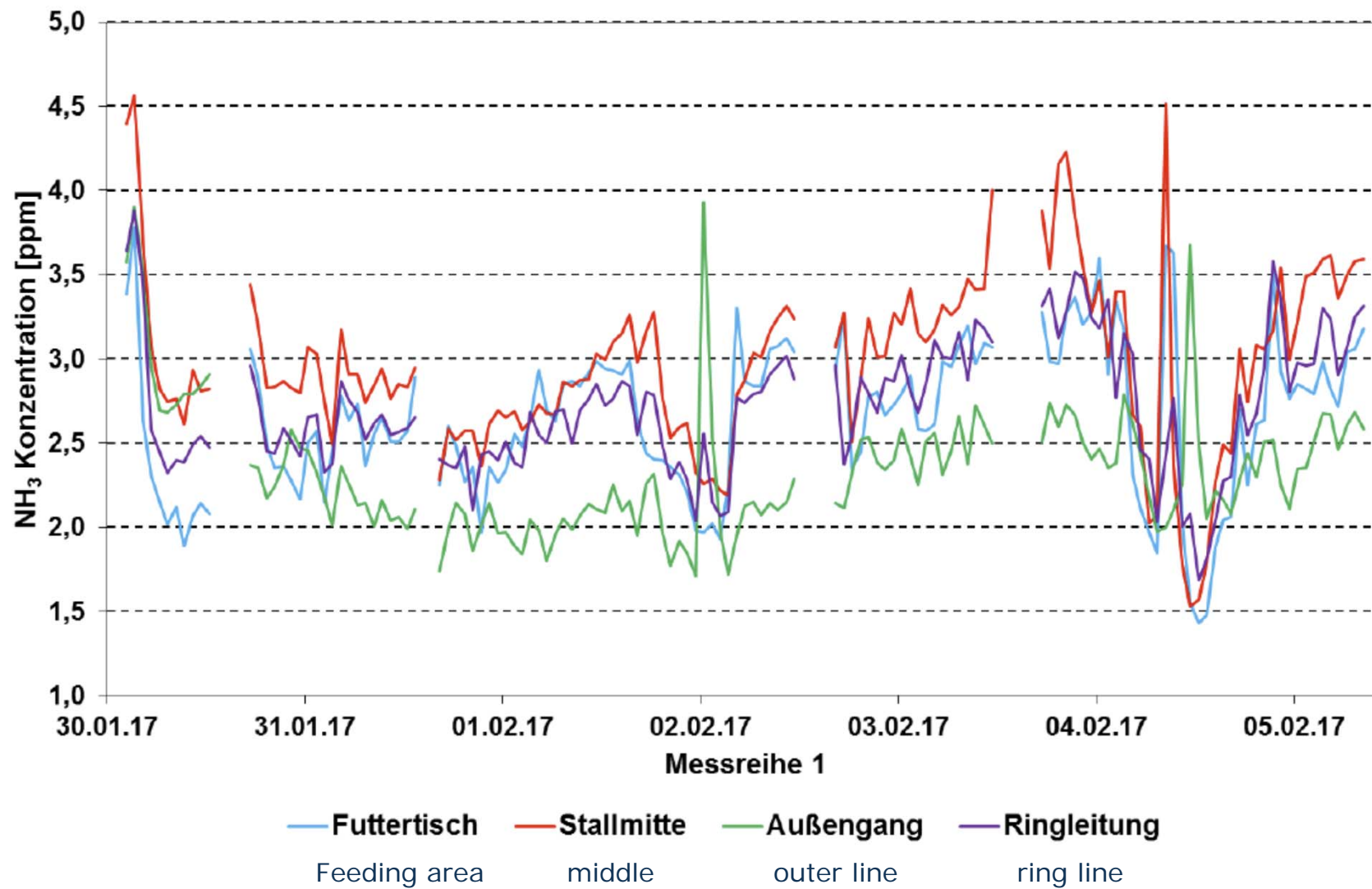


CO₂ measurements



Milking
times

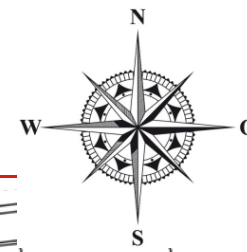
NH₃ measurements



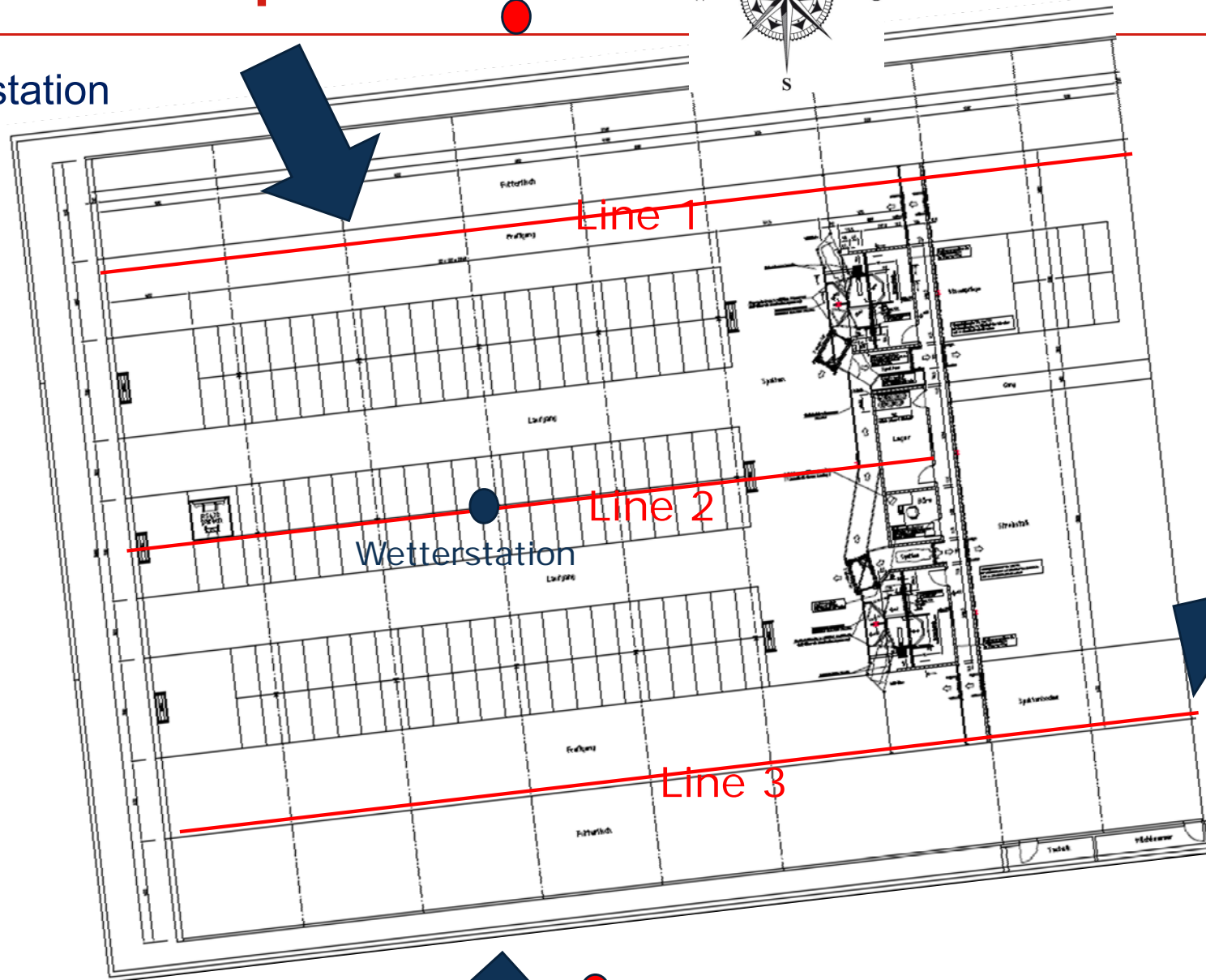
very open housing



Where to put the lines



meteorological station



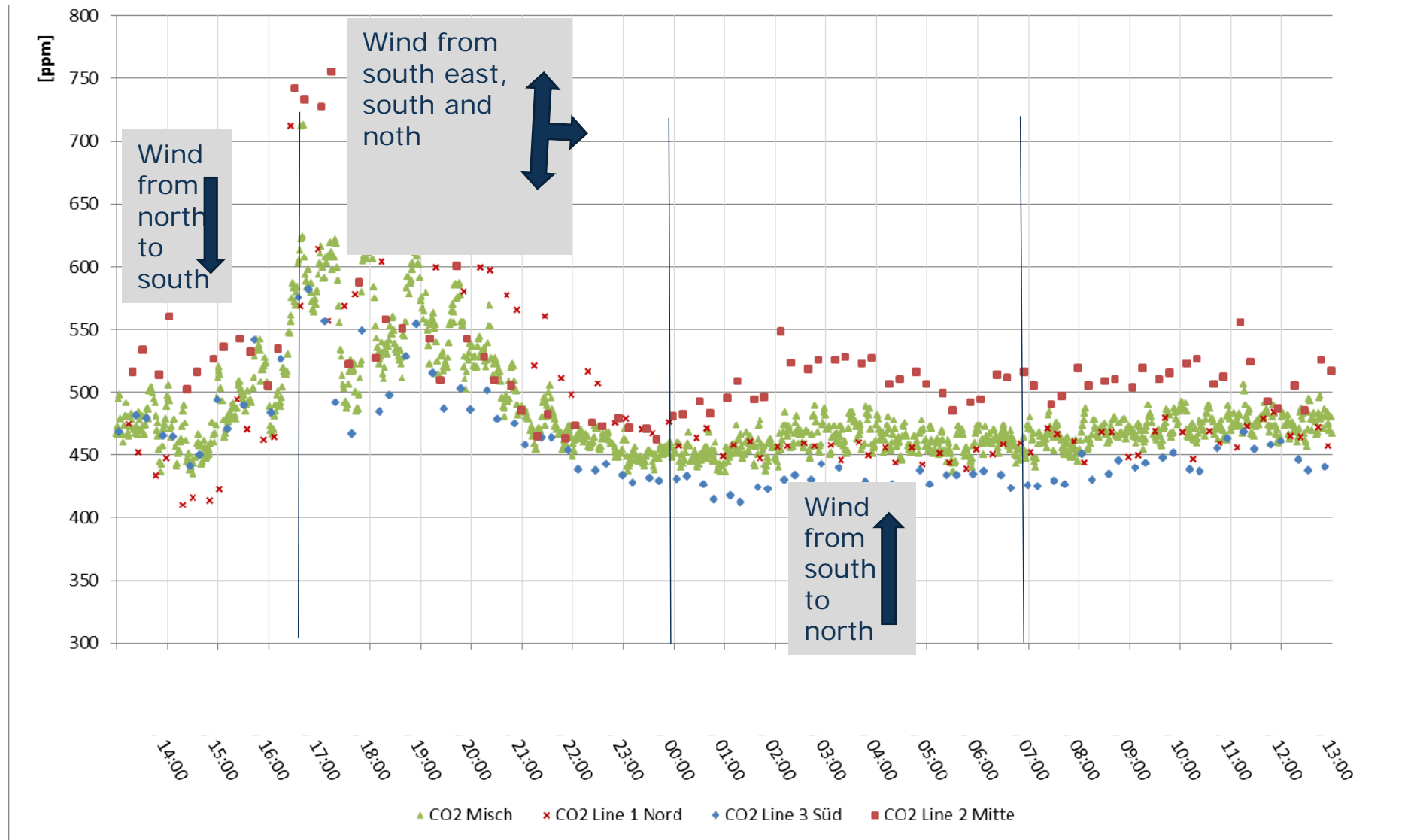
Outdoor measuring point

17

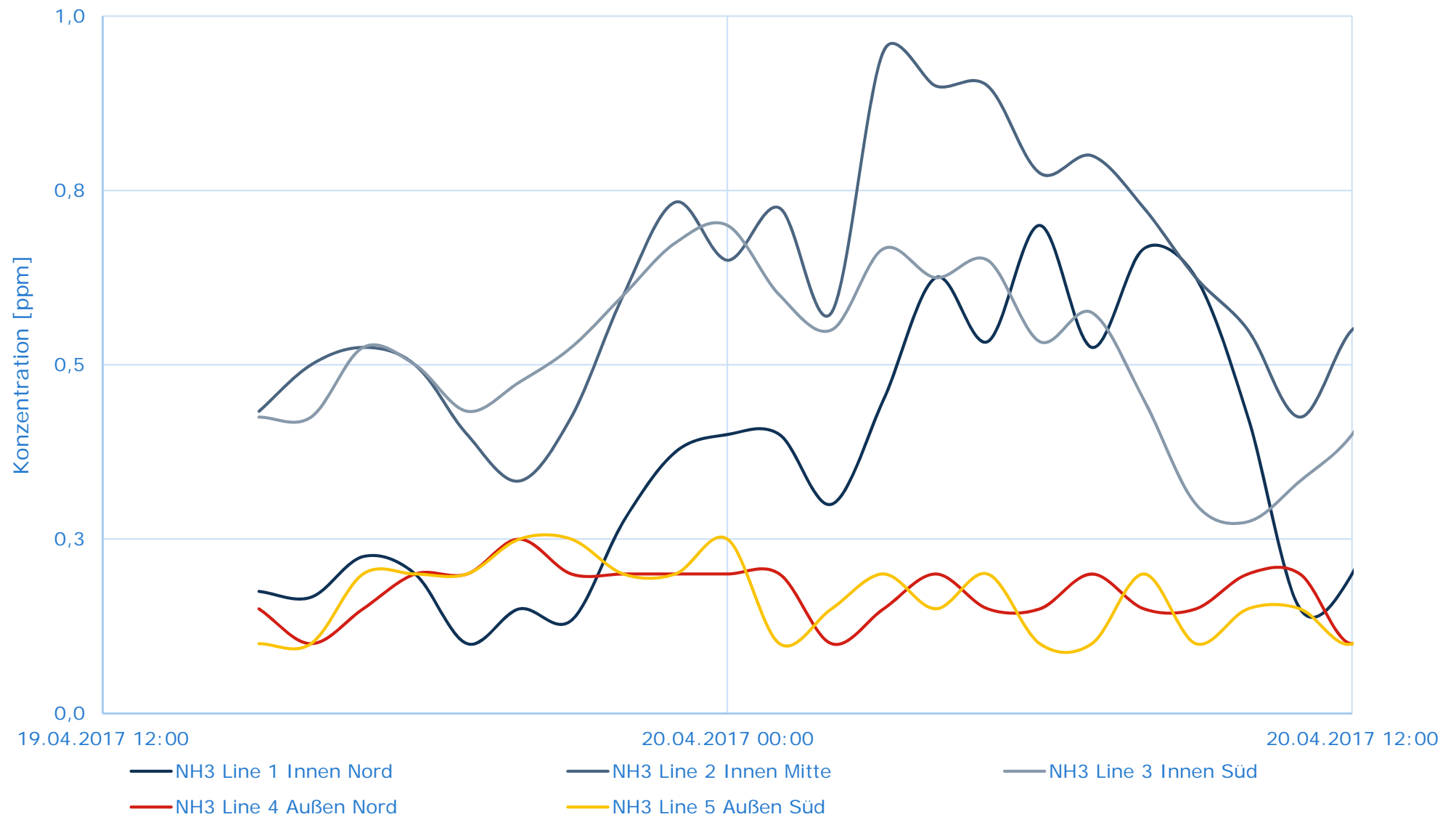
14.06.2017

LUFA Nord-West

CO₂-Measurements



