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► To cite this version:

Claire Delon, Corinne Galy-Lacaux, Loubet B., Masson S., Camara N., et al.. N compounds emissions and deposition measured at a sahelian site (Dahra, Ferlo, Senegal). Experimental deployment. 6th International Nitrogen Conference, Nov 2013, Kampala, Uganda. hal-00910754

HAL Id: hal-00910754

<https://hal.science/hal-00910754v1>

Submitted on 23 Dec 2021

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N COMPOUNDS EMISSION AND DEPOSITION MEASURED AT A SAHELIAN SITE (DAHRA, FERLO, SENEGAL). EXPERIMENTAL DEPLOYMENT.

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Objective: Reactive Nitrogen cycle in semi arid regions.

► N is produced in the soil by the decomposition of buried organic matter and by the volatilization of animal excreta. It is further emitted in the form of NO and NH₃ to the atmosphere and strongly impacts the NO_x and NH₃ concentration in the atmosphere.

► Flux and concentration measurements at the beginning and end of the wet season have been performed, to characterize the variation of N emission (pulses) and deposition fluxes during the wet season. Measurements during the dry season need to be done to characterize the annual cycle.

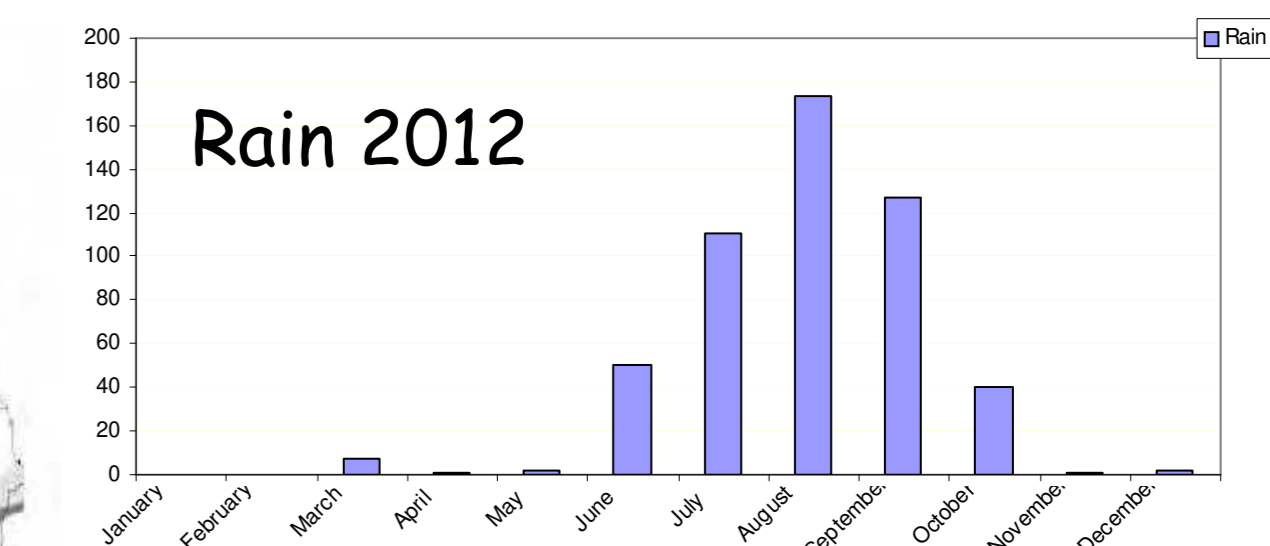
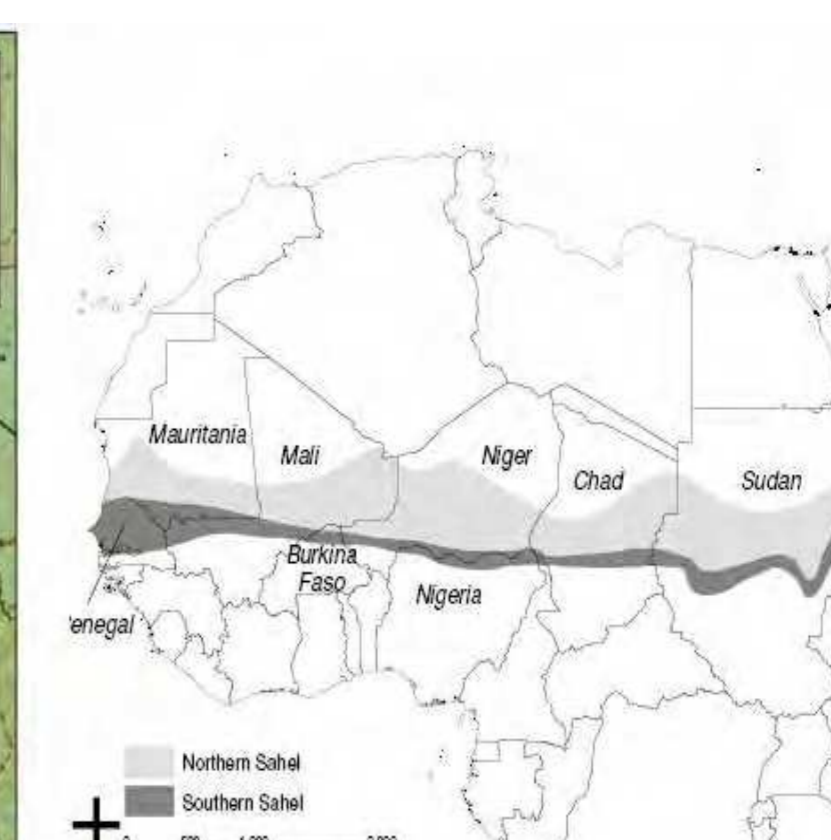
► Measurement strategy: direct and indirect methods, July 2012, July and October 2013.
 Compounds: NO, NO₂, NH₃, HNO₃, NH₄⁺, NO₃⁻.

