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## ***Interactive comment on “Above- and below-ground response to soil moisture change on an alpine wetland ecosystem in the Qinghai-Tibetan Plateau, China” by G.-L. Wu et al.***

**G.-L. Wu et al.**

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Author response to all referees' interactive comments for Manuscript MS-BG-2011-162 “Above- and below-ground response to soil moisture change on an alpine wetland ecosystem in the Qinghai-Tibetan Plateau, China” by G.-L. Wu et al.

We really thank four anonymous referees and Dr. Donatella Zona for their time and effort in reviewing this manuscript and for their helpful comments and suggestions. They provided us very insightful and constructive comments, which helped improve this manuscript. We have tried our best to carefully consider and respond to all the comments raised by all referees and editor. We have now revised the manuscript

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substantially by the comments and suggestions of all referees and editor.

And, each review comment is listed in the left column of tables and our response/action is written in the right column of the tables. We would like to revised anything by the suggestions if there are another needing revision.

#### Anonymous Referee #1 Comments Response/Actions

The paper has the aim to investigate the effects the effects of soil moisture spatial heterogeneity on wetland community. In particular, authors used a sequence space-series variation of soil moisture to reflect potential time-series variation of soil moisture in alpine wetland community in order to assess the potential effect of climate change in their study area. The paper is within the scope of the journal and the topic is quite important in order to quantify the potential effects of climate change on grassland ecosystems in alpine areas. Even though the experimental approach sounds quite good, I have some major concerns. All the sites are meadows but no information on grazing (i.e. type of grazing [cows, sheep etc.], stocking rate, seasonality) are given in material and method section. Are the authors completely sure that the differences they found are not related to different grazing ? Please provide some evidence for that. REİİjŽOn this comment, in revised text, we have added these information in material and method section: “All the samples sites are open flat wetland area, basically there is no slope. All the sites that we selected for studying were completely excluded live-stock grazing during the plant growth-seasons from April to October and slight grazing was done only during the hay-stage in winter, because of “Return Livestock Production to Grassland Ecology Project” of China from 2001, and there were scarcely no grazing. Meanwhile, all the samples sites are open flat wetland area, basically there is no slope.” We sure that the differences they found are not related to different grazing, because we have done many studies for many years in this area and we also do some studies on grazing experiments in the other place of this study area. Moreover, the experimental design is not completely clear to me. In fact, authors stated that they chose three block for each selected site and they established three 1 x 1 m quadrats in

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each block for detailed analysis. This means they have 9 quadrats for plot. Why then are they calculating standard error (table 1) on 12 quadrats ? Why did they decide to sample only five quadrat for above ground biomass? Please clarify better your experimental design. In some part of the paper English has to be re-checked. Please also report citations according to journal style. I think the paper can be accepted for publication in Biogeosciences after the authors will answer the above questions and will solve the following detailed comments. RE: On this comment, we have clarified that it is our writing errors, similar English writing and grammar errors were all appeared in earlier edition. In revised text, we have re-checked them and revised them. In this study, we selected three plots (each plot was about  $5 \times 103 \text{ m}^2$ ) in each selected site and three diagonal sampling quadrats (1 m<sup>2</sup>) per plot. Night quadrats were investigated and sampled in each studied site at early September of 2009, when biomass reaches its highest. We determined the aboveground dry biomass of each quadrat by weighing after drying at 80 °C for 48 h to constant weight. Vegetation covers, mean height, productivity based on aboveground biomass, richness of plant community were measured. Richness index (R) was determined by the total species numbers of each community by the methods of Wu et al. (2009). And, the top-soil water content of weight ratio in studied sites was determined by ordinary gravimetric measurement. Meanwhile, we collected three soil samples from each soil depths (0-10 and 10-20 cm) by bucket auger (diameter is 5 cm and length is 10 cm) from each quadrats in a simple random pattern, then fixed three soil samples from the same depths in each sampling quadrats. Nine mixed soil samples for each soil depth and each quadrat were used to laboratory analysis. Page 1 line 7: please change all citation throughout the text according to journal style. In this case Houghton et al., 2001 instead of “Houghton and others, 2001” Page 2 line 16: “terrestrial environments” instead of “terrestrial and environments” Page 2 line 6: I do not understand the sentence “which indicates an increase in local species richness”. Probably you have to delete it as you have already stated that warming increases species richness RE: In revised text, we have revised this by the suggestion. Page 2 line 6: “other studies” instead of “other study” (you are

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citing two studies at the end of the sentence) Page 2 line 22: please cite the studies you are referring to Page 3 line 2: “.” Instead of “,” RE: In revised text, we have revised this by the suggestion. Page 4 line 22: please check the English of the following sentence because I cannot understand its meaning: “The monthly mean temperature and precipitation, annual average precipitation and annual accumulated temperature of \_0\_C from 1969 to 2005 in this protection area, which showed that annual accumulated temperature for decades is increasing and the regional climate become warmer in this area along the global climate change, which were reviewed in Wu et al. (2009).” Page 5 line 4: please complete the name of all the species you are reporting according to journal style.( i.e.” Kobresia tibetica Maxim.” instead of “Kobresia tibetica”) RE: In revised text, we have revised this by the suggestion. Page 5 line 7: please change the sentence as “A selection of 15 sampling sites with the same Humic alpine soil and similar historical wetland vegetation in alpine area of the Qinghai-Tibetan Plateau was studied in September 2009” RE: In revised text, we have revised this by the suggestion. “Fifteen sampling sites, where had the same alpine meadow soil, which corresponds to typical Cryrendoll according to USDA soil classification” Page 5 line 10-11. If I understood well, you sampled 9 quadrats in total for each plot (3 block x 3 quadrat). If this is the case, why are you calculating standard error in table 1 using 12 quadrats ? Page 5 line 14-15: you previously stated that the three diagonal sampling quadrats per plot in both three blocks of each site were investigated and sampled, why did you sample only five quadrats for each site to estimate biomass ? Page 5 line 22: “from each quadrats” instead of “from each quadrats from every sampling quadrats” Page 5 line 22: what do you mean saying “in both five blocks in a simple random pattern, then fixed them” ? Please check the English Page 7 line 8: please complete species name (see my previous comment) Page 10 line 10: “Many” instead of “Mnay” Page 11 line 13: “– wetland species –” instead of “ – wetland species” RE: In revised text, we have revised this by the suggestion. In this study, we selected three plots (each plot was about 5 × 103 m2) in each selected site and three diagonal sampling quadrats (1 m2) per plot. Night quadrats were investigated and sampled in each studied siteat early Septem-

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ber of 2009, when biomass reaches its highest. We determined the aboveground dry biomass of each quadrat by weighing after drying at 80 °C for 48 h to constant weight. Meanwhile, we collected three soil samples from each soil depths (0-10 and 10-20 cm) by bucket auger (diameter is 5 cm and length is 10 cm) from each quadrats in a simple random pattern, then fixed three soil samples from the same depths in each sampling quadrats. Nine mixed soil samples for each soil depth and each quadrat were used to laboratory analyze. Table 2: please write that you are reporting standard error and report the size of your sample (n) Figure 1: it would be better to regress each variable with soil water content at each depth separately instead of plotting all together. RE: In revised text, we have revised all these specific comments by these suggestions. And the regression of figures 1 were showed by the each variable with soil water content at depth of 0-10 cm and 10-20 cm, separately.

#### Anonymous Referee #2 Comments Response/Actions

I had a great deal of difficulty in reading this manuscript. The authors used long complicated sentences with poor grammar, which made it difficult to understand what they wanted to say. The entire manuscript requires a very thorough editing to correct this problem. RE: For the English writing and grammar errors, we have edited it thoroughly and our colleague Dr. David Warrington have help us to check it.

The objective of the paper is to determine the above and below ground response to soil moisture. The moisture data used to achieve this goal were determined on a weight basis and, as is explained below, this makes the comparisons of their findings unreliable and questionable. I suggest that they redo the analysis using soil moisture content determined on a volume basis. RE: We know that it is more appropriate using soil moisture content determined on a volume basis than on weight basis, however, it is difficult to measure for soil bulk density and volume in local field, especially in this special area, even in nearby county, there is difficult traffic conditions and we must reached some area by ride, and have no many required conditions. So we only sampled and weighted and calculated on a weight basis during the experiment process. So, we have to do the

