Gaseous emissions during storage of pig solid manure: what lessons for measurements in farms?

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Espagnol S.[1], Levasseur P.[1], Hassouna M.[2,3]
[1] IFIP French institute for pig and pork industry, France; 2 INRA UMR 1069 Sol Agro et hydrosystème Spatialisation, France;
[3] INRA UMR UMR1069 Sol Agro et hydrosystème Spatialisation, France

THIS STUDY AIMS TO :

- measure gaseous emissions during the outside storage of solid pig manure
- identify methods for quantification of gaseous emissions in commercial farms

MATERIALS AND METHODS

- Outside storage of 4 heaps of solid manure from fattening pigs on litter (2004 and 2011 during cold periods and 2006 and 2011 during warm periods)
- Gaseous emissions (NH_3, N_2O, CH_4, CO_2, H_2O) measurements with a dynamic greenhouse, multigas analyseur (INNOVA1412) coupled to a sampler dosimeter (INNOVA 1303)
- Mass balances for H_2O, N, C, P_2O_5, K_2O

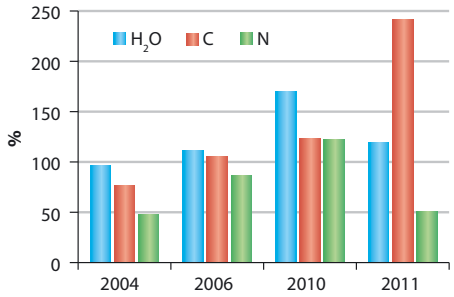
RESULTS AND DISCUSSION

- During the cold period of 2011 : higher losses of N and lower losses of C (with the mass balance deficit) than other periods
- Quite good recovery rates between measurements and mass balance deficits for 2004 and 2006
- Likely overestimation of measured gaseous emissions in 2010 (pb with the estimation of the air density)
- Strong difference between the C emissions measurements and the mass balance deficit in 2011 (possible pb with the C losses of the mass balance deficit)

Tab 1: Manure composition and mass balance deficits

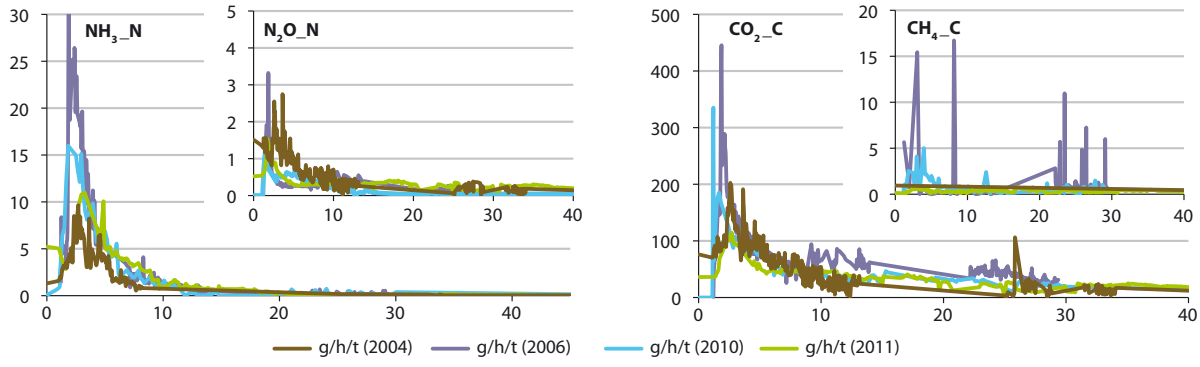
		2004	2006	2010	2011
Composition	DM (%)	36,1	39,5	30,5	26,5
	NTK (g/kg)	12	12,6	9,3	8,6
	C (g/kg)	-	155,6	118	101,8
Mass balance deficit	H_2O (%)	55	52	47	46
	C (%)	28	30	30	18
	N (%)	22	23	15	40
	DM (%)	22	19	24	19,5
	P_2O_5 (%)	12	-1	5,7	-33
	K_2O (%)	14	-2	-3.1	-3.9

Fig 1: Recovery rate between gaseous emissions measurements and mass balance deficits



- Very similar kinetics of emissions for NH_3, CO_2 and N_2O : peak of emissions during the **3 first days of storage**
- During the **2 first week**s of storage, 90% of NH_3 emissions have occurred and 60% of CO_2 emissions
- Lower amplitude of emissions for cold periods compared to **warm periods**
- The majority of N emissions are NH_3 emissions and the huge majority of C emissions are **CO_2 emissions**

Fig 2: Kinetics of gaseous emissions during 40 days of storage



CONCLUSION

- The similarity between kinetics indicates a possibility to identify periods for intermittent measurements to estimate emissions **in commercial farms**
- Difficulties to estimate the quality of gaseous measurements with the manure mass balance : a simplified method **should be independent** of manure's measurements

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