Biogeosciences Discuss., 12, C1235–C1261, 2015
www.biogeosciences-discuss.net/12/C1235/2015/

Biogeosciences
Discussions
Open Access

Interactive comment on "Responses of energy partitioning and surface resistance to drought in a poplar plantation in northern China" *by* M. Kang et al.

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Received and published: 16 April 2015

With our heartful thanks and appreciations, we have carefully read all the insightful reviews and comments by two anonymous reviewers for our paper submitted to your journal. We do think that all those review comments are addressable, therefore, we have revised the whole paper and answered all the questions raised accordingly.

The reply on each of comments is as following: General Comments

In the introduction, write a review of sustainability index for ecosystem (or how to assess sustainability for ecosystem). And, introduce the sustainability index which you will use (or how will you assess the sustainability) in the paper. Reply: Thanks for your

critical comments! To our knowledge, there is no and it is hard to develop a metrics for the sustainability of forest plantation, even though there are a couple of studies defining the sustainability of forest plantation by site and plantation productivity for commercial purpose only (e.g., (Richardson et al., 1999; Watt et al., 2005) other than in a broader sense of the plantation and environment interactions that were our focus in the current paper. However, we do think that the reviewer raised a great question directing our future exploration in semiarid regions in a holistic approach. We, thus, referred only a rather broad term here for sustainability in terms of ecosystem and environment interactions relating to the water availability and supply. For more clarification, we have revised the context in BGD from Page 348, Line 21 to Page349, Line 21 as "Poplars require large quantities of water throughout the growing season, and may experience water limitation even on the mesic sites (Kim et al., 2008; Stanturf and Oosten, 2014). For example, poplar plantations may even cause the transformation of wetlands into dry land due to the water-pumping effect on groundwater (Li et al., 2014; Migliavacca et al., 2009). Thus, poplar plantations, which have higher productivity but also higher water use (Zhou et al., 2013) than other forests, clearly require large quantities of irrigation in water limited areas such as northern China. However, over the past 50 years, northern China has experienced the decline of the water table, land degradation, large increases in surface air temperature and severe droughts (Ding et al., 2007; Qiu et al., 2012; Wang et al., 2008; Zhang et al., 2014), while the wide-spread use of irrigation has been cited as one of possible causes for these impacts. Therefore, studying the drought response of poplars under water shortage is essential for effective management of water resource over this region and avoiding the use of water-intensive species in ecological restoration and reforestation efforts if the environmental resources are not sufficient. Whereas, most of previous and current studies are only concentrated on the water balance of forest ecosystem other than the interactions between forest ecosystem and environment, it is clear that exploring the energy partitioning and ecosystem response to drought is central important for understanding forest water and carbon cycling processes (Guo et al., 2010; Jamiyansharav et al., 2011; Sun et al., 2010; Tak-

agi et al., 2009; Wu et al., 2007), and thus understanding the adaption and long term sustainability of plantation establish in water limited regions."

In the methods, write how the indices (Rs, LE/LEeq, beta and Omega) are related to the ecosystem sustainability, or explain the sustainability index which is introduced in the introduction or the methodology which can assess the sustainability properly in this study case. Reply: Thanks for this suggestion. We have revised the content in Method in BGD Page 356, Line 1-6 as "LE/LEeq characterizes the surface dryness of ecosystem. It, therefore, indicates whether soil water supply for evapotranspiration of an ecosystem is under limitation or not. An LE/LEeq of < 1 represents an ecosystem under water stress and, therefore, experiences reductions in evapotranspiration; whereas LE/LEeq of > 1.26 indicates an ecosystem of unrestricted water supply and only available energy limits evaporation (Arain et al., 2003)". Then, as we have stated in BGD Line 1-6, Page 356, LE/LEeq < 1 indicates that the poplar plantation needs water supply by pumping groundwater to supplement the insufficient precipitation, therefore, we could conclude that growing poplar plantation is not sustainable for the water limited regions.

In the quantification of surface energy balance, the storage term is important, especially for forest ecosystems (e.g., Leuning et al., 2012). Estimate the storage term and add the result. ReplyïijŽYes, the heat storage term is important for studying surface energy balance of forest ecosystem. Therefore, we have revised the content in BGD Page 354, Line 5-6 as "Based on the daytime half-hourly and daytime totals of turbulent energy fluxes, the energy balance ratio (EBR) is calculated as Eq. (3),"Also, we have added the results in BGD Page 358, Line 14 as "Moreover, the average value of daytime total S among four growing seasons were 0.46 MJ m-2, 0.49 MI m-2, 0.51 MJ m-2, 0.54 MJ m-2, respectively. S/Rn varied between 6.0% in 2007 and 6.8% in 2009 and showed no differences between the wet and dry years.", and revised "0.85" to "0.88" and "over 0.95" to "> 0.96" in Page 360 Line 22-23 in BGD and corrected the Figure 3 and Table 2(Page 360 Line 22-23 in BGD), the equation for calculating heat storage and Table 2

can be seen in supplement.