Direct methods:

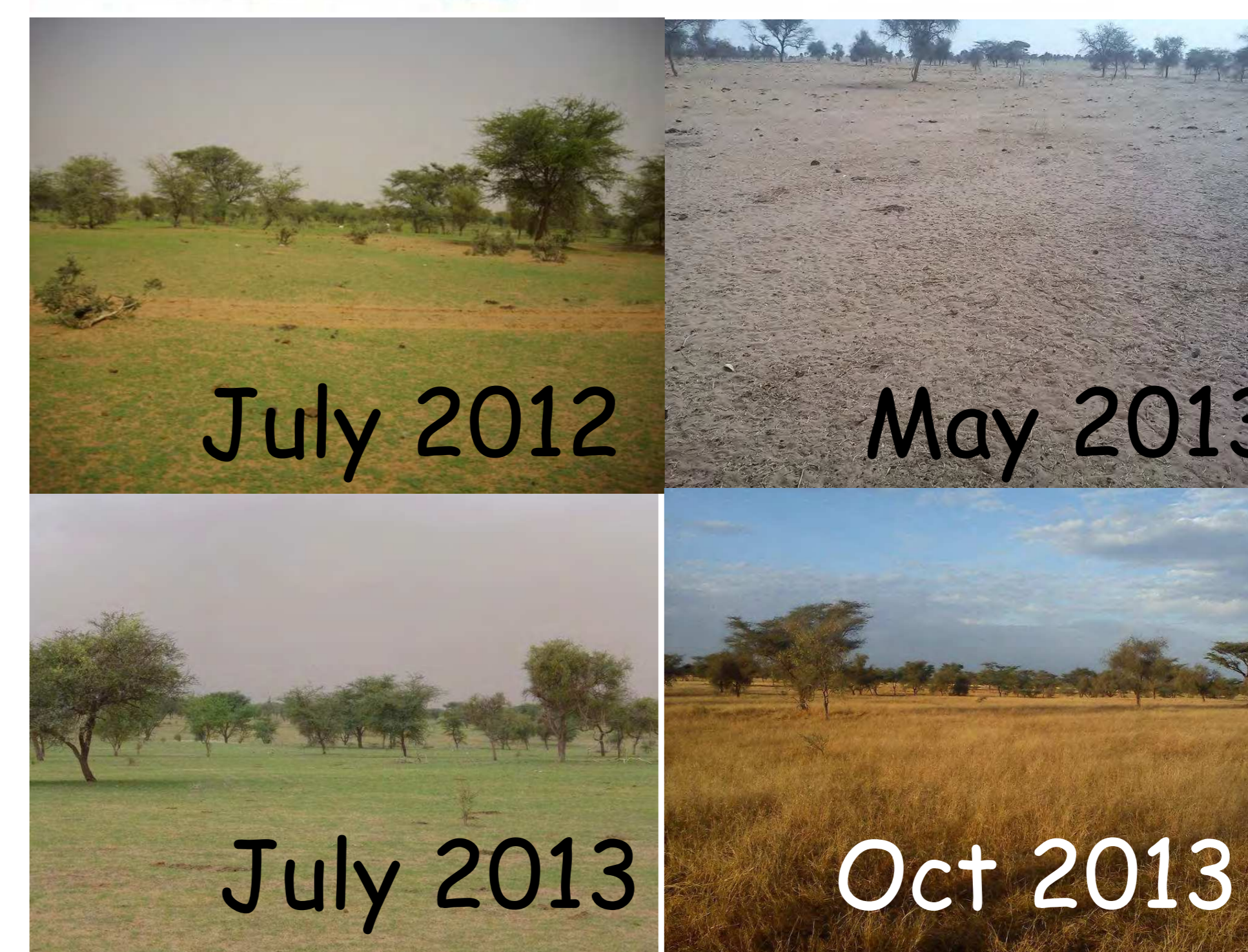
- NO and NH₃ Fluxes from soil and from animal excreta. (Dynamic chamber method, 17C/17i Thermo-Scientific analyzer).
- NO and NH₃ ambient concentrations (17C/17i analyzer)
- CO₂ Fluxes from soil (dynamic chamber method, EGM-4 analyzer)



