Biogeosciences Discuss.,
doi:10.5194/bg-2016-68-AC1, 2016

Biogeosciences Discussions
Open Access
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Interactive comment on "Flower litters of alpine plants affect soil nitrogen and phosphorus rapidly in the eastern Tibetan Plateau" *by* Jinniu Wang et al.

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Received and published: 6 May 2016

Dear reviewer, All the authors greatly appreciated about your positive opinion and professional comments to our manuscript (bg-2016-68), which has improved its structure and readability. We are pleased to revise our manuscript in details according to your comments. Major comments about the methods, "However, employed methods are not clear, especially litter collection and chemical analyses of litters. Litter collection method is very important to assess the production of litter per unit area and researchers employ litter trap in general. However, authors did not give any specific methods, but said only "collect". Also, there is no method to analyse chemical properties of litter. For example, I could not find how authors measured total nitrogen and phosphorous

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in litter". Yes, we all agree that these items should have been added for their close relationship with interpreting the exact processes and following results in the context. The method of litter collection has been supplied in details, so have analysis methods of chemical properties. Litter collection, "4 litter traps were placed under the crown of each individual shrub in the study, which were processed and modified based on the litterfall monitoring protocol (Muller-Landau and Wright, 2010). The litter trap was composed of 1 cloth bag and 4 support legs. Window screen (with a mesh size of 0.8 mm) was used to seize the cloth bag. Its size was about 50 cm deep and 25 cm length of a side. 4 legs (made by 80 cm PVC pipe) were tied with cloth bag and frame. The frame of opening was made of iron wire with 3 mm diameter. After inserting it into the soil under the shrub's crown, the plant litter was collected twice per week, which was later sorted as flower litter and other types during the blooming period. Due to the small size of herbaceous individuals, flowers were just plucked at the end of flowering phase and their mass ratios to aboveground biomass was calculated. Freshly fallen leaves of different species were collected from the floor of the alpine meadow (i.e. mixed leaf litters, ca. 3950 m a.s.l.)." Chemical analyses, "The contents of C and N were determined by dry combustion with a CHNS auto-analyser system (Elementar Analysen systeme, Hanau, Germany) (Brodowski et al., 2006). The content of P was obtained colorimetrically by the chloro molybdophosphoric blue color method after wet digestion in a mixture of HNO3, H2SO4, and HClO4 solution (Institute of Soil Academia Sinica, 1978). Lignin and cellulose were estimated by the method described by Melillo et al (1989)." Muller-Landau, H.C. and Wright, S.J., 2010. Litterfall Monitoring Protocol. Melillo, J.M., Aber, J.D., Linkins, A.E., Ricca, A., Fry, B. and Nadelhoffer, K.J., 1989. Carbon and nitrogen dynamics along the decay continuum: Plant litter to soil organic matter. Plant and Soil 115, 189-198. Other minor comments 1. Line 68: mineralization of soil organic matter and decomposition of plant residues have the same meaning. It is meaningless to divide these two. Yes, we agree that there was no necessary to distinguish two terms since plant residues can be included in soil organic matter. In the revised version, we addressed the sentence to be "the plant residue is one prin-

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cipal component of soil organic matter, whose decomposition can supply available N to plants and microorganisms." 2. Line 152: Add "genus" before Kobresia and Carex and add spp. after Festuca, Gentiana, and Leontopodium to deliver exact meaning. Yes, we have done based on the review's suggestions. 3. Line 164: Table 1 is not necessary. Delete it. Ok, Table 1 has been deleted. 4. Line 164: Mixed litter- What is this litter composed of? It might be composed of flower and leaf litters. This is not clear. Thanks for your kind reminder. Here is mixed leaf litter, which was composed of dominant species' leaf litters in the alpine meadows. 5. Lines 184-187: It is not clear that collected samples were mixed through sieving or each sample was mixed through sieving. Yes, we have revised the relevant context-"After 50 days, each soil sample was collected from three points of each pot in the center and then mixed to avoid the boundary layer effect. Each soil sample from different PVC pots was mixed evenly by sieving through a 2 mm mesh respectively. The samples were stored and marked separately in an ice box prior to chemical determination." 6. Line 215: It is not necessary to use abb. of DHN and DNN for NH4+-N and NO3-N, respectively. Thanks, NH4+-N and NO3–N are just used in the updated version. 7. Table 1, 4 and 5 should go to the place after text which were mentioned. Yes, Table 4 and 5 have been edited to right place after combined with Table 2 and 3. 8. Table 6 and explanation should go to results part, rather than Discussion part. Yes, we did it after combine new figures and tables. Please kindly notice that it is Table 4 in revised version. Effects of flower litter addition on soil solution N pool and soil MBC and MBN Soil solution N pool has been improved noticeably from 31.46 mg g−1 to 47.35 mg g−1 in flower litter treatment compared with the control, particularly in fragment of NO3–N, which has been greatly increased (from 30.93 mg g−1 to 46.8 mg g−1). (Table 4). In mixed leaf litter treatment, there were no obvious variations after litter decomposition, with 32.4 mg g-1 NO3–N and 0.45 mg g-1 NH4+-N, respectively. There were notable differences of both MBC and MBN between different treatments. Litter addition not only increased soil microbial biomass C (102.05 mg kg−1, 68.08 mg kg−1, and 46.25 mg kg−1 for flower litter, mixed litter, and control, respectively) and MBN (73.02 mg kg−1, 69.29 mg kg−1, 67.13 mg kg−1 for flower

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Discussion paper

litter, mixed litter, and control, respectively) but also their C:N ratios (1.40, 0.98, and 0.69 for flower litter, mixed litter, and control, respectively). Table 4 Comparing median value of soil solution pool and soil microbial biomass between litter addition treated (flower litter and mixed leaf litter) and control. Treatments Soil solution N pool (mg g-1) Soil microbial biomass (mg kg-1) NO3–N NH4+-N MBC MBN MBC/MBN Flower litter 46.8 0.55 102.05 73.02 1.40 Mixed leaf litter 32.4 0.45 68.08 69.29 0.98 Control 30.93 0.53 46.25 67.13 0.69

9. Line 259: delete per unit. Yes, done. 10. Table 2 and 3: DIN and DON are not necessary because these are deliberated from TN, DNN, and DHN do not have any special meaning. Yes, please see response of the 11th item. 11. After delete DIN and DON, I suggest to combine Tables 2 and 4, Tables 3 and 5, and Figures 4 and 5. Thanks for your professional recommendation, which improved the whole structure of this manuscript a lot. We have combined tables and figures for your further review. 12. Fig 4: add explanation of (a) and (b) in the Figure caption. Yes, we have added explanation of (a) and (b) in Fig 4. 13. Fig 6: Where did ab of lower case letters come? To use ab, there should be b but there is no b. Check the statistical analysis. Sorry for this unnecessary mistake. We have corrected in the revised version. We changed ab to be a and c to be b, respectively.

Thanks again for you time! Jinniu Wang, on behalf of all the authors of bg-2016-68

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2016-68/bg-2016-68-AC1-supplement.pdf

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-68, 2016.

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Effects of flower litter addition on soil solution N pool and soil MBC and MBN

Soil solution N pool has been improved noticeably from 31.46 mg g^{-1} to 47.35 mg g^{-1} in flower litter treatment compared with the control, particularly in fragment of NO_3^--N, which has been greatly increased (from 30.93 mg g^{-1} to 46.8 mg g^{-1}). (**Table 4**). In mixed leaf litter treatment, there were no obvious variations after litter decomposition, with 32.4 mg g^{-1} NO_3^--N and 0.45 mg g^{-1} NH_4^+-N, respectively. There were notable differences of both MBC and MBN between different treatments. Litter addition not only increased soil microbial biomass C (102.05 mg kg^{-1}, 68.08 mg kg^{-1}, and 46.25 mg kg^{-1} for flower litter, mixed litter, and control, respectively) and MBN (73.02 mg kg^{-1}, 69.29 mg kg^{-1}, 67.13 mg kg^{-1} for flower litter, mixed litter, and control, respectively) but also their C:N ratios (1.40, 0.98, and 0.69 for flower litter, mixed litter, and control, respectively).

Table 4 Comparing median value of soil solution pool and soil microbial biomass between litter addition treated (flower litter and mixed leaf litter) and control.

Treatments	Soil solution N pool (mg g^{-1})		Soil microbial biomass (mg kg^{-1})		
	NO_3^--N	NH_4^+-N	MBC	MBN	MBC/MBN
Flower litter	46.8	0.55	102.05	73.02	1.40
Mixed leaf litter	32.4	0.45	68.08	69.29	0.98
Control	30.93	0.53	46.25	67.13	0.69

Fig. 1.

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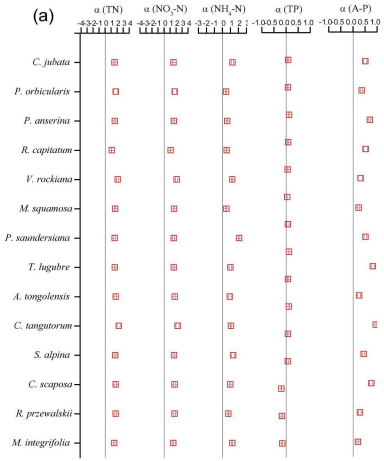

Fig. 2.

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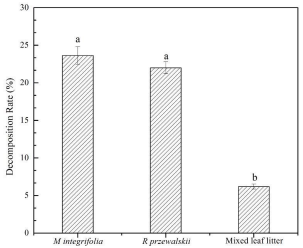

Fig. 5 Percentage of decomposed dry mass of *M. integrifolia* and *R. przewalskii* in a 50-day litter-bag study. *Column* represents mean, and bar indicates Standard Error (n = 8). Different lowercase letters indicate significant differences of decomposition rate between litter materials.

Fig. 3.

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