I recommend to analyze four components of radiation (i.e., incoming/outgoing shortwave/ longwave radiation), if the data from CNR1 is available. I think radiative energy balance is very important to assess surface energy balance. The authors only show net radiation (i.e., sum of the four components). The author can find the differences of radiative energy balance between the dry and wet years such that the outgoing longwave radiation is higher in the dry year than that in the wet year. Reply: Yes, this is a great point for in-depth analysis. The current paper focused on the energy balance, surface resistance, coupling of canopy and atmosphere as a whole. We will further conduct the detailed radiative energy balance analysis to explore the responses of poplar plantation under different climate conditions.

The authors have LAI data. I recommend normalizing Rs using LAI (i.e., Rs per unit leaf area). It guarantees to evaluate more clear response of Rs to drought. Reply: Great, the normalized Rs by LAI allows a more straightforward comparison between years. We have revised the context in BGD Line 17-19, Page 359 as "Overall, the seasonal average of LAI-normalized Rs (i.e., Rs:LAI) in 2008 (54.1 s m-1 leaf area)was lowest among four years(i.e., $p < 0.05$). The Rs:LAI in the dry year (106.8 s m-1 leaf area) was 50% higher than in the wet year (71.2 s m-1 leaf area) ($p < 0.001$). The Rs:LAI in the seasonal drought. . ."; Moreover, we also have revised the content in BGD Line 10-13, Page 363 as "Compared with the Rs in other researches, the Rs:LAI in dry years of this poplar plantation was close to that of Euphrates Poplar (Populus euphratica Oliv.) (130.2 s m-1 leaf area) and smaller than that of Gansu Poplar (Populus gansuensis Wang et Yang) (189.4 s m-1 leaf area) in northwest China (Chen et al., 2004), but in wet years it was similar to that of poplar (58.6 s m-1 leaf area)in Iceland (Wilson et al., 2002b) and boreal aspen during the full-leaf period (51.8 s m-1 leaf area)in Canada (Blanken et al., 1997)."

In the discussion, explain which ecosystem is sustainable ecosystem. For example, an ecosystem which water loss equal to water supply is sustainable or an ecosystem

which vegetation can survive in drought is sustainable or an ecosystem which surface resistance is not sensitive to drought is sustainable. And, explain why the authors argue that. Currently, it is hard to know how the authors assess the ecosystem sustainability. I guess the authors may argue that the higher Rs, beta and Omega is the less sustainability. It is hard to be acceptable without additional explanation. Reply: As we have replied in the earlier comments, the broad sense of the sustainability of poplar plantation in water limited region was assessed in terms of plantation and environment interactions relating to water availability and supply. Therefore, thanks for this constructive suggestion. We have added the discussion of sustainability in BGD Line 26, Page 364 as "[4.3 Implication for poplar plantation establishment]To our knowledge, there is no and it is hard to develop a metrics for the sustainability of forest plantation, even though there are a couple of studies defining the sustainability of forest plantation by site and plantation productivity for commercial purpose only (e.g. (Richardson et al., 1999; Watt et al., 2005)) other than in a broader sense of the plantation and environment interactions that were our focus in the current paper. Our previous study indicated that annual water use of the plantation was even higher than the annual precipitation (Zhang et al., 2014) and thus the irrigation was applied in dry years by pumping groundwater (Table 1). Such water abstraction for irrigating plantation and agriculture crops led to the dramatic water table decline in the last 30 years (Zhang et al., 2014). Energy partitioning to latent and sensible heat and surface resistance was dramatically responsive to meteorological drought, and as indicated by low LE/LEeq (< 1) and low values of decoupling coefficient (Ω) (Zhu et al., 2014), the dry climate dominated the poplar plantation no matter in wet or dry years, which led to the shortage of water use in poplar plantation. In other words, the poplar plantation would consume much water which comes from precipitation or groundwater to maintain its ecological services, while the required irrigation for sustaining these forests may present a threat to the adjacent ecosystems because of their role in reducing ground water table, and may compromise long-term sustainability and livelihoods in the region. Therefore, from the viewpoint of hydrologic balance as well as interactions with atmosphere, growing

poplar trees in a water-stressed region is not sustainable."

Everyone knows that Rs, beta and Omega for an ecosystem under water stress is higher than that under normal condition. But, the authors compare Rs, beta and Omega between the study site and the others, without explanation of water stress status of the sites. I recommend to find the reported Rs, beta and Omega for ecosystems in (semi) arid region, and compare those with the indices for the study site. Reply: Thanks for your suggestion, as suggested in general comment 5, we compared the LAI normalized Rs (Rs:LAI) with other studies, can be seen in BGD Line 17-19, Page 359 and Line 10-13, Page 363.

Specific Comments

Line 12, page 350: present –> presented Reply: Thanks for your careful reading. Revised. (see in Line 6, page 5 in Revised MS).

Line 18, page 352: The correction method of Burba et al. (2008) can be applied to the case a sensor LI-7500 is installed perpendicularly. Write how the sensor is installed. Reply: Thanks for this review comment. The sensor Li-7500 was installed towards predominant wind direction (southeast) with a slight tilt (< 20 degree). Therefore, we have revised the statement in BGD Page 351, Line 19- 20 as "The CO2/H2O sensor head was installed towards a predominant wind direction (southeast) with a slightly vertical angle (< 20 degree) and downwind of the sonic anemometer in the predominant wind direction;".

Line 24, page 352: The friction velocity threshold method is also applied to the latent/ sensible heat flux? If not, eliminate the explanation of friction velocity correction for CO2 flux during nighttime. Reply: Thanks for your comments and we are sorry for the confusions. The friction velocity threshold was applied to process the EC data for screening and gap-filling CO2 fluxes and the latent heat fluxes, but not for the sensible heat fluxes.

Line 19-21, page 355: The sentence, “Lower or higher. . .” should move to the next paragraph. Reply: Thanks for your careful reading. We have removed the sentence “Lower or higher values indicate that evaporation rates are lower or higher than the equilibrium rate, respectively (Wilson et al., 2002b).”.

Line 8, page 363: (Noormets et al., 2008) –> (e.g., Noormets et al., 2008) Reply: Corrected.

Figure 2, 3, 4, and 5: Unify the ranges of x axis (DOY). Use running mean average for time series data. After applying running mean, it will be easier to distinguish the differences of seasonalities of time series. Reply: Thanks for your suggestion. We have revised the Figure 2(a-d), 3, 4, 5(a-e) based on the comments;

Author changes in MS, which including all the changes in MS except for reply on referee comments C298,

1. Page 347, in BGD, revised “S. McNulty” to “S. G. McNulty”; and corrected “Eastern Forest Environmental Threat Center” to “Eastern Forest Environmental Threat Assessment Center”;

2. Page 347, Line 1-24 in BGD: the Abstract has been revised as “Poplar (Populus sp.) plantations have been used broadly for combating desertification, urban greening, and paper and wood production in northern China. However, given the high water use by the species and the regional dry climate, the sustainability of these plantations needs to be evaluated. Currently, the understanding of the acclimation of the species to the semiarid environment is limited, impeding assessments of their long-term success and impact on the environment. In this study we examine the variability of bulk resistance parameters and energy partitioning over a four-year period encompassing both dry and wet conditions in a poplar (Populus euramericana CV. “74/76”) plantation located in northern China. The partitioning of available energy to latent heat (LE) decreased from 0.62 to 0.53 under meteorological drought. A concomitant increase in sensible heat (H) resulted in the increase of a Bowen ratio from 0.83 to 1.57.Partial correlation

analysis indicated that surface resistance (Rs) normalized by leaf area index (LAI) (i.e., Rs:LAI) increased by 50% and became the dominant factor controlling the Bowen ratio. Furthermore, Rs was the major factor controlling LE during the growing season, even in wet years, as indicated by the decoupling coefficient (Ω =0.45 and 0.39 in wet and dry years, respectively) and the LE/LEeq ratio ranging from 0.81 and 0.68 in wet and dry years, respectively. In general, the dry climate dominated the poplar plantation ecosystem regardless of soil water availability suggesting that fast-growing and water use-intensive species like poplar plantations are poorly suited for the water limited region. The required irrigation for sustaining these forests also presents a thread to the adjacent ecosystems because of their role in reducing ground water table, and may compromise long-term sustainability and livelihoods in the region.”;

3. Page 348, Line 11-13 in BGD: revised the content as “However, indiscriminate use of the same species beyond its native range and habitats may result in unanticipated consequences. For example, the use of poplars in water limited regions may increase the risk of environmental degradation, soil moisture deficit, hydrologic and vegetation changes”.

4. Page 350 in BGD, Line 8 and 9: change “removed and replanted” to “replaced with new saplings”, and change “given” to “provided”; Line 11-13: change the sentence to “The average leaf area (LAI) of the stand increased over time. During the growing season, shrubs as the understory layer were low at density due to manual removal.”; Line 16-21: change sentences to “The local climate is classified as sub-humid warm temperate zone, with a mean (1990–2009) annual temperature of 11.6°C, and maximum and minimum temperature are 40.6 °C and -27.4 °C, respectively. The annual precipitation ranges from 262 mm to 1058 mm (1952-2000), with an average of 556 mm, of which 60%-70%”; Line 24-26: change “belong to” to “is on”, add “the” before “Yongding River”, remove “with”;

5. Page 351 in BGD, Line 2: change “average annual depth of 16.5 m below ground” to “annual average of 16.5 m below the ground” Line 12 to 13: change “at the 32 m

central instrument tower" to "at a 32 m tower"; Line 16: change "measured using the eddy-covariance" to "calculated based on the eddy-covariance (EC)"; Line 17: correct "eddy-covariance" to "EC"; Line 22 to 24: revise sentences "To sure that . . .in February." to "This was increased to about 18 m before the start of the growing season in 2007, and again to 20 m in February 2009 to ensure that the sensors remained well above the tree canopy"

6. Page 352 in BGD, Line 3: remove "with sampling points"; Line 5: remove "above the ground"; Line 14: revise the sentence to "The raw 10Hz data were processed with an EC Processor,"; Line 15: correct "eddy covariance" to "EC"; Line 17: add "the" before "planar fit method"; Line 22-23: Delete sentence "Data gaps were filled using the MDV (mean diurnal variation) method (Falge et al., 2001).", which duplicated with Page 352, Line 28 in BGD;

7. Page 353 in BGD, Line 3: remove "the"; Line 10: revise "much stonger" to "strong"; Line 13: revise "PAR > 4 umol m-2 s-1, the controlling processes" to "PAR > 4 μmol m-2 s-1. The regulations"; Line 14: correct "and" to ", with", and delete "are"; Line 15: change "reliable than" to "station than those"; Line 22: change ":" to ","

