N2O historical emissions from animal waste manure management from domestic livestock

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N_2O emissions due to manure management were responsible for 26% of the total anthropogenic emissions of N_2O in 1998. We calculated the N_2O historical emissions due to animal waste manure management (it is not included the N_2O emissions from animals grazing) of domestic livestock using the HYDE (History database of the global environment, 2003) population by country, and the inventory methodologies of the IPCC (1996) from 1890 to 1998. The emission follows a simple rule: the emission factor per animal multiplied for their population. The world populations of these domestic livestock were obtained from the History Database of the Global Environment (HYDE 2003) by country. The emission factors were calculated with basis on the Intergovernmental Panel on Climate Change (IPCC 1996).

The world historical emissions inventories are important to evaluate the countries contributions to the present concentrations of those gases in the atmosphere, to calibrate the models decay time of the gases and to analyze the different patterns by region along the time (Muylaert et al. 2005). According to IPCC TAR, 2001, the N2O concentration before the industrial revolution was around 270 ppbv and in 1998 it was 314 ppbv presenting 0.8 ppb per year as a rate of changing the concentration during this period.

The IPCC uses the emission factors of pigs, sheep and cattle and we calculated their N_2O emissions. The formula used is:

N_2O = n x EF

where:

N_2O = N_2O emission from the animals (kg N year^{-1});

n = number of animals;

EF = N_2O emission factor (kg N_2O-N/per animal).

The emission factor (EF) is function of the nitrogen excretion of the animal and the waste management system in the region. The N_2O emission factors of the dairy and non-dairy cattle were estimated averaging them. We have used the default values of the IPCC (1996) to calculate the EF. The emission factors related to each different period of time were not taken into account, meaning that from 1890 to 1998 it was considered constant for each country and each animal. Future improvement is being carried out and some sugestions in this direction are presented in this work.

From the N2O cumulative emissions (due to animal waste manure management), we calculated the contributions to the atmospheric concentration of N_2O (in GgN2O) in the year of 1998 (taking into account 114 years for the gas decay time). The results are discussed in comparison with others studies.

References:

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