Referee 1 's Comments:

1. **The English language of this manuscript is at times difficult to follow and contains errors. I recommend the text to be corrected by a native English speaker. Also some carelessness has occurred and several papers are missing from the reference list.**

Reply: This paper has been corrected by a native English speaker, and has been improved in English. The errors in the paper have been corrected and the missing papers in the reference list are added.

2. **I hope that the effect of relative humidity to the gas exchange would also be discussed and the relevance of this tree in ecosystem studies to be more high-lighted.**

Reply: According to the referee's suggestions, the relationship between relative humidity and photosynthesis rate has been further discussed. 'Fig.4c shows the diurnal change in relative humidity (h) at the leaf surface. The h value decreased slowly from 43.6% at 8:00 to 18.83% at 11:00 and leached a plateau about 14.3% from 12:00 to 14:00. After that the h value slowly increased from 19.61% to 21.03% from 15:00 to 16:00. Analysis of the response of the rate of photosynthesis rate (A, μmol m-2 s-1) to relative humidity (h, %) for leaves at the field site showed that there was positive relationship between A and h (Fig.4d).' The tree in ecosystem studies is more high-lighted: *Populus euphratica Oliv*. is the dominant native woody species in the reserve, whose average age is 25 years, and their growth status is good. The stem density is 500 plants ha^{-1}. Mean tree height is about 10m and men breast-height diameter is about 12 cm. The understory includes the species *Tamarix ramosissima* and *Sophora alopecuroides* L., the former is an invasive xerophytic woody shrub species, which can form monospecific stands at a maximum height varying between 2 and 3 m; the latter is a perennial legume drought-resistant forage species infested to the reserve, commonly, 30-60 cm in height.

Specific comments

3. **Abstract: It would be clearer to have the definition for Vcmax etc behind each symbol in parenthesis, instead of a list of the definition in parenthesis.**

Reply: According to the reviewer's suggestions, we have changed the sentences of 'The photosynthesis parameters, Vcmax, Jmax, TPU, and Rd (maximum carboxylation rate allowed by ribulose 1 · 5 – bisphosphate carboxylase / oxygenase (Rubisco), rate of phosynthetic electron transport, triose phosphate use, and day respiration) at the measurement temperature were determined by using the genetic algorithm (GA) method based on A/C_i datasets.' in lines 5-9 has been changed as 'The photosynthesis parameters [including maximum carboxylation rate allowed by ribulose 1 · 5 – bisphosphate carboxylase / oxygenase (Rubisco) carboxylation rate (V_{cmax}), potential light-saturated electron transport rate (J_{max}), triose phosphate utilization (TPU) and day respiration (R_d)] were determined by using the genetic algorithm (GA) method based on A/C_i datasets.'

4. **Abstract: You could include the obtained parameter values of Vcmax and Jmax in the abstract, since they are highly interesting to the readers.**

Reply: According to the reviewer's suggestion, the parameter values of V_{cmax} and J_{max} is added in Line 10 page 6504 after the sentence 'The stomatal conductance sub-model was calibrated independently'. **Values of V_{cmax} and J_{max} standardized at 25 °C were 75.09 ± 1.36 (mean ± standard error), and 117.27 ± 2.47, respectively.**

5. **6504, line 23: The Ball *et al*. model is empirical, like said on page 6518, but this sentence gives the impression that it is mechanistic. Please rephrase. Maybe also the English name of *P. euphratica* could be mentioned some where.**

Reply: Yes, the Ball et al. model is empirical and this sentence gives the impression that it is mechanistic. We rephrase this sentence. The sentences 'A major advantage of using the combined models with this frame work is that it is mechanistic and, therefore, capable of describing the CO2 and H2O gas exchange processes that might not be well described by simple empirical approaches. The disadvantage is that it requires extensive calibration of a number of parameters (Cannell and

Thornley, 1998). As for data, they are still insufficient and further studies of the variations in the parameters of both the photosynthesis and stomatal conductance models for various materials and environmental conditions are still needed, especially for the forest tree species in spite of the insignificance for gas exchange estimation at the land surface(Kosugi et al., 2003).' are changed as 'Although combined models with this framework have become an important tool for understanding the CO_2 and H_2O gas exchange at both the leaf and canopy scales, the parameterization of these models is still insufficient and further studies of the variations in the parameters of both the photosynthesis and stomatal conductance models for various materials and environmental conditions are still needed, especially for the desert forest tree species such as *P. euphratica* in spite of the insignificance for gas exchange estimation at the land surface (Kosugi *et al*., 2003).'