Dahra site: 15.4°N, 15.4°W, Senegal (Ferlo)



- Institut des Sciences de l'Environnement, UCAD, Dakar, Senegal.
- Institut Sénégalais de Recherche Agronomique, Dahra, Senegal.
- Institut de Géographie de Copenhague, Denmark
- Karlsruhe Institute of Technology (KIT), Germany
- Geosciences Environnement Toulouse (France)
- Laboratoire d'Aérodynamique (Toulouse, France)



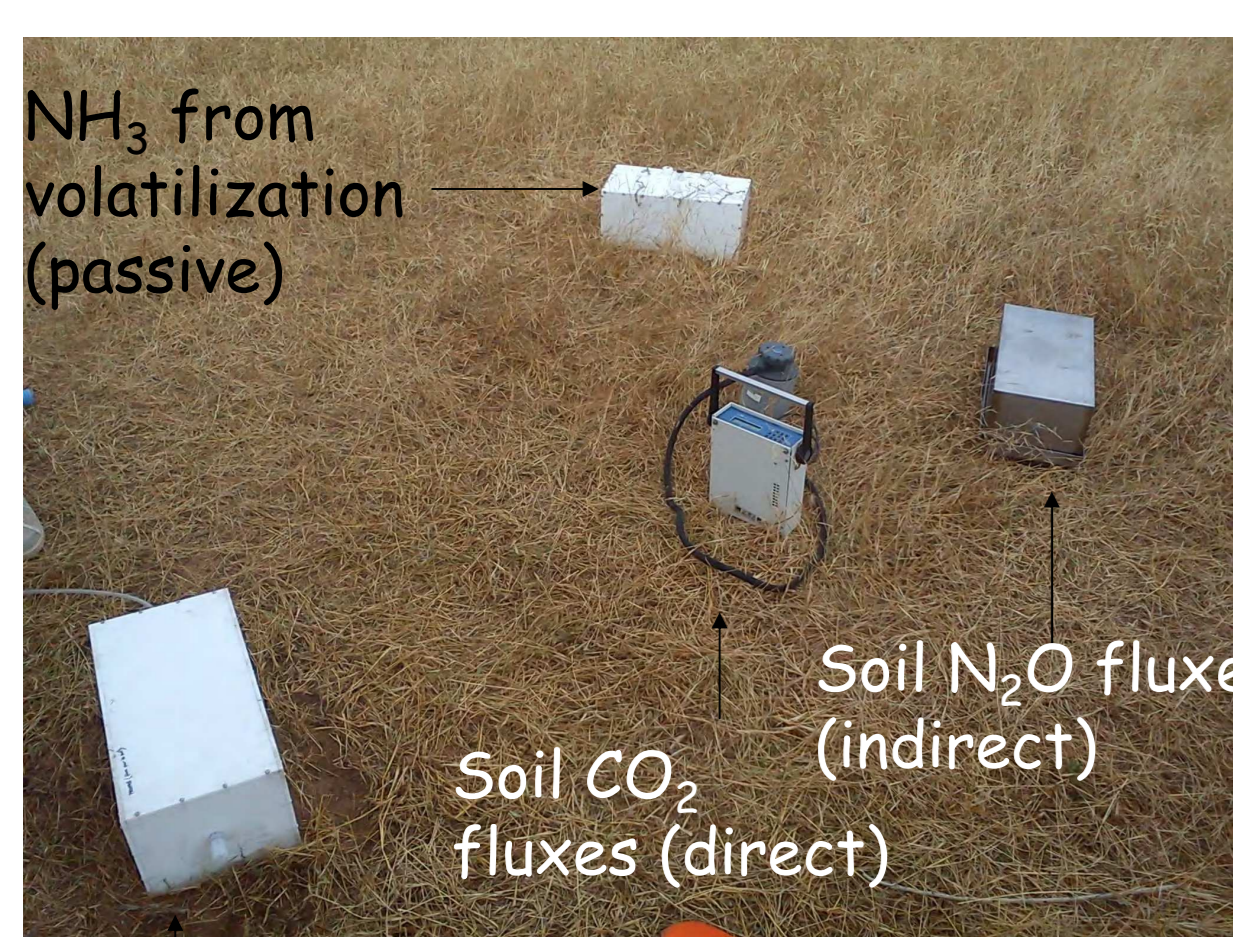
(Fensholt et al., Transactions on Geoscience and Remote Sensing, 44(7), 1774-1786, 2006; Fensholt et al., International Journal of Remote Sensing, 26(12): 2561-2594, 2005.)