8. Page 354 in BGD, Line 1: revise "As an indicator of water stress, the" to "The"; Line 3: change "the midday" to ". The midday"; Line 6-7: add the equation for calculating the heat storage term as Eq. (4) Line 8: change ":" to ","; Line 9: change "(4)" to "(5)"; Line 14: revise "Ri, the climatological resistance (s m-1) indicates" to "Ri is the climatological resistance (s m-1) indicating"; Line 15: change "in Eq. (5):" to "as," ; Line 16: change "(5)" to "(6)";

9. Page 355 in BGD, Line 4: change ":" to ","; Line 5: change "(6)" to "(7)"; Line 6: revise "transfer and rb" to "transfer, and rb is"; Line 14: change ":" to ","; Line 15: change "(4)" to "(5)"; Line 17: revise "it is calculated as:" to "is dependent only on Rn and temperature. It is calculated as,"; Line 19-21: delete the sentences "The LEeq is dependent only on . . ., respectively (Wilson et al., 2002b)";

10. Page 356 in BGD, Line 1: revise "can denote" to "reflects"; Line 3-7: revise to "An LE/LEeq of < 1 represents an ecosystem under water stress and, therefore, experiences reductions in evapotranspiration; whereas LE/LEeq of > 1.26 indicates an ecosystem of unrestricted water supply and only available energy limits evaporation (Arain et al., 2003). The LE/LEeq is dependent on"; Line 12-13: revise "to compare the environmental factors, the energy fluxes and" to "for quantifying the changes of all biophysical variables, energy fluxes, and"; Line 14: change "different studies" to "the differences of biophysical variables among different studies." Line 15-16: revise "Bowen ratio values with the other two as the control variables" to "Bowen ratios"; Line 21: delete "the"; Line 22-23: revise the sentence "Whereas in 2007 and 2008 rainfall exceeded the 20 year mean by over 100 mm" to "Whereas rainfall exceeded the 20-year mean by over 100 mm in 2007 and 2008."; Line 24: revise "the growing season (i.e., April-October)" to "April-October,";

11. Page 357 in BGD, Line 8: insert "throughout the year" after "distributed"; Line 10: correct "accounted for 57 mm of the total annual precipitation" to "(57 mm)"; Line 11-12: revise "(P > 25 mm d-1) in July also presented a large portion of the total annual sum." To "(i.e., > 25 mm d-1) in July were recorded."; Line 13: correct "and" to "of which"; Line 13-17: revise the sentences ", mostly . . . of the sandy soil" to ". There were several short droughts across the growing season of 2009 (Fig. 2d). Despite the higher-than normal rainfall in the two wet years. there was no flooding or overland runoff."; Line 18: correct "The Ta" to "The growing season Ta", and delete "during growing season"; Line 21: delete "overall"; Line 23: change "reached" to "was"; Line 24: revise "Mean" to "The mean"; Line 27: add "those" behind "than";

12. Page 358 in BGD, Line 1-2: revise the sentence "the VPD of . . . (i.e., p < 0.01)." to "the VPD was the highest in June 2009 (i.e., 2.3 $\pm$ 1.1 kPa, p < 0.05) and the lowest in 2008 (i.e., 1.0 $\pm$ 0.5 kPa, p < 0.01)."; Line 4: change "Seasonal and inter-annual" to "The"; Line 7: delete "at", revise "and" to ", ", and remove "then"; Line 10: revise "On the other hand, even though the" to "The"; Line 11: change "between" to "among"; Line

12: revise “the value of wet years was lower than” to “with a lower value in wet years”; Line 13: change “Also” to “Additionally”; Line 13-14: revise “which ranged from 2.1 (in 2007) to 4.9% (in 2006)” to “which ranged from 2.1 in 2007 to 4.9% in 2006” Line 17: correct “except in August for the year of” to “but August for”; Line 20: add “the” before “four years”; Line 21: add “those” before “in 2006”; Line 22: revise “in the other” to “those in other”; Line 27: correct “during which” to “when”;

13. Page 359 in BGD, Line 1: delete “even”; Line 4-5: revise “(from April to June) and end (from September to October)” to “(April-June) and end (September-October)”; Line 7: revise “DOY 180 to 250” to “DOY 180-250”, and change “DOY 180 to 290” to “DOY 180-290”; Line 8: change “wet year” to “the wet year”; Line 11-12: revise “The Bowen ratio . . . in 2008” to “The Bowen ratio was smaller than 1 during drought stressed periods in 2008”; Line 16: change “(DOY: from 190 to 250)” to “(DOY 190-250)”; Line 20: correct “in the no stressed” to “those in unstressed”; Line 21: add “a” before “significantly”; Line 22: change “wet year” to “wet years”; Line 23: revise “July and August, before” to “July/August before”; Line 24: insert “a” before “mean value”; Line 26: change “between” to “among the”, and revise “depicts” to “presents”;

14. Page 360 in BGD, Line 3: correct “during” to “that of”, and change “than in dry year” to “than that in dry years”; Line 6: revise the sentence to “The changes of LE/LEeq value varied between 0.4 and 1.0”; Line 7: change “of four years” to “of the four years”; Line 10: correct “was” to “were”; Line 11: revise “was observed” to “existed”; Line 14: change “the studied years were” to “the four years was”; Line 16: revise “than in dry year” to “than that in dry year”; correct “non-stressed” to “unstressed”; Line 18: change “show” to “was”; Line 21: change “one” to “a”, and correct “eddy covariance” to “EC techniques”; Line 22-24: change “0.85” to “0.88”; correct “over 0.95” to “> 0.96”; change “daily” to “daytime”, and correct “value” to “values” ; Line 26: change “with 50 site-year” to “with the 50 site-year”;