6. **p. 6506, line 29: I don't understand, what 'in suit' means in this sentence. .Should it be 'in situ'?**

Reply: Yes, the word 'suit' should be changed as 'situ'.

7. **p. 6507, line 3: Does the word 'implementation' refer to the model implementation? Please specify.**

Reply: Yes, the word 'implementation' refers to the model implementation. Here, the sentence has been changed to '**some details of the model implementation were provided.**'

8. **p. 6507, line 20: Here Rd is define as mitochondrial respiration. In abstract you mention Rd to be day respiration. May be you could define 'day respiration' here explicitly.**

Reply: According to referee's suggestion, the sentence 'R_d is the rate of mitochondrial respiration' in Line 20 is changed as 'R_d is the day (non-photorespiratory) respiration rate'.

9. **p. 6508, line1: I consider V_{cmax} to represent Rubisco carboxylation, not 'activity' as mentioned here. Also photorespiration is Rubisco 'activity'.**

Reply: Yes. The sentence in Line 1 page 6508 has been changed to '**V_{cmax} is the maximum rate of carboxylation**'.

10. **p. 6508, line 2: You could also mention in parenthesis that the O_2 concentration is considered to remain constant.**

Reply: According to the referee's suggestion, the sentence in Line 2 page 6508 has been changed to **'and O_2 (which is considered to remain 21 kPa)'.**

11. **p. 6508, line 18: Maybe you could describe how you get value for alfa from quantum yield and leaf absorptance.**

Reply: According to the referee's suggestion, we rewrite the Equation 4 is rewritten as:

$$\theta J^2 - [J_{\max} + \frac{\varepsilon(1-f)}{2}Q]J + J_{\max}\frac{\varepsilon(1-f)}{2}Q = 0$$

where $J_{\max}$ is the potential rate of electron transport, θ (0.90) is the curvature of the light response curve (Evans, 1989), ε (0.86) is the leaf absorbance of Q (von Caemmerer, 2000), f (0.3) is the fraction of photosynthetically active radiation (εQ) loss (Evans, 1987).

12. **p. 6508. line20: Where did you get the value for theta?**

Reply: We have added the reference where we got the value of theta, Evans, 1989.

13. **p. 6509: What are the references for these two different exponential temperature dependences? It should also be mentioned have they differ (..the other one is Arrhenius type and the other one has an optimum temperature..) and which response was used to each variable. From Table 1 I understand that only TPU uses eq.(7), but this should be clearly told and you could mention also that for Vcmax you tried both of them.**

Reply: According to the referee's suggestion, sentences between Lines 9 and 19 were rewritten.

The dependence of reaction rates on temperature is described by either exponential or peaked exponential functions. The equations used here can be found in Harley et al. (1992):

$$Parameter = e^{(c-\frac{\Delta Ha}{R \cdot T_k})} \quad (6)$$

or

$$Parameter = \frac{e^{(c-\frac{\Delta Ha}{R \cdot T_k})}}{1+e^{(\frac{\Delta S \cdot T_k - \Delta H_d}{R \cdot T_k})}} \quad (7)$$

where c is a scaling constant, ΔH_a is an enthalpy of activation, ΔH_d is enthalpy of deactivation, ΔS is the entropy, T_k denotes leaf temperature in K and R is the universal gas constant (8.314 J mol^{-1} K^{-1}). The scaling constant for the equations used to adjust the parameters is chosen to cause the results to be 1 at 25ºC and the calculated value at other temperature can be used to scale the parameter to 25ºC. Eqn. 7 is essentially the exponential equation (Eqn. 6) modified by a term that describes how conformational changes in the enzyme at higher temperature start to negate the on-going benefits that would otherwise come from further increasing temperature. The exponential function is used for the temperature dependences of parameters K_c, K_o, Γ^*, $Jmax$, V_{cmax} and R_d, and the peaked exponential function is used for the temperature dependence of g_m. The values used in this paper are presented in Table 1.

