**Text S1** Preparation for the inputs of meteorological data.

For the meteorological data inputs of the upland sites, the reported 3-hourly meteorological data from the weather station at the experimental site were used. If these data not available, the daily maximum and minimum temperature (*T*max and *T*min), the daily *P* and *W* derived from [Li et al. (2019](#_ENREF_40)), as well as the daily maximum solar radiation (*R*max), moment of *R*max appearing (*M*) and daily RH of the adjacent weather station in the China Meteorological Administration (CMA, http://www.data.cma.cn) were adapted by referring to the reported average or maximum values. With regard to the paddy rice sites, the daily meteorological data inputs from the adjacent weather station in CMA were used, which are listed in Table S2, and adapted referring to the reported maximum or average values. Then, the daily meteorological data of the upland and paddy rice sites were converted to 3-hourly data according to the following algorithms for time-scale transformation. The three-hourly *T*air and *R* values were interpolated using a sinusoidal curve that needs daily maximum and minimum values as well as the moments of those appearing. *T*max and *T*min were derived from the adjacent weather station in CMA. The authors assumed that *T*max occurred at 14:00 and *T*min occurred at the moment of sunrise, which was set at 7:00 from January to March and from September to December as well as at 6:00 from April to August. *R*max and *M* were derived from the adjacent weather station in CMA. The authors supposed that the daily minimum *R* (i.e., a value of zero) occurred at the moment of sunset, which was set at 18:00 from January to March and from September to December as well as at 19:00 from April to August. The moments of sunrise and sunset and the moment of *T*max appearance can be adjusted according to the real situation of the study site. CMA provided the average *W* at 02:00, 08:00, 14:00 and 20:00 measured at a height of 10 m. *W* at those moments was set as the CMA average value, and *W* at other moments was randomly set as a value ranging from 0 to the average value. The three-hourly *P* was derived from the CMA daily precipitation, which was randomly allocated to each 3-hour period. The 3-hourly RH used the daily average RH from CMA due to the lack of a reliable interpolation algorithm.

**Reference**

Li, S., Zheng, X., Zhang, W., Han, S., Deng, J., Wang, K., Wang, R., Yao, Z., Liu, C., 2019. Modeling ammonia volatilization following the application of synthetic fertilizers to cultivated uplands with calcareous soils using an improved DNDC biogeochemistry model. Sci. Total Environ. 660, 931–946. http://dx.doi.org/10.1016/j.scitotenv.2018.12.379