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analysis by the weight basis. We hope to pay attention to this problem in studies in the future. Specific comments: Page 7144, lines 20-26. This part should be incorporated in the methods section. RE: We have adjusted and revised this part in the revised text. Page 7145, Subtitle 2.1. “Study description” should be changed to “Study area.” RE: We have revised this point by this suggestion in the revised text. Page 7146, line 1. What is Humic alpine (felly soil)? Please give the soil classification in either the WRB or the US Soil Taxonomy. RE: In the revised text, we have revised it and it should be “alpine meadow soil, which corresponds to typical Cryrendoll according to USDA soil classification”. Page 7146, lines 20-21. Soil moisture determined on a weight basis is very misleading. Moisture content on a weight basis for soils with high organic matter and soils with low organic matter are far apart even though these two soils have the same moisture content on a volume basis. RE: On this point, we have explained this in front, because of the experimental process has been determined that. So, we have to do the analysis by the weight basis. We hope to pay attention to this problem in studies in the future. Page 7146, lines 21-23. This sentence ends with “then fixed them.” What does “then fixed them” mean? RE: In revised text, we have revised “them” as “five soil samples from the same quadrats with the same soil depth”. Page 7147, line 2. Omit “in laboratory” at the end of sentence. RE: In revised text, we have deleted “in laboratory” in that sentence. Page 7147, line 7. Omit “properties”. The sentence should read: All vegetation and soil data were expressed: : .. RE: In revised text, we have deleted “properties” in that sentence. Page 7147, lines 9-12. The sentence starting with “Test of between subjects” is not clear. It should be re-written. RE: In revised text, we have re-written this sentence, it was revised into “ A general linear model (GLM) procedure with two-way ANOVA was used to examine the between-subjects effects of studied sites and two soil depths on soil properties. All data were assessed for homogeneity of variance and normality. ” Page 7148, lines 23-28. Comparison of soil moisture values determined on a weight basis for upper and lower layers is very unreliable. For comparison, moisture content determined on a volume basis should be used. RE: On this point, we have explained this in front, because of the experimental process has

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been determined that. So, we have to do the analysis by the weight basis. Page 7148, line 23. What properties of the sample site affect the soil moisture regime? The paper gives no information on soil properties such as texture and organic matter content which also affect soil moisture. RE: On this point, we are sorry for the confusion with this sentence, In the revised version of the manuscript, we revised it as “there were significantly differences among different sampling sites ( $F = 56.57$ ,  $P < 0.001$ ) and between soil depth ( $F = 11.97$ ,  $P < 0.01$ ) for soil moisture”, here, these sampling sites have the same soil type and similar soil texture, so we only to showed their differences.

Page 7148, line 28 to Page 7149, line 1. It would be better to state that the pH, N, C, etc. varied between sample sites, probably as a result of differences in soil properties. The authors, however, presented no data on soil properties. RE: In revised text, we have revised this sentence by this suggestion, and it was written as “Soil pH value ( $F = 20.38$ ,  $P < 0.001$ ), soil organic carbon ( $F = 8.45$ ,  $P < 0.001$ ), total nitrogen ( $F = 6.88$ ,  $P < 0.001$ ), available nitrogen ( $F = 4.38$ ,  $P < 0.01$ ), total phosphorus ( $F = 5.79$ ,  $P < 0.01$ ), available phosphorus ( $F = 5.64$ ,  $P < 0.01$ ), total potassium ( $F = 11.54$ ,  $P < 0.001$ ) and available potassium ( $F = 12.83$ ,  $P < 0.001$ ) varied between sample sites, probably as a result of differences in soil properties.”. Page 7149, line 28. What was the range of slopes (by percent) for these wetlands? This information should be given in the Materials and Methods section. RE: In revised text, we have added this content. “All the samples sites are open flat wetland area, basically there is no slope.” Page 7149, line 26 to Page 7150, line 14 (section 3.3). It is very difficult to read this section since it contains mainly numerical values with very little text. This section should be reorganized to make it easier to read. Perhaps some of the numerical values should be presented in table form. RE: In revised text, we have re-written this section by this suggestion. And it was revised into “Results showed that aboveground biomass were significant positively related to soil organic carbon, total N, P, and available N, P, but negatively related to total K. Vegetation covers and height were also significant positively related to soil organic carbon, total N, P and available N, P, and available K, but negatively related to total K. But, species richness were significant negatively related to soil or-