15. Page 361 in BGD, Line 1-2: delete the sentence “It should be . . . additional measurements.”; Line 4: correct “between” to “among the”; Line 5-6: revise the sentence

“At our site. . .energy balance closure” to “In addition to the known reasons for decreasing energy balance closure”; Line 7-8: revise the sentence “management operations . . . partial felling,” to “management operations at our site (e.g., irrigation, tilling and partial felling)”; Line 10-11: delete the sentence “to the extent that . . . turbulent flux data,” Line 16: delete “and”; Line 19: revise “even at specific forest site” to “by even at any site”; Line 21: revise “was” to “were”; Line 23-25: correct “avaiability” to “availability”; change “timescale” to “scale”, correct “was” to “appeared”, correct “precipitation amount of growing season” to “growing season precipitation”; Line 28-29 in BGD: revised the sentence “β during the most of growing season in 2008 and non-stressed periods in other 3 years varied from 0.18 to 0.71, with a mean of 0.35 $\pm$ 0.15,” as “β varied from 0.18 to 0.71, with a mean of 0.35 $\pm$ 0.15 during the most of growing season in 2008 and non-stressed periods in other 3 years,”;

16. Page 362 in BGD, Line 1-2: correct “in a deciduous forest” to “for a deciduous forest”, change “. Similar to” to “, similar to”; and delete “of Bowen ratio”; Line 3: correct “in a deciduous” to “a deciduous”; Line 7, 9: change “Loblolly” to “loblolly”, and change “resulted” to “might be resulted”; Line 21: change “dependent on” to “dependent of”; Line 25: correct “exchange of ecosystem” to “exchange of an ecosystem”;

17. Page 363 in BGD, Line 3-5: correct the sentence “similar to Kutsch et al. (2008), Rs varied seasonally with plant phenology, and showed similar seasonal characteristics with the other deciduous forests during the course of the growing season (Cabral et al., 2010; Li et al., 2012)” to “similar to Rs varied seasonally with plant phenology, and showed similar seasonal characteristics with the other deciduous forests during the course of the growing season (Cabral et al., 2010; Kutsch et al. 2008; Li et al., 2012)”; Line 6-7: revise “were much higher than in” to “was much higher than that in”; Line 19-20: revise “impacted” to “also influenced”; and change “(soil evaporation, canopy structure and turbulence)” to “(e.g., soil evaporation, canopy structure and turbulence)”; Line 22: change “over 50%” to “$\sim$ 50%”; Line 23: change “for a vineyard” to “in a vineyard”; change “due to” to “likely due to”; Line 25: revise “timescale” to “scale”;

18. Page 364 in BGD, Line 1: revise “not” to “not be”; Line 2: change “(such as. . .)” to “(e.g.,...)”; Line 3: change “factors” to “roles”, and revise “were” to “was”’ Line 4: correct “than in wet years” to “than that in wet years”; Line 5: revise the sentence “but no impact . . . in earlier studies.” to “but not in dry years.”; Line 6: change “in this site, similar to” to “at our site, which is”; Line 8: delete the sentence “which ranged from 0.58 to 1.06”; Line 9: change “(ranging from 0.39 to 0.46)” to “(0.39-0.46)”; Line 15: delete “universal”; Line 20: revise “coefficient” to “coefficients”;

19. Page 365 in BGD, Line 24: insert text “First author also thanks the scholarship support by Beijing Municipality Educational Committee under the graduate student training program.”

20. Page 376 in BGD: revised Table 2. (see in supplyment)

21. Page 380 in BGD: revise the Figure 2, revise the caption to “Figure 2. The seasonal variation of environmental conditions during 2006–2009, (a–d): the relative extractable water (REW) (drought periods longer than 20 days are shaded), daily sum of precipitation (P); (e-h): daytime mean air temperature (Ta), daytime mean air vapor deficit (VPD)”;

22. Page 381 in BGD: revise the Figure 3, and correct the caption to “Figure 3. Seasonal patterns of daytime energy components (5-day running average) during the growing season from 2006 to 2009, including net radiation (Rn), latent heat (LE), sensible heat (H) and soil heat flux (G) and heat storage term (S).”;

23. Page 382 in BGD: revise the Figure 4, and correct the caption to “Figure 4. Seasonal and inter-annual variability of the midday mean Bowen ratio (β) (5-day running average) across the growing season, with detailed β between DOY 185 and 255 representing in small pane; Midday means the time course from 10:00 am to 15:00 pm at local standard time”;

24. Page 383 in BGD: revise the Figure 5, and correct the caption to “Figure 5. Sea-

sonal dynamics of the midday mean surface resistance (Rs), climatological resistance (Ri), aerodynamic resistance (Ra), LE/LEeq and decoupling coefficient (Ω) (5-day running average) across the growing season from 2006 to 2009. Midday means the time course from 10:00 a.m. to 15:00 p.m. LST.”

