Geophysical Research Abstracts
Vol. 20, EGU2018-8863, 2018
EGU General Assembly 2018

Can N fertilizer application rate be reduced by considering atmospheric N deposition as a kind of fertilizer input in croplands of China?

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Atmospheric nitrogen (N) deposition is in the high level in the recent years in China due to the high emissions of NH3 and NO_x. The large amount of N from atmospheric deposition in the croplands is an important N nutrient and should be considered in nutrient management. In this study, atmospheric dry and wet N depositions were monitored in a typical paddy field and a tea field during 2011 to 2015 in subtropical China with the aim to evaluate the contribution of N deposition to N input in croplands. Furthermore, the N deposition in major croplands in China was also reviewed and the proportion of N deposition to the total N application rate in croplands was evaluated. The results showed that the annual mean N depositions at the paddy site and the tea field sites were as high as 41 and 60 kg N ha-1, with dry deposition contributed to 41 to 57 % of the total N deposition. At both sites, NH3 emissions were higher than NHx deposition (dry depositions of NH3 and particulate NH4+ and wet deposition of NH4+), showing that the sites were net sources of atmospheric NHx. On the other hand, the emissions of NO_x at the sites were much lower than the deposition of NO_y (dry depositions of NO_2, HNO_3 and particulate NO_3- and wet deposition of NH4+), showing that the sites were net sinks of atmospheric NO_x. The nitrogen fertilizer application rates were 300 and 450 kg N ha-1 yr-1, respectively, and if the deposited N from atmosphere was also considered as a kind of N fertilizer, then the N fertilizer application rates can be reduced by 14% at the two sites. In other regions of China (e.g. North China Plain, the Yangtze River Delta, Sichuan Basin), atmospheric N deposition in the croplands accounted for 10 to 20% of the N application rates, indicating that a large amount of N fertilizer can be reduced when considering atmospheric N deposition as a source of N fertilizers.