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ganic carbon, total N, P, and available N, P, but positively related to total K. Meanwhile, species richness showed significantly positive correlations to aboveground biomass, covers and height. Additionally, there are some other positive or negative correlations among aboveground properties or below-ground properties in natural wetland community of studied sites (Table 3).”, because all the numerical values were presented in Table 3. Page 7151, lines 4-7. This is a very complex sentence. I would write it this way: Variations in the average annual precipitation and air temperatures show a decreasing trend in rainfall and an increasing trend in temperature, resulting in increased aridity. RE: In revised text, we have revised this sentence by this suggestion.

Page 7162, Table 2. Since some of the soil moisture contents presented in this table are well above 100% this would indicate that these moisture values were determined on a weight basis. This should be stated in this table. RE: In revised text, we have noted that “these moisture values were determined on a weight basis” in Table 2.

### Anonymous Referee #3 Comments Response/Actions

The authors should be congratulated for picking a very important and endangered ecosystem in China. This region is a focal point for endangered grazing animals and biodiversity. At the moment, though, I can not evince more enthusiasm for this paper given the difficult and distracting writing style. No clear explanation of the "sequence space-series variation" method, or indeed its assumptions, is provided. In the site description, I saw reference to a "felty" soil ("peaty" ?), and am not familiar with this designation. The authors should use a std soil taxonomy, perhaps FAO. Perhaps all further technical comment might be forestalled if I simply point-out this paper's subject matter might be better suited to "Journal of Vegetation Science", or "Arctic, Antarctic and Alpine Research". RE: On the English writing and grammar errors, we have edited it thoroughly and our colleague Dr. David Warrington had helped us to check it. Additionally, on the "sequence space-series variation", it was that we selected some variation gradients by the different space with different soil moisture to reflect the potential variation of soil moisture by time. “We used sequence space-series variation of



soil moisture to reflect potential time-series variation of soil moisture in alpine wetland community, by examining the effects of spatial heterogeneity of soil moisture on wetland community”. It may reflect the potential trend in field, because it need longer time to monitor the potential variation of soil moisture by time. Thirdly, in the revised text, we have revised it and it should be “alpine meadow soil, which corresponds to typical Cryrendoll according to USDA soil classification”.

#### Anonymous Referee #4 Comments Response/Actions

The importance of the research done is not questionable. However, the methodology, the design and the way the result is presented is not sufficient enough to get published at this stage. I suggest the author to address the following issues and re-write the manuscript in a clear way. RE: Regarding the comment on the writing and structure of this paper, we have revised it by the suggestions and comments of this reviewer.

**Abstract** The abstract is well written. Only the last sentence of the abstract needs to be rewritten for more clarity. RE: In revised text, we changed it as “Our observation indicates that decreased soil moisture potentially negatively impact on the alpine plant communities and soil properties.”. **Introduction** In line 24 (the first sentence of the paragraph), there is a term ‘climate warming’ and please change it to ‘global warming’ or use the appropriate term. The unit of temperature is not correctly written in some places (see line 2 of page 7143). Shorten some of the long sentences (one sentence has 6 lines from line 6-13 in page 7143). It would be more appropriate to use the term ‘soil water’ than ‘soil moisture’. RE: In revised text, we have revised them by these suggestions.

**Methodology** It would be good to use a consistent unit system, preferably SI units. The sentence in line 13 on page 7146 seems to have a type about the number of quadrants. Generally this section needs a revision to correct the sentences. The gravimetric analysis of soil water is not described in detail. . . .for example the size of the soil sample (length and diameter). Detail description of the laboratory analysis is missed for most