25. Page 387 in BGD: revise the Figure 9, and correct the caption to “Figure 9. Seasonal variations of monthly average LAI and Rs during the growing season in wet year 2007 and 2008.” Reference: Chen, R., Kang, E., Zhang, Z., Zhao, W., Song, K., Zhang, J., and Lan, Y.: Estimation of tree transpiration and response of tree conductance to meteorological variables in desert-oasis system of Northwest China, Science in China Series D: Earth Sciences, 47, 9-20, 2004. China, S. A. o. t. P. s. R. o.: Classification of meteorological drought. In: National Standard of People’s Republic of China GB/T 20481-2006, China Standard Press, Beijing, 2006. Ding, Y. H., Ren, G. Y., Zhao, Z. C., Xu, Y., Luo, Y., Li, Q. P., and Zhang, J.: Detection, causes and projection of climate change over China: An overview of recent progress, Adv Atmos Sci, 24, 954-971, 2007. Guo, H. Q., Zhao, B., Chen, J. Q., Yan, Y. E., Li, B., and Chen, J. K.: Seasonal Changes of Energy Fluxes in an Estuarine Wetland of Shanghai, China, Chinese Geogr Sci, 20, 23-29, 2010. Jamiyansharav, K., Ojima, D., Pielke, R. A., Parton, W., Morgan, J., Beltrán-Przekurat, A., LeCain, D., and Smith, D.: Seasonal and interannual variability in surface energy partitioning and vegetation cover with grazing at shortgrass steppe, J Arid Environ, 75, 360-370, 2011. Kim, H.-S., Oren, R., and Hinckley, T. M.: Actual and potential transpiration and carbon assimilation in an irrigated poplar plantation, Tree Physiol, 28, 559-577, 2008. Li, Y., Qin, H., Xie, Y., Wang, W., Chen, X., and Zhang, C.: Physiological mechanism for the reduction in soil water in poplar (Populus deltoides) plantations in Dongting Lake wetlands, Wetl Ecol Manag, 22, 25-33, 2014. Migliavacca, M., Meroni, M., Manca, G., Matteucci, G., Montagnani, L., Grassi, G., Zenone, T., Teobaldelli, M., Goded, I., Colombo, R., and Seufert, G.: Seasonal and interannual patterns of carbon and water fluxes of a poplar plantation under peculiar eco-climatic conditions, Agr Forest Meteorol, 149, 1460-1476, 2009. Qiu, G., Yin, J., and Geng, S.: Impact of Climate

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Interactive comment on Biogeosciences Discuss., 12, 345, 2015.