NH₃ measurements



Next steps

- Lines, how many are needed minimum?
- Database
- Comparative tests for the measuring institutes, workshop planned
- ??

Housings systems fattening pigs

1	2	3	4
Naturally ventilated building			Closed building
Outdoor area.....			
Solid floor with litter	slatted floor	Solid floor with litter	Solid floor with litter
Semi open housing Pigport	Semi open housing Pigport	Very open housing with a hut/box	Ventiation only through the windows

Name	Institution	Place
Prof. Dr. Thomas Amon	ATB	Potsdam
Stefan Linke	Thünen-Insitut	Braunschweig
Susanne Gäckler	DLG	Frankfurt
Dr. Eva Gallmann (Vorsitz)	Uni Hohenheim	Hohenheim
Prof. Dr. Eberhard Hartung	Uni Kiel	Kiel
Thomas Heidenreich	Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie	Köllitsch
Dr. Stefan Neser	Bayerische Landesanstalt für Landwirtschaft	Freising
Dr. Nico Ogink	Animal Science Group der Uni Wageningen	Wageningen, NL
Dr. Sabine Schrade	Agroscope	Tänikon, CH
Dr. Manfred Trimborn	Uni Bonn	Bonn

Acknowledgement



The project is supported by funds
of the German Government's
Special Purpose Fund held at
Landwirtschaftliche Rentenbank



<https://www.ktbl.de/inhalte/themen/ueber-uns/projekte/emidat/>

Thank you for your attention

