Choosing between often and many

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N_2O emissions from peat soils

Dairy farming accounts for about 35% of the national emission of N_2O.

The majority of this 35% originates from peat soils.

However, the quantification of N_2O losses from peat soils is complicated by huge temporal and spatial variability.

Common coefficients for spatial variability: 50 – 200%[1]

Common coefficients for temporal variability: 100 – 350%[1]

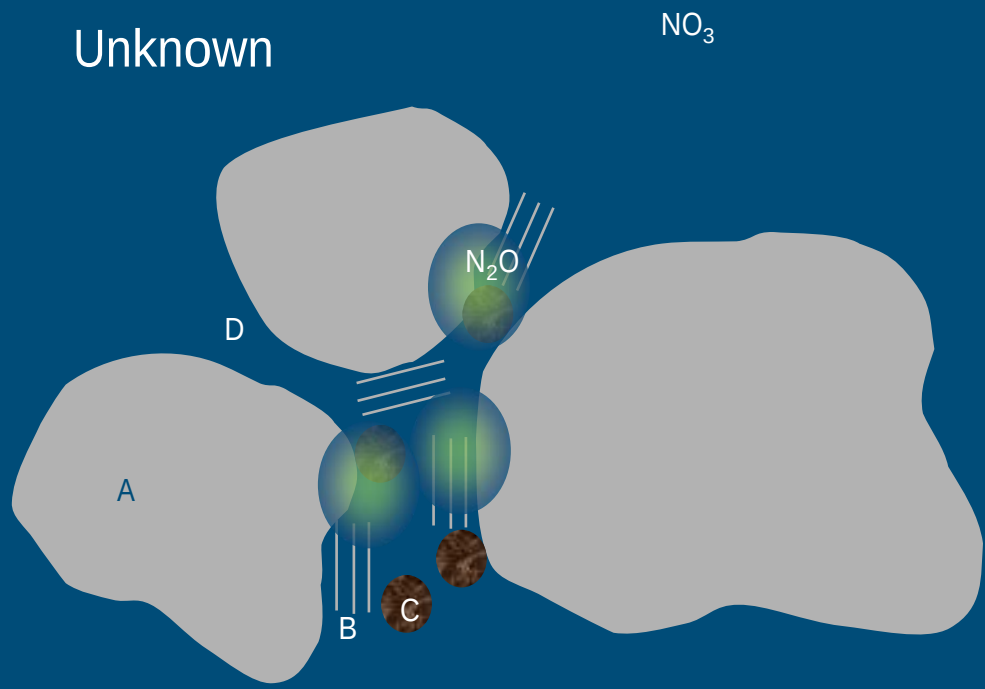
[1] Goodroad et al. (1984)

Consequences of variability

- Difficulties for exact quantification.
- Difficulties to control emissions.

Sources of variability

Temporal variability	Spatial variability
Weather!	Dung and urine patches
Management	Management
Unknown	Unknown



Spatial organization of sand (A), clay (B), organic matter (C) and pores (D) in soil. After Emerson, 1959:237 & 240.

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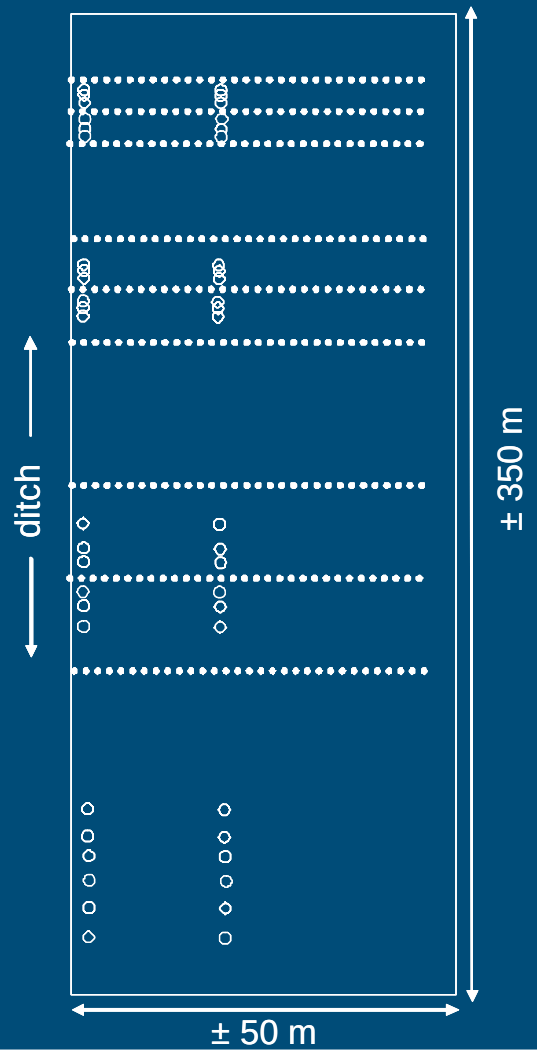
N_2O flux measurements at Zegveld (NL)



