

Schallhart Simon

From the 25.07 to the 6.08.2011 emissions of cows were measured in a research stable at Agroscope Liebefeld-Posieux, Switzerland. The aim was to determine proportion of methane as well as ammonia, amines and various volatile organic compounds during rumination compared to that from manure.

After setting up the instruments (Los Gatos RMT-200 (methane), PTR-TOF (amines, volatile organic compounds (VOCs)), eTR-MS (ammonia, VOCs) and impinger sampling (for later laboratory LC-MS analysis of amines and other bases)), different cow activities as well as emissions from dung and urine were measured. Measurements of a stable containing single cows and a herd were made, as well as emission of several food types have been recorded.

As already known high methane concentrations are produced by ruminating cows (Pinares-Patiño et al. 2003). This was in good agreement with our measurement results (Figure 1). Also high concentrations of acetone were emitted during the rumination process, and excrement was also influencing the acetone concentration.

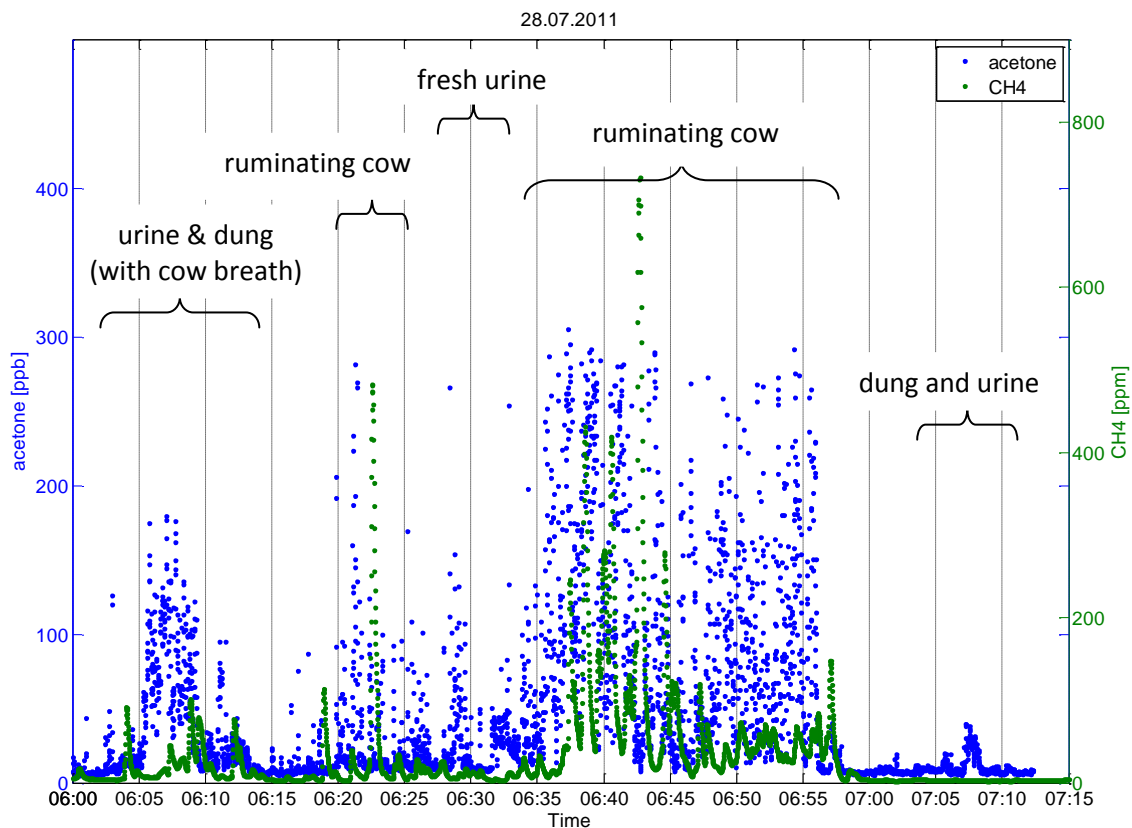


Figure 1: Preliminary methane and acetone concentrations for different cow emissions. Both compounds are mainly produced during rumination activities.

One hypothesis was that the amines are emitted during this rumination process (Schade and Crutzen, 1995), but our measurements showed (Figure 2), that the main source of amines was the mixture of dung and urine. To get a better understanding of these emissions, we performed more detailed dung, urine and mixture -measurements and studied at their time development. The data evaluation of the PTR-TOF is very time consuming (it produces 1GB of data per day) more detailed results will follow.

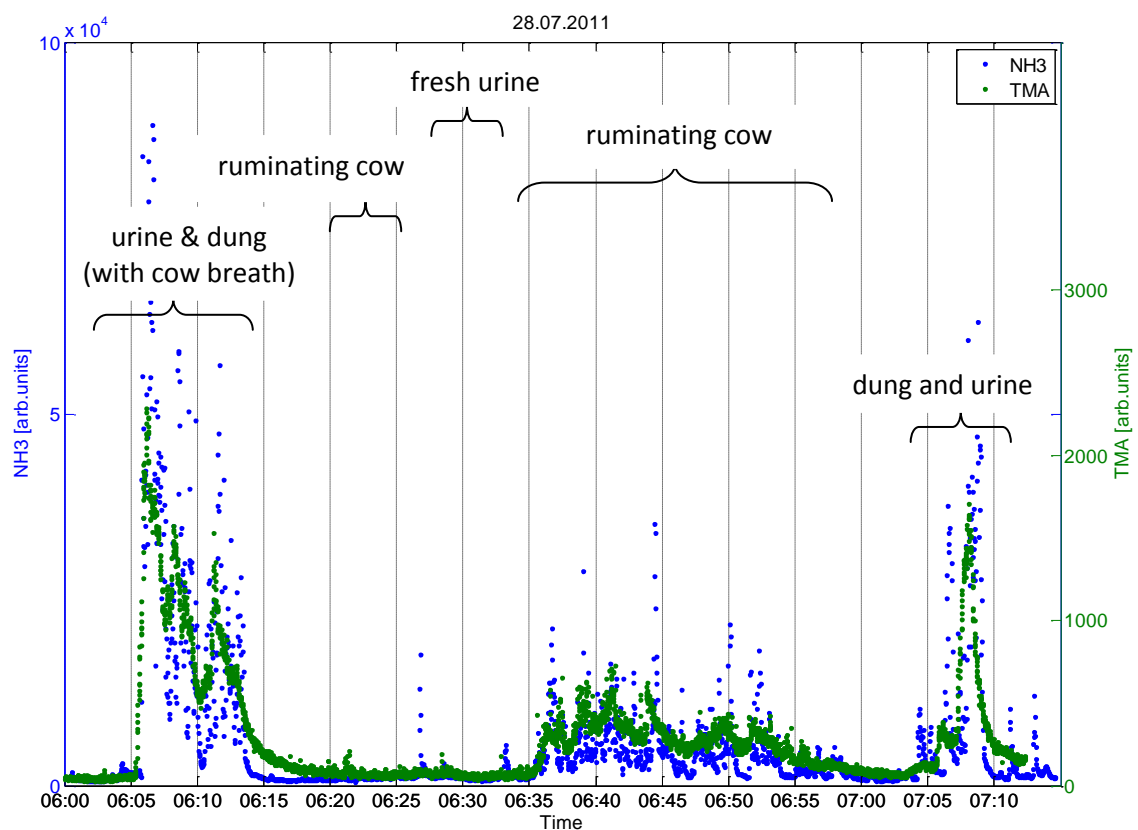


Figure 2: Preliminary NH₃ (measured with eTR-MS) and TMA (measured with PTR-TOF) concentrations (in arbitrary units) for dung, urine and ruminating activities of cows. The main source for both compounds is cow excrement.

We plan to analyze the results in detail and write a publication in a peer reviewed journal during the next year. The work with the host institution went very smooth and without any problems. We are continuing collaboration with the Air Pollution / Climate laboratory of the Eidgenössisches Volkswirtschaftsdepartement and we are planning a workshop for discussing and writing the publication.

References:

Schade, G. W. and P. J. Crutzen (1995). "Emission of Aliphatic-Amines from Animal Husbandry and Their Reactions - Potential Source of N₂O and HCN." *Journal of Atmospheric Chemistry* 22(3): 319-346.

Pinares-Patiño, CS and Baumont, R. and Martin, C (2003), "Methane emissions by Charolais cows grazing a monospecific pasture of timothy at four stages of maturity".Canadian journal of animal science 83(4): 769-777.

Travel costs:

Travel from Geneva (CERN) to Posieux per car (price of a first class train ticket) 35 SF (=30.70€)*

Travel from Posiex to Innsbruck per train 54.40 €

Subsistence Allowance 850.00€

*exchange rate from national bank of Finland (25.08.2011): 1€ =1.1407 SF

935.10€