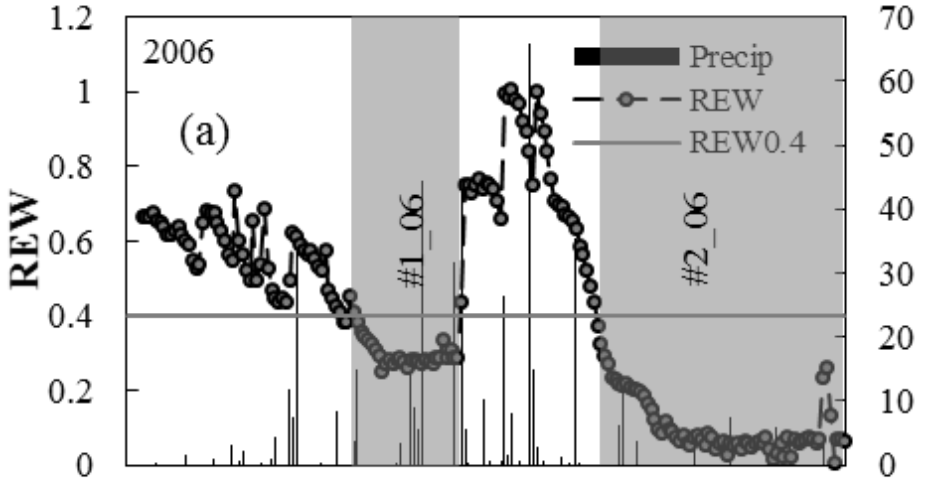


Fig. 1. figure 2a

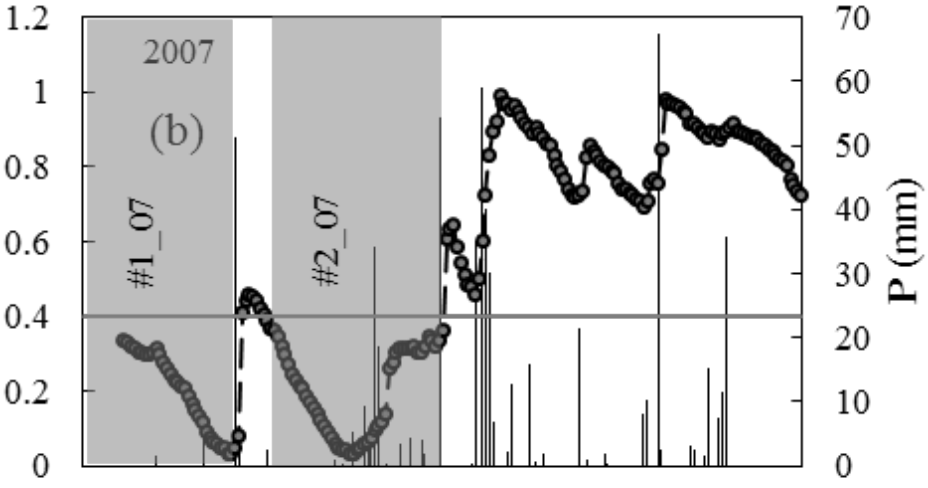


Fig. 2. figure 2b

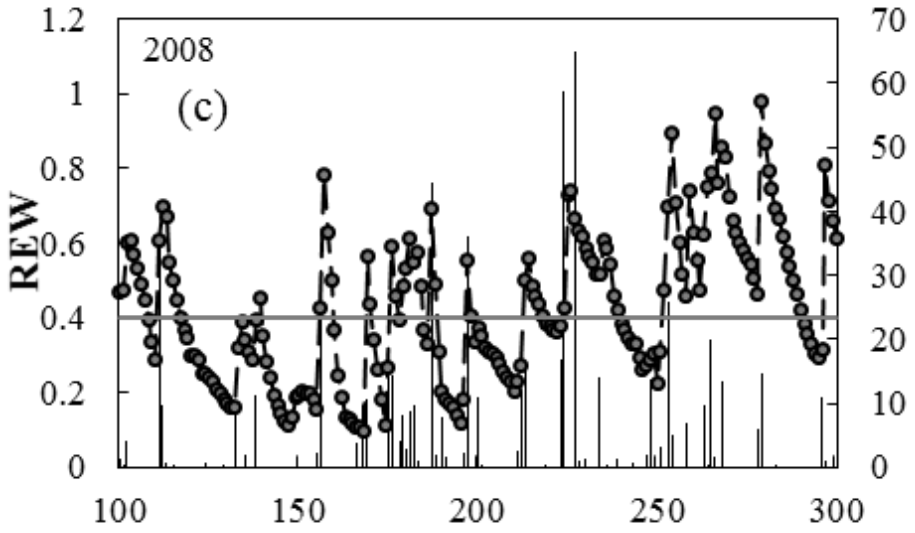


Fig. 3. figure 2c

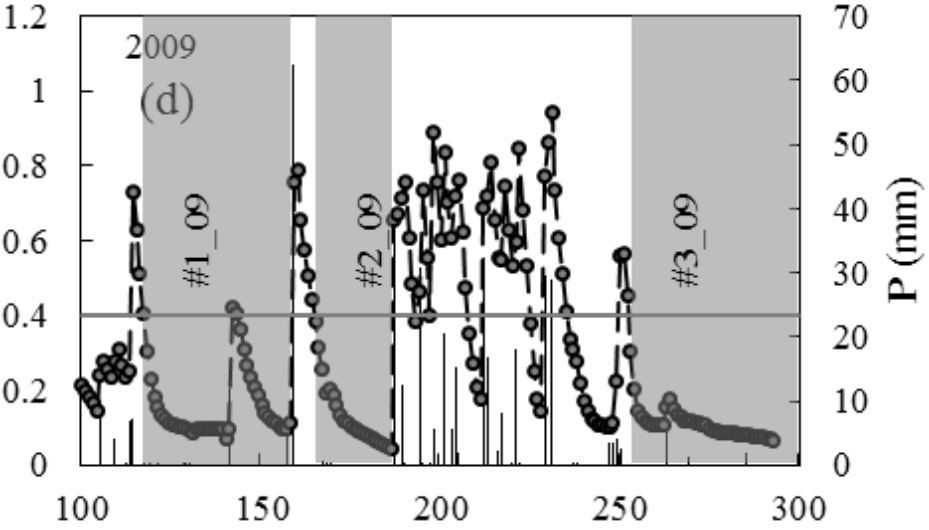


Fig. 4. figure 2d

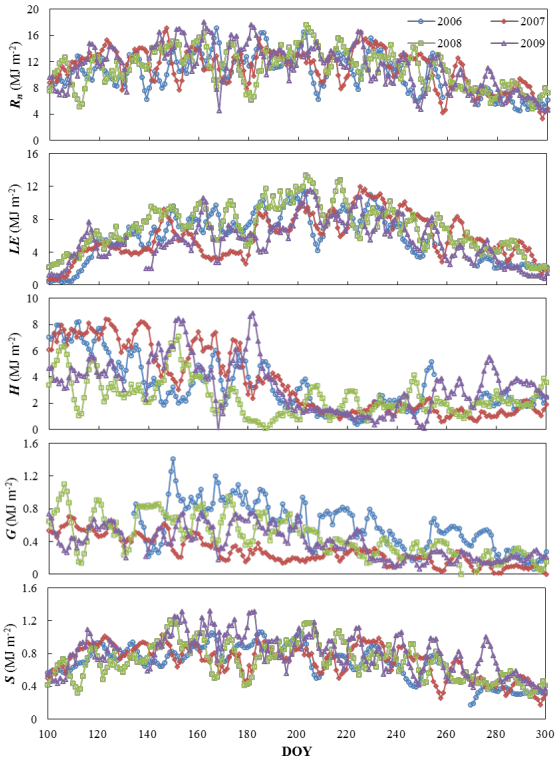
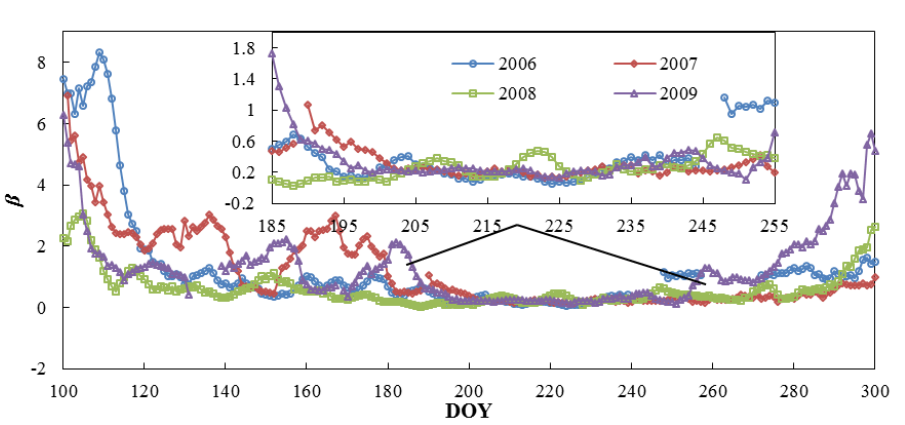