Two fields: wet and dry

4 drain distances: 0, 4, 8 and 12 m

2 locations: centre and ditch

3 interdrain locations: 0, ¼ and ½ between the drains

Replicates: left and right from the drain

In total: 96 measurements per sampling event

From October 2005 onwards monthly and irregular measurements → more than 6000 fluxes in database

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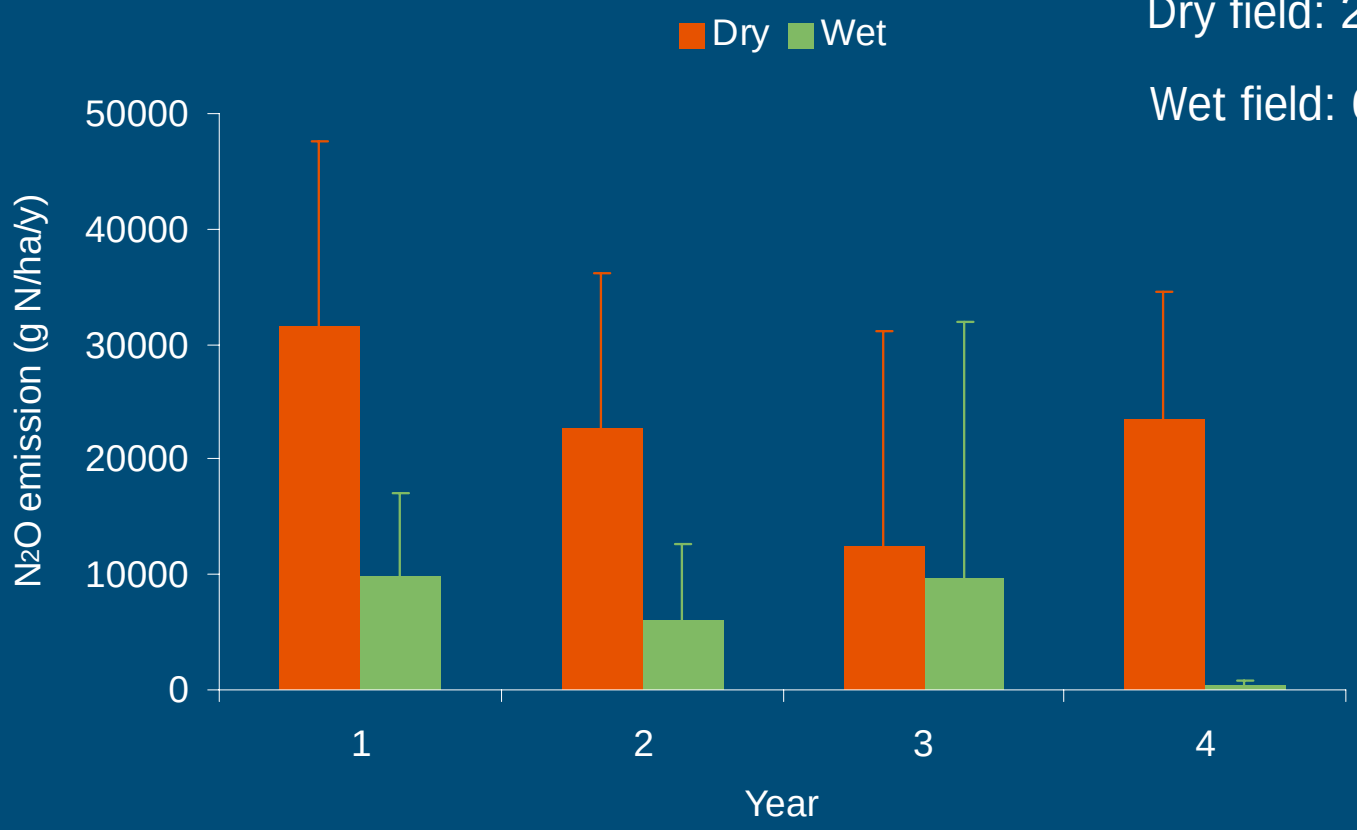
General results