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of the soil properties. RE: In revised text, we revised some writing and added some details on soil sampling, and laboratory analysis. The units were revised by SI units, the soil sample by the bucket auger (diameter is 5 cm and length is 10 cm), the laboratory analysis were conducted by the methods introduced by the paper Wu et al. (2009), so we do not repeated description them more. Wu, G.L., Du, G.Z., Liu, Z.H. and Thirgood, S.: Effect of fencing and grazing on a Kobresia-dominated meadow in the Qinghai-Tibetan Plateau, *Plant Soil*, 319, 115-126, 2009. Result and Discussion In section 3.2, it is reported that the water content ranges from 17.6 to 103.3%. A volumetric water content cannot be that much high, so it has to be checked or if the unit is different, it has to be clear. It would be better to present water content in  $\text{m}^3 \text{m}^{-3}$  or  $\text{kg kg}^{-1}$  with the bulk density of the soil. I suggest to add the bulk density of the soils. This section is generally hard to follow and needs more work. RE: In revised text, we have revised it as “Soil water content on a weight basis were ranged from 17.6 to 103.3 % in the upper layer (depth of 0-10 cm) and from 113.1 to 16.5 % in the lower layer (depth of 10-20 cm) for fifteen sampling sites.”. Because we only sampled and weighted and calculated on a weight basis during the experiment process, and do not measure soil bulk density, so, we have to do the analysis by the weight basis and describe the results by the data of soil water content on weight. In addition, we have revised the results and discussions sections in revised text.

#### Anonymous Referee #5 Comments Response/Actions

I requested another revision. See below, reviewer’s comment: In their paper ‘Above- and below-ground response to soil moisture change on an alpine wetland ecosystem in the Qinghai-Tibetan Plateau, China’, Wu et al. study vegetation characteristics along gradient of soil moisture in alpine ecosystems. As far as I understand from their paper they measured soil moisture content only once, namely at the occasion of vegetation and soil sampling. I doubt that this approach gives any information on how the factor moisture affects vegetation. First, the authors did not study moisture change but soil moisture at different sites, making it impossible to relate factor and response as many

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other factors such as global radiation, duration of snow coverage, management etc. which drive vegetation community and productivity may vary together with moisture. Second, they measured soil moisture only once. As soil moisture is one of the most variable soil properties reliable information on soil moisture characteristics should provide a high resolution in time with time series of at least 2-3 years and ideally also include soil water retention characteristics. Both information is missing here, minimizing the scientific value of the manuscript. RE: We would like to thank Dr. Donatella Zona for his positive review of this manuscript. We have addressed her specific comment and technical correction. On her perplexity on sampling once, we must declared that it is difficult to sampled in this area and we must pay a high price for sampling and many places were difficult to reach; And, all these sampling sites were natural wetland area and there were scarcely no grazing, meanwhile, all the samples sites are open flat wetland area, basically there is no slope. Thirdly, in this paper, we used sequence space-series variation of soil moisture to reflect potential time-series variation of soil moisture in alpine wetland community, by examining the effects of spatial heterogeneity of soil moisture on wetland community. Meanwhile, we selected a number of plots and quadrats in each sampling sites at the same time, to reflect characteristics of sample sites (three plots (each plot was about  $5 \times 103 \text{ m}^2$ ) in each selected site and three diagonal sampling quadrats ( $1 \text{ m}^2$ ) per plot. Night quadrats were investigated and sampled in each studied site). But we do not to study its long-term variation, because it is difficult to provide a high resolution in time with time series of at least 2-3 years in this special area.

## Anonymous Referee #6 Comments Response/Actions

After reading the reviewers' comment and consultation with the Biogeosciences editor for this Special issue, we decided that unfortunately your manuscript does not mean the minimum quality criteria necessary for publication in Biogeosciences. All the reviewers, even if they recognized the importance of the topic and of the location of your study, had great difficulties in reading the manuscript, and expressed major concerns

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on the analysis performed by the authors (the results were defined as unreliable and questionable). Unfortunately, this could not be addressed in a revision, but only with a new submission of an extensively re-structured manuscript with better data collection. Still, we hope that the reviewers' comment will be helpful to the authors, Best regards, Donatella Zona RE: We agree with suggestions of reviewers on soil water content analysis, it is more appropriate using soil moisture content determined on a volume basis than on weight basis, however, it is difficult to measure for soil bulk density and volume in local field, especially in this special area, even in nearby county, there is difficult traffic conditions and we must reached some area by ride, and have no many required conditions. So we only sampled and weighted and calculated on a weight basis during the experiment process. So, we have to do the analysis by the weight basis. We hope to pay attention to this problem in studies in the future.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/8/C4790/2011/bgd-8-C4790-2011-supplement.pdf>

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