Continuous measurements of land surface fluxes and state during the rainy season - since 2001.

Since 2012: measurements of N cycle components at the soil-atmosphere interface.

Indirect methods: Passive samplers, GCM, rain collector

- NH₃ Fluxes from animal excreta (teflon static chamber).
- NH₃, NO₂, HNO₃ ambient concentrations (time integration: 15-30 days) => dry deposition flux
- GCM: N₂O fluxes from soil (Inox static chamber method)
- NH₄⁺, NO₃⁻ concentrations in rain samples => wet deposition flux.



Soil NH₃ fluxes (direct)



Teflon chamber: Passive samplers => NH₃ volatilization from animal excreta



Passive samplers => NH₃, NO₂, HNO₃, O₃ ambient concentration.

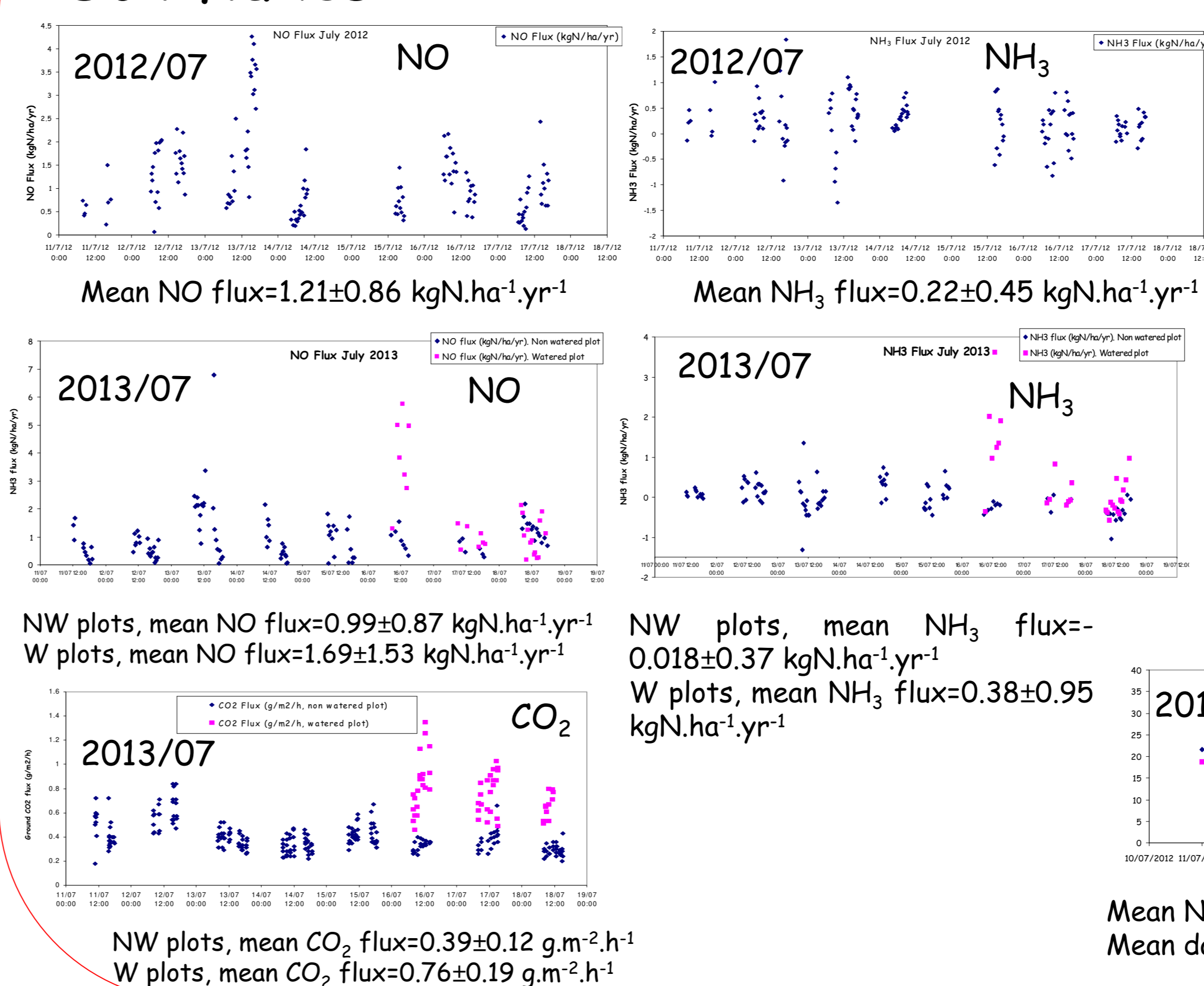


Rain collector => NH₄⁺ and NO₃⁻ concentrations in rain

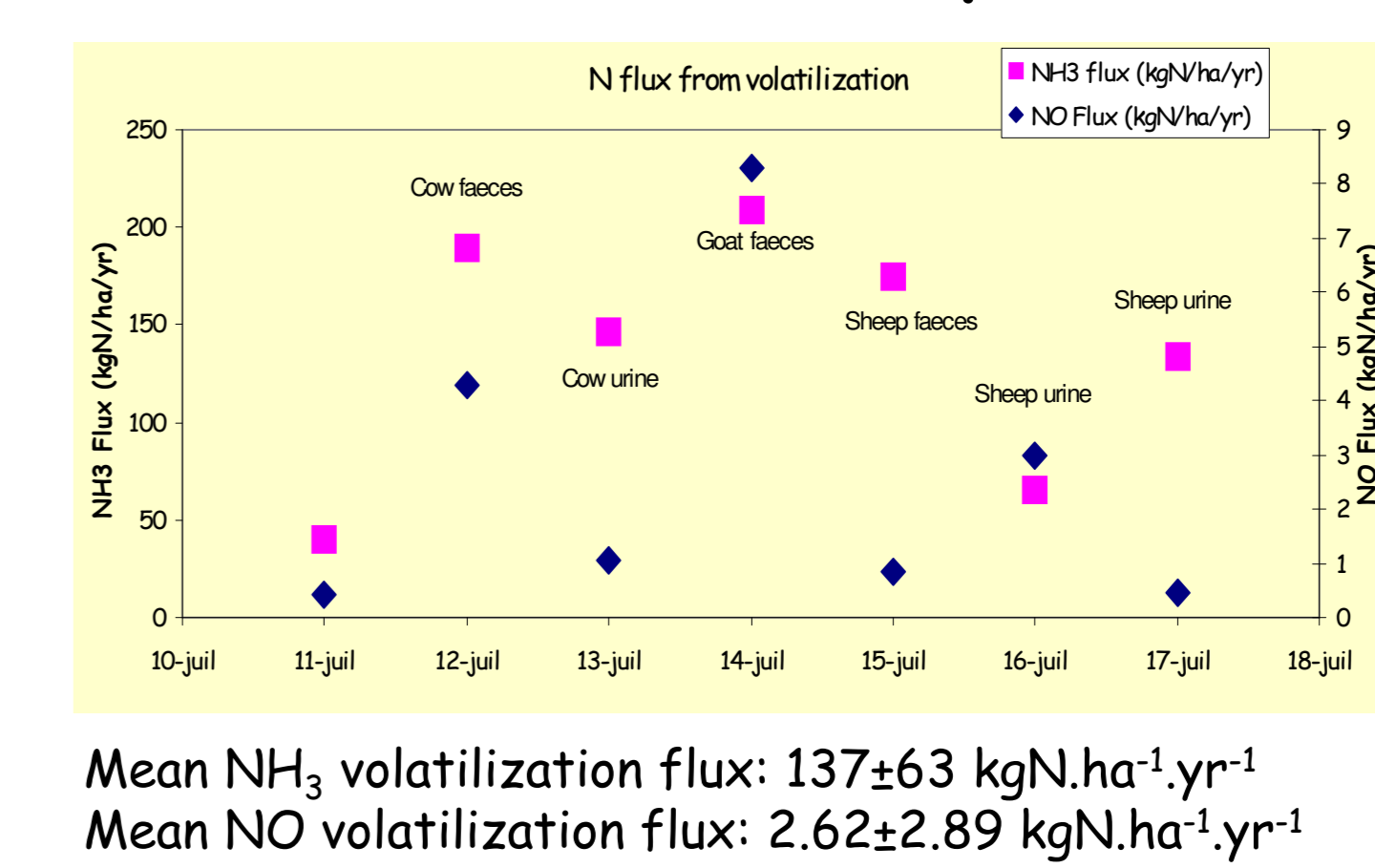
Supplementary measurements: pH, soil temperature and moisture, soil N content, faeces and urine N content.

Preliminary results

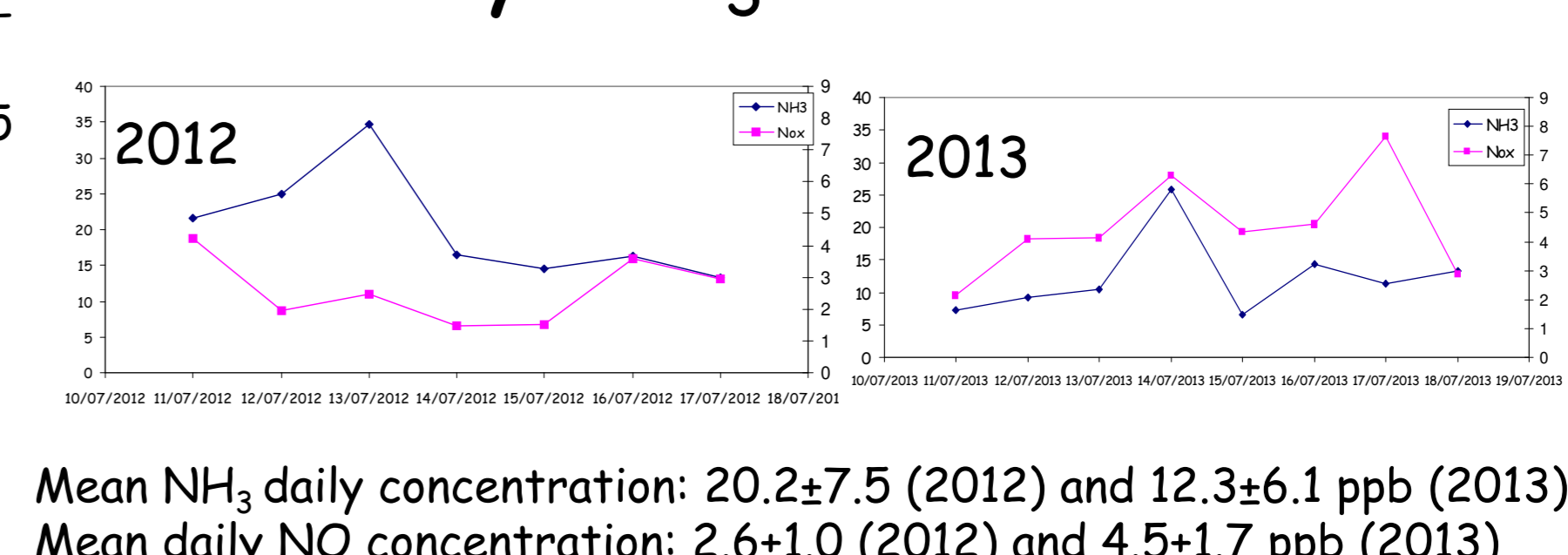
Soil fluxes



Volatilization fluxes



Daily NH3 Concentrations



These preliminary results from the Dahra site are comparable to other Sahelian sites investigated within the IDAF network (Mali, Niger, Adon et al., ACP, 10, 7467-7487, 2010). Work still needs to be done to analyze October 2013 measurements and explore seasonal variations. These data will help to investigate the N cycle at the soil/atmosphere interface in Sahelian region where very few data are available.