Dry field: 22 kg N N_2O/ha/y

Wet field: 6 kg N N_2O/ha/y

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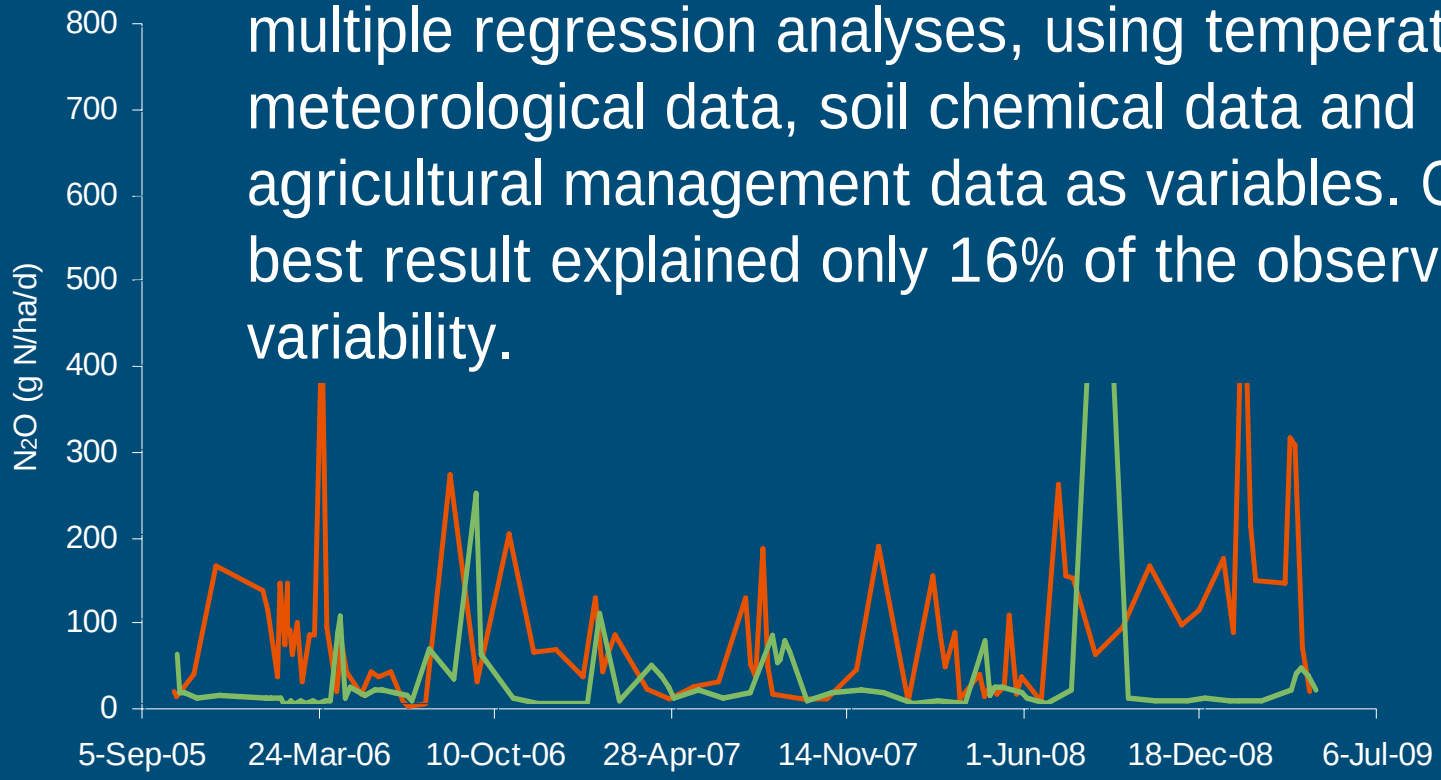
Results (average fluxes)

We tried to explain the observed fluxes by multiple regression analyses, using temperature, meteorological data, soil chemical data and agricultural management data as variables. Our best result explained only 16% of the observed variability.



→ High temporal variability

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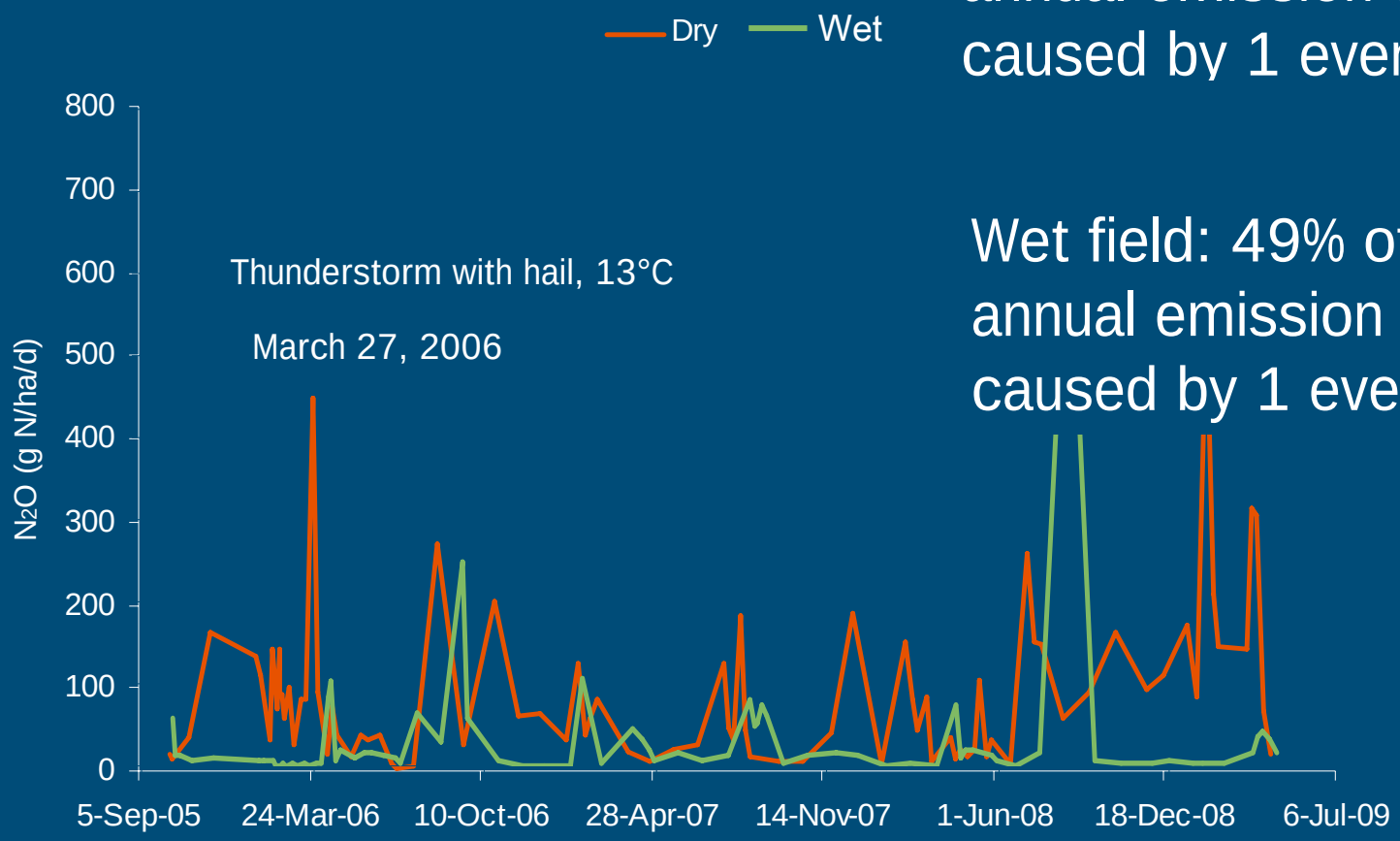
Temporal variability

Dry field: 24% of the annual emission was caused by 1 event.

Wet field: 49% of the annual emission was caused by 1 event.



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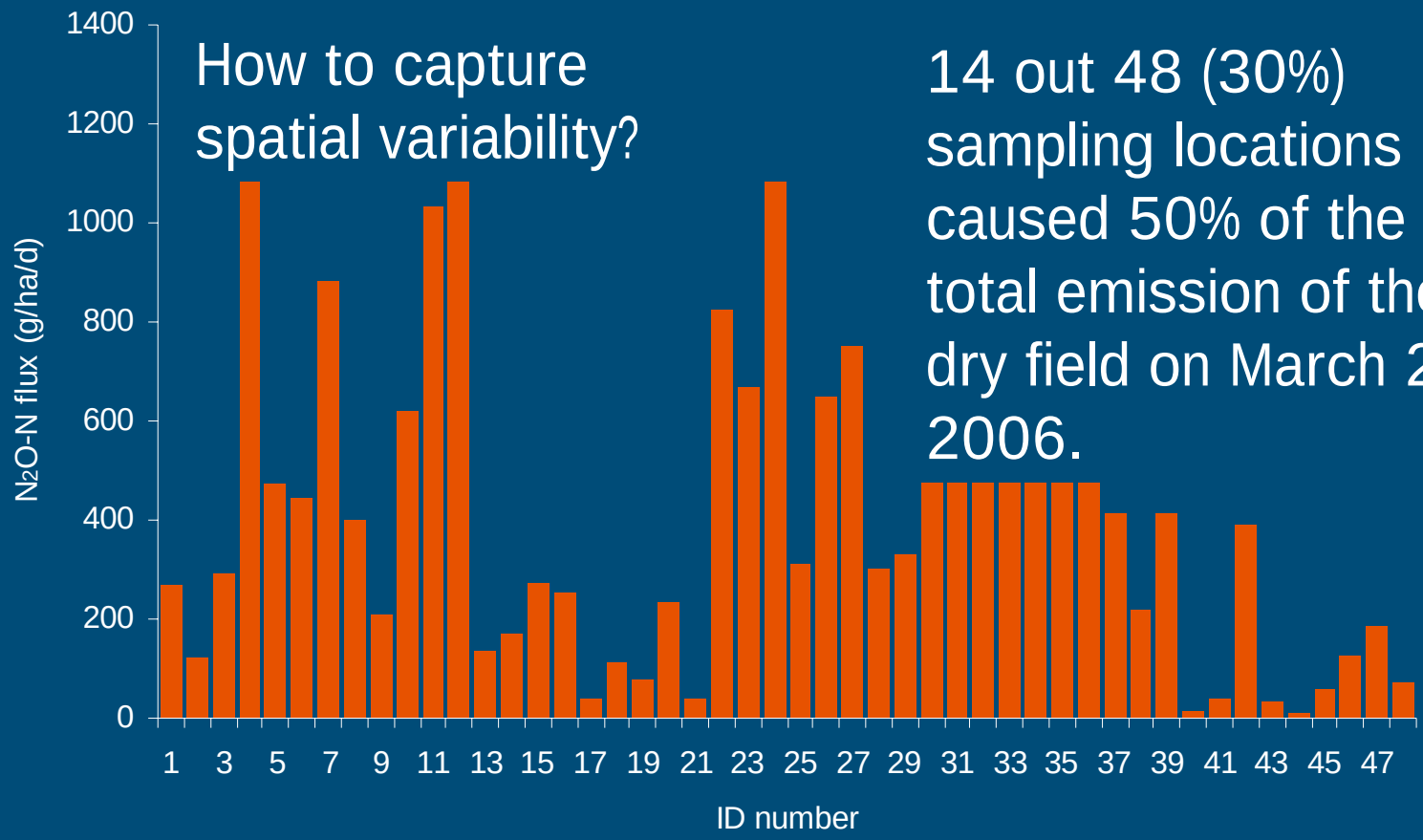
Measured fluxes on March 27, 2006



On an annual basis only about 3% of the N_2O emission is caused by the sampling location with the cumulative highest flux.

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Factors explaining variability

		Dry field	Wet field
Drain distance (g/ha/d)	4	95[a]	31[a,b]
	8	80[b]	22[a,b]
	12	91[b]	22[b]
	(0)	51[c]	39[a]

Conclusions

- Rising groundwater levels most likely result in lower N_2O emission from peat soils, but
- Increased spatial and temporal variability, which complicates exact quantification.
- Spatial variability ‘levels out’ in time. Temporal variability does not ‘level out’ in space.
- Choosing between often and many…?