We thank the reviewer for her/his very careful reading of the manuscript and the resulting constructive comments! All reviewer comments are in italics, whereas our response/ [action] is described in Times New Roman font.

Climate Data: did the use of kriging on precipitation significantly change the number of rainfall days compared to the climate stations? With DNDC the distribution of the rainfall events can be just as important as the total amount of precipitation, so if the interpolation method produces (for example) a larger number of rainfall events with less rain per event this should be noted as a possible source of error.

[Answer]: As the reviewer said, the precipitation is a critical factor in the N_2O emission simulation. The authors compared interpolated precipitation events and observed precipitation events in 2000, which is shown in Fig 1. This selected meteorological station is in Lanzhou (103.53, 36.03), China. Although the interpolation method produces a larger number of rainfall events with less rain per event, the annual precipitation and simulated N2O emission is quite close to the observed one (Fig 1, 2, 3) .

Modelled N2O emissions: the caption for Table 3 should note that the modelled values are averages using 8 years of climate data. Some sort of uncertainty estimate for these figures should also be included. (According to the methods section the effect of varying SOC was investigated, there's also the effect of annual weather patterns that could be considered).

[Answer]: The authors add new description on the caption of Table 3 according to the reviewer's suggestion. A new paragraph was added to the manuscript to discuss the uncertainty.**[See 3.5]**

Grassland categories: it looks like the N2O emission rates in Table 4 have been calculated by taking the unweighted means of the emission rates in each of the grassland types. However, it would be better to take the N2O emission rate as: (Total N2O emission)/Area, as this gives appropriate weight to each grassland type according to its area.

[Answer]: The authors accepted the suggestion and added a new column in Table4, which represents the weighted mean emission rate. The weighted mean emission rate is more reasonable than the unweighted one. Weighted emission rates are 0.26, 0.14 and 0.38 for Temperate grasslands, Montane grasslands and Tropical/ subtropical grasslands, respectively. See more details in new Table 4.

Section 3.6: The P-value in Figure 6 is 0.1414, so the trend is not statistically significant. This is *unsurprising as 8 years is a small time-frame to expect to see significant climate change effects. It would also be useful to confirm that there are no other longterm effects that might be influencing N2O emissions (e.g. is there any major build-up or loss of SOC?). If weather differences are the major cause of inter-annual variation in N2O emissions then these results could be used to infer what changes future climate change might make to N2O emissions. In line 22 it is stated that the precipitation and temperature "significantly increased" between 2001 and 2005. It seems unlikely that there was a significant increase in the statistical sense, so this should be rephrased to avoid confusion.*

[Answer]: In the 8-years simulation, all variables except climate factors keep constant, so it only the climate which influenced the N2O emission. According to the sensitivity analysis, the temperature and rainfall can change the N2O emission pattern. However, they are not simply linear related. Especially, the combinative effect of precipitation and temperature is more complex, so that we cannot do a simple inference that the climate change led to the N2O emission change in this research. As the reviewer pointed out, the word 'significantly' in line 22 was confused and not precise. The authors accepted the reviewer's suggestion and rephrased the statement.

[In the northern grassland region, the precipitation and the temperature increased (Fig. 7a, b)]

Technical corrections
Pg 1677, line 8: more up-to-date figures for the relative contributions of anthropogenic N2O, CH4 and CO2 emissions are available in IPCC 2007

[Answer]: The suggestion was accept. A *more up-to-date* percentage value was adopted.
[On a global basis, carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), contribute 76.7, 14.3 and 7.9%, respectively, to the anthropogenic GHGs' effect (IPCC, 2007).]

Pg 1677, line 25: "The IPCC method was frequently used. . ." this sentence doesn't quite seem complete. Who used it and when?

[Answer]: The suggestion was accept, the sentence was rephrased.
[The IPCC method was frequently used to estimate N2O emissions at national scale.]

Pg 1688, line 20: N2O emissions have not increased "constantly" from 2000-2007. For example the N2O emission in 2005 was higher than 2006 according to Figure 6.

[Answer]: The suggestion was accept, the sentence was rephrased.
[The N_2O emissions from the entire grassland ecosystem varied year-by-year and have increased from 2000–2007]

Section 3.2-3.4: References to Figures 3a-g when there is only Figure 3.
Answer: The suggestion was accept. The authors added parenthesis on the Figure 3 sub panels, such as, Figure3 (a)

Table 1: The measured value in Xu(2003) is 0.296 kg N/ha/y

Page 1701: Should be "sensitivity analysis" rather than "sensitive analysis"

[Answer]: Corrections were made according to the reviewer's suggestion.

Fig 1 Comparison of Interpolated annual rainfall and observed rainfall

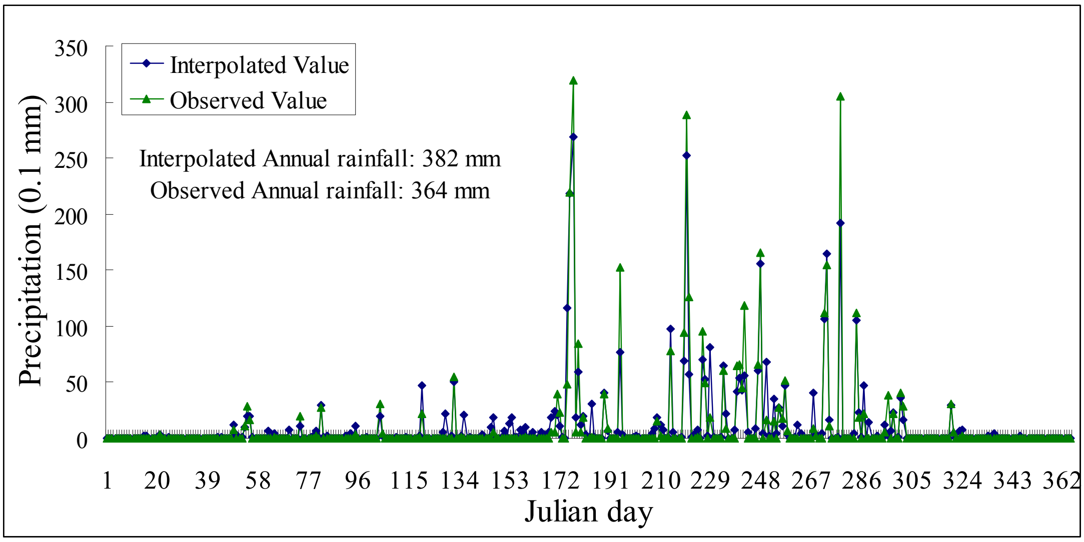


Fig 2 Comparison of simulated N2O emission with Interpolated precipitation and observed precipitation, respectively. Except precipitation, two simulations used same parameters including temperature.

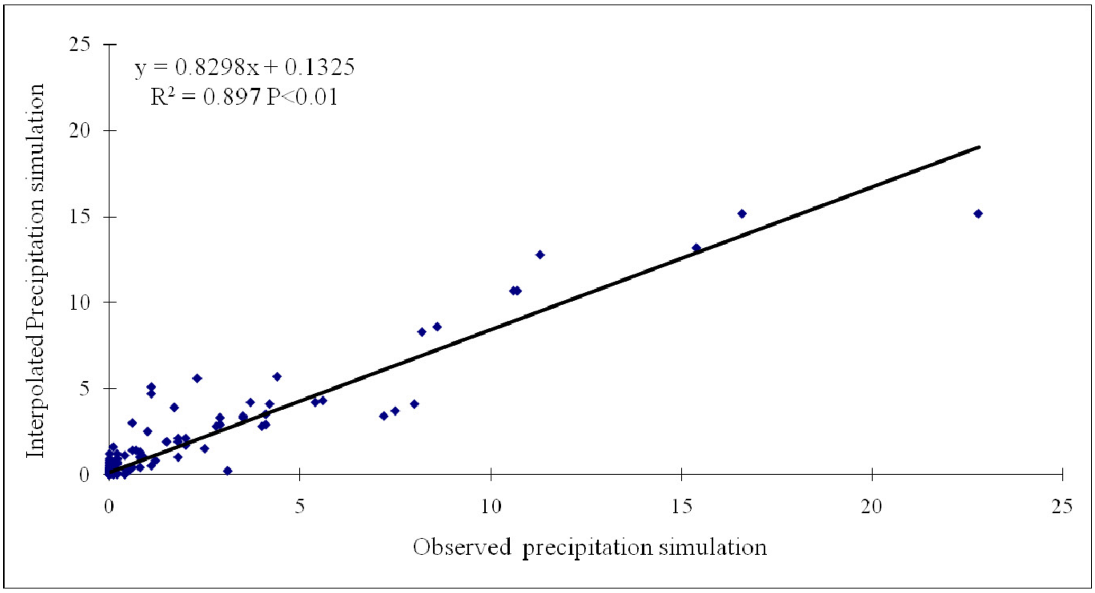
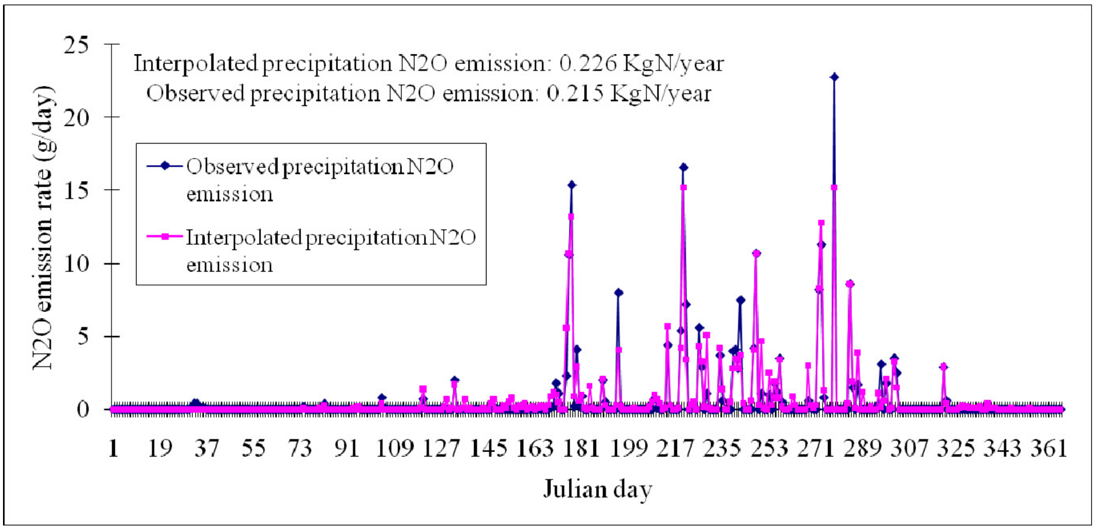


Fig3 Comparison of N2O emission simulation with Interpolated precipitation and observed precipitation



New Paragraph

3.5 Uncertainty analysis

This study has made great efforts to reduce the uncertainties in the estimation of N_2O inventory, especially in the input data. All input datasets are from official statistical data of China and the national survey in order to simulate as precisely as possible. However, there are still uncertainties associated with the climate data, grazing and soil data.

As Fig3 shown, climate is a key parameter of DNDC model. In this research, we interpolated precipitation, which produces larger number of rainfall events with less rainfall per event, but the total precipitation is similar with the observed value. This can be source of the uncertainty of simulated results.

In Chinese natural grassland regions, the rotation grazing method is usually adopted, which requires transferring live stocks from one pasture to another in different seasons and staying in same pasture during the whole season. For example, in Qinghai-Tibet grassland region, there are three types of pastures, namely spring-winter, summer, and autumn pasture. In real, every pasture will be grazed in turn according to the seasons. This grassland management, however, was simplified in this research as we could not find any specific data about it. We assumed that live stocks stay in the same pasture whole year with 12 hours grazing time per day and the stocking rates are same throughout the country. Furthermore, we assumed all grasslands are useable. These assumptions could induce some uncertainties in the simulation results. The average stocking density rate may be underestimated compare to the real since not all grasslands usable or be grazed in same time. As Fig3 (d,e) shown, this simplified grazing assumption could induce underestimated N_2O emission.

Accurate soil properties can help to reduce uncertainties. This research, we used the second national soil survey data conducted from 1979-1994 as initial model input value. This value should have some changes since then. As Fig3 shown, soil properties was one of most sensitive factors, the outdate soil value will increase uncertainties.