Fig. 5. figure 3



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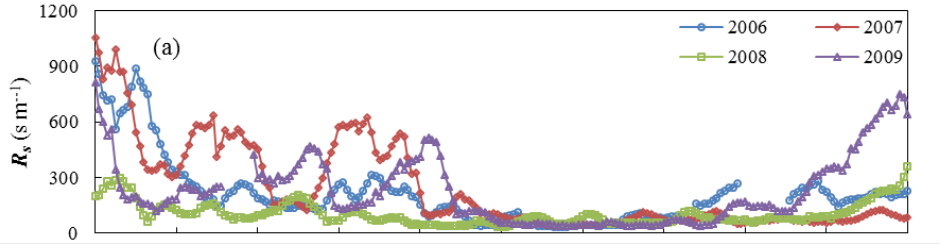


Fig. 7. figure 5a

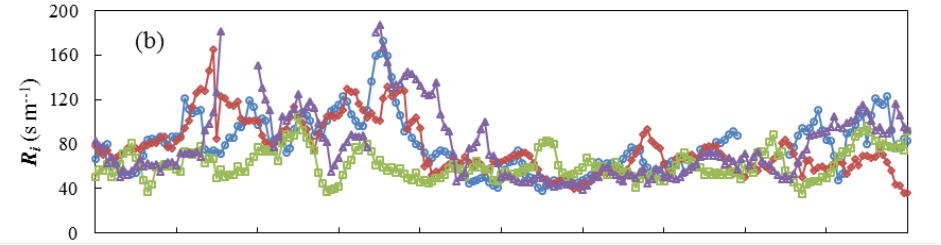
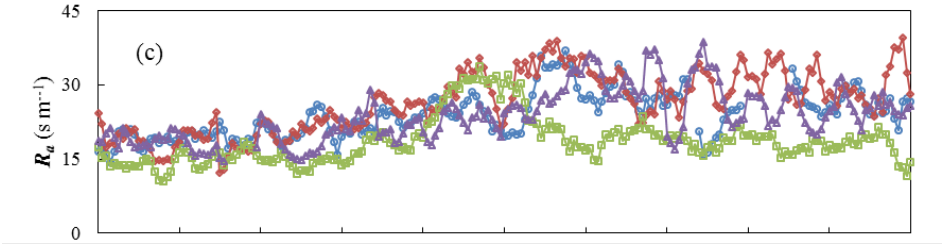


Fig. 8. figure 5b



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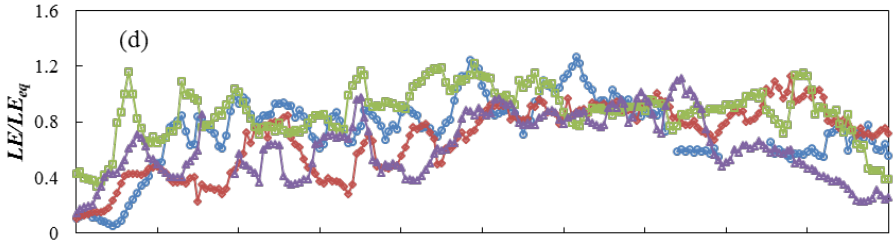

Fig. 10. figure 5d

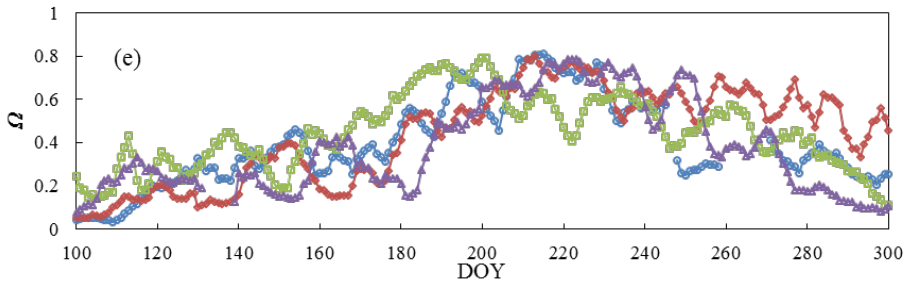

Fig. 11. figure 5e