14. p. 6509, line 29: g_scmin should be g_swmin.
Reply: Yes, thanks. The word 'g_{scmin}' in Line 29 Page 6509 has been changed to 'g_{swmin}'

15. p. 6510, line 18-19: References to wrong equations. Should be to Eqs.8 and 9.
Reply: Yes, thanks. Eqn.11 in Line 18 Page 6510 should be changed as Eqn. 8, and Eqn.10 should be changed as Eqn.9.

16. p. 6511, line 5:Maybe you could mention when is the growing season.
Reply: According to the referee's suggestion, the growing season is mentioned in Line 5 Page 6511. The sentence '84% of which occurs during the growing season' is changed as '84% of which occurs during the growing season (May-September)'

17. p. 6513, line 2: Theta has been used earlier in eq. 4. You should use another symbol here.
Reply: Yes, theta has been used in Eqn.4. In our revised paper, theta has been changed as beta.

18. p. 6513, line 4: You should define X already here, because it is used here, not after eq.11 like it is done now.

Reply: Yes, we have defined X in Line 4.

19. **p. 6513, eq. 11: What is 'w' in the equation?**

Reply: w is the weighting factor for the *j*th estimated outputs. We have defined it in our revised paper.

20. **p. 6515, line 5: Please provide units for g_swmin.**

Reply: The unit for g_{swmin} is same as g_{sw} (mol m^{-2} s^{-1}) which is added in Line 5 Page 6515.

21. **p. 6516, line 7: It seems to me that this would be wrong number mentioned here.**

Reply: Yes, the number of 820 in Line 7 Page 6516 should be changed as 621.

22. **p. 6516, line 18: You state here, that the model overestimates transpiration. To me it seems that Fig. 6b has 3 points overestimated and 6 points underestimated.. In addition you state on line 21 that water loss was underestimated. There is some discrepancy in these statements.**

Reply: Yes, the word 'overestimates' is wrong, and it should be changed as 'underestimates'.

23. **p. 6516, line 24: Here it says that the model generally captures diurnal patterns of CO2 and H2O exchange resulting from variation in temperature and irradiation. I miss here some further evidence, even though the responses for temperature and irradiation have been shown in previous figure. Could you add environmental variables (irradiation, temperature and relative humidity) to Fig 6? I also wonder why you don't talk about the role of air humidity on the leaves. If the studied tree lives in arid areas and is resistant to drought, it would be good to bring also this aspect forward.**

Reply: According to the referee's suggestions, we add environmental variables in Fig.4c. Also Fig.4d is added to analysis the relationship between relative humidity and photosynthesis rate. 'Fig.4c shows the diurnal change in relative humidity (h) at the leaf surface. The h value decreased slowly from 43.6% at 8:00 to 18.83% at 11:00 and leached a plateau about 14.3% from 12:00 to 14:00. After that the h value slowly increased from 19.61% to 21.03% from 15:00 to 16:00. Analysis of the response of the rate of photosynthesis rate (A, μmol m-2 s-1) to relative humidity (h, %) for leaves at the field site showed that there was positive relationship between A and h (Fig.4d).'

24. **p. 6517, line 2: Was it referenced somewhere that GA method outperforms simultaneous estimates or how is this statement argued?**

Reply: The simultaneous estimates means that all parameters associated in the FvCB model can be estimated at one time. We know traditionally that the A/Ci curve fitting method need arbitrary identification of the transition points between Rubisco- and RuBP-limitition of photosynthesis. The sentence in Line 2 is changed as 'The major advantage of the proposed method is its global nature, and its ability to outperform simultaneous estimates of the photosynthetic parameters (e.g. V_{cmax}, J_{max}, TPU and Rd).'

