Geophysical Research Abstracts
Vol. 16, EGU2014-14721, 2014
EGU General Assembly 2014

Greenhouse gas emission from cattle urine deposition in pasture under tropical conditions.

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Animal production systems are important sources of greenhouse gases (GHG), especially methane (CH_4) and nitrous oxide (N_2O). Brazilian beef production is almost exclusively (more than 90%) pasture-based, and most GHG emissions from this system originate from urine patches. GHG emissions from urine patches have been extensively studied in temperate climates, but not for tropical conditions. Here we examined the driving factors of N_2O emission from urine patches (U treatment) in the tropics, as well as the role of the nitrification inhibitor DCD (dicyandiamide – U+DCD treatment) in mitigating emissions. We measured the emission of CH_4 and N_2O from beef cattle urine (360 kg N ha^{-1}) in Rondônia state (Brazil, tropical climate), during two different seasons (winter and summer), with and without the application of DCD (10 kg ha^{-1}). We hypothesized that the high temperature and periodical rainfall can decrease GHG emissions from urine patches through accelerating mineralization of urine-N. The cumulative emissions during winter were 10.8 and 39.2 mg N-N_2O m^{-2} (U and U+DCD treatment, respectively), and 126.2 and 129.5 mg N-N_2O m^{-2} during summer (U and U+DCD treatment, respectively). No effects of DCD were detected in summer, but DCD retarded the main peak of N_2O emission. Otherwise, during winter U+DCD treatment had the higher cumulative N_2O emission ($p \leq 0.05$). The emission factors determined were 0.08 and 0.13% (winter U and U+DCD, respectively) and 0.38 and 0.37% (summer U and U+DCD, respectively), significantly lower than the IPCC default value of 1%. We hypothesize that biological nitrification inhibition (BNI) is the main reason for such low emission factors, since *Brachiaria* grasses naturally inhibits the nitrification process. In this situation the use of DCD is not recommended. The fast decomposition of DCD in warmer climates leads to a short-term effect in nitrification inhibition. The excess of N due to DCD decomposition can trigger a priming-effect, increasing the N_2O emission in the U+DCD treatment.