

Interactive
Comment

Interactive comment on “Atmospheric nitrogen budget in Sahelian dry savannas” by C. Delon et al.

k. pienaar (Referee)

kobus.pienaar@nwu.ac.za

Received and published: 13 October 2009

1) Scientific Significance: Excellent

The paper represents a first attempt to quantify the atmospheric nitrogen budget in Sahelian dry savanna in West Africa. The data reported for this region is poorly explored in international literature in terms of both emissions and deposition. Integrated monthly concentrations were obtained and used in calculating deposition estimates of a selected number of N species. The different N emission processes known to be of relevance in the specific region were explored as extensively as possible. Large scale meteorological forcing was used in the calculations to produce a good (first) estimate of the N budget in a globally important ecosystem. The paper thus contains both new data and information that are of global importance and of excellent scientific significance.

C5869

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



2) Scientific Quality: Good

The monthly mean ambient concentrations of three nitrogen compounds (NH_3 , HNO_3 and NO_2) were measured using passive samplers that have been tested globally in different environmental conditions and which have been accepted as an appropriate method in a number of international monitoring programs. Dry deposition fluxes of these species were calculated using deposition velocities reported in literature. Since the deposition velocities used in this study represent “maximum” values and are of a reference height of 20 meters, whereas the measurement height used in the study was 1.5 meters, the flux estimates reported in the paper are likely the maximum for these species. Other sources of dry N deposition, such as particulate N and organic N (PAN, etc) were not included in this estimation and are so reported in the paper. Wet N deposition measurements of NH_4^+ and NO_3^- were performed according to established methods and the laboratory performing the measurements participates in the twice annual WMO inter laboratory comparisons with good results. The different N emission processes known to be of relevance in the specific region were explored as extensively as possible. Emissions from soils, volatilization, biomass burning, domestic fires were included in the budget (synthetic fertilization is not common practise in this region and not included). Large scale meteorological forcing was used in the model and not micro meteorological measurements since such measurements are not available at these remote sites. These surface forcing has been validated within the ALMIP project. Monthly mean values have thus been calculated to be in agreement with the integrated monthly mean ambient concentration values obtained from the passive samplers. Although other methods may be preferred, it is not practical or affordable in studies the paper report on. Although the estimates are thus not based on “state of art” high resolution measurements, the methodology followed are in agreement with similar studies in international programmes (e.g. mean meteorological information is also used in filterpack studies, etc.). The methodology followed and the calculations performed are thus scientifically sound and clearly reported in the paper. The challenge remains to improve on these estimations in future but the scientific approach and applied methods

C5870

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



are valid and good scientific quality.

3) Presentation Quality: Good

The presentation is of a good quality

4) General comments

Based on the detailed comments of anonymous referee 1, the authors proposed a revised version of the work which improved the scientific value of the paper.

In addition to these comments, which were mostly addressed in the revised version, it also needs to be mentioned that the three N gases measured (and thus considered in the budget) does not represent all the N gaseous compounds in the atmosphere. (It is mentioned on Page 14204, Line 9 that PAN concentrations may be low (due also to reasons given by Referee 1), and that other non reactive N compounds were not included (Page 14204, Line 1) but this aspect needs to be pointed out clearly because it might influence future estimates.

It is also important to mention that the reported deposition flux represent most probably the maximum values (based on arguments mentioned earlier about the deposition velocities used). This is partly stated on Page 14195, Line 9, but may be mentioned again after giving the chosen values on Page 14195, Line 22.

In conclusion, it is my opinion that the paper represents a substantial contribution to scientific information and knowledge within the scope of ACP and merit publication. It will assist in global assessments and evaluations of the nitrogen budget and direct future investigations.

Yours sincerely

JJ Pienaar

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 14189, 2009.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