25. **p. 6517, firs paragraph: I find this paragraph difficult to follow. From line 6 I would understand that it's good to have wide bounds but next it is said that they results in biologically implausible results. Please clarify this text.**

Reply: According to the referee's suggestions, the sentences form Line 6 in paragraph 1 is changed as: Wide parameter searching bounds for the GA may result in parameters drifting into nonsensical ranges. For example, in very rare circumstances, data include samples of two segments (A_c and A_j), but wide bounds may result in an A/C_i set for which one of the two functions (e.g. A_j) happens to provide a better fit than two functions combined, despite the underlying presence of two phases (Su et al., 2009).

26. **p. 6518, line 10: I found it difficult to follow how you found the minimum and maximum parameter limits for Vcmax and Jmax. Can you please be a little bit more specific when**

you deduce these values from the analysis above?

Reply: The minimum and maximum psrameter limits for Vcmax and Jmax are identified according to that given by Su *et al*. (2009). Details can be referred to this paper.

27. **p. 6519, line 18: It is stated here that the photosynthesis is commonly Rubisco-limited. Could you provide some more justification for this argument? E.g. , according to the model the photosynthesis is limited by Aj at all the light levels at 20 C (Fig5d).**

Reply: Under natural condition, the temperature and irradiation mainly varied from 26.6 to 42.4^{o}C and from 1213 to 1755 mol m^{-2} s^{-1} in this study, respectively. Form Fig.5d, we can see that under such condition photosynthesis is commonly limited by Rubisco process.

28. **p. 6520, section 4.3: You discuss the value of m in detail but say nothing about the value obtained for g_swmin. The value you obtain for g_swmin from fit is negative and therefore I would consider it actually to be unrealistic. It's any how close to zero. You should mention its negative value in this section and discuss it.**

Reply: According to the referee's suggestion, we mentioned and discussed the value for g_{swmin} in this section. The discussion about g_{swmin} is added after the sentence 'This value is in the range of values for C3 tree species listed in Table 3'. Parameter g_{wmin}, the minimum stomatal conductance to H_2O when A=0 at the light compensation point, should be non-negative in the sense of biological realities. Although g_{wmin} is negative in our study, it was noticed that it is relative low (-0.0091 mol m^{-2} s^{-1}) and has small effect on the estimated g_{sw}. Thus, we thought it is acceptable to use the negative g_{swmin} value to predict the values of g_{sw} in the coupled models.

29. **Reference list: Sharkey et al. and Wullschleger are missing from the References. As well as Bernacchi et al. 2001, 2002 and 2003.**

Reply: The missing references of Sharkey et al., Wullschleger, and Bernacchi et al. 2001, 2002 and 2003 are added.

Sharkey, T.D., Bernacchi, A.J., Farquhar, G.D., Singsaas, E.L: Fitting photosynthetic carbon dioxide response curves for C_3 leaves, Plant, cell and Environment, 30, 1035-1040, 2007.

Wullschleger, S.D.: Biochemical limitations to carbon assimilation in C_3 Plants – A retrospective analysis of the A/C_i curves from 109 species, Journal of Experimental Botany, 44, 907–920,1993.

Bernacchi, C.J., Singsaas, E.L., Pimentel, C., Portis, A.R., Long, S.P.: Improved temperature response functions for models of Rubisco-limited photosynthesis, Plant, Cell and Environment, 24, 253–259, 2001.

Bernacchi, C.J., Portis, A.R., Nakano, H., von Caemmerer, S., Long, S. P.: Temperature response of mesophyll conductance. Implications for the determination of Rubisco enzyme kinetics and for limitations to photosynthesis *in vivo*, Plant, Cell and Environment, 130, 1–7, 2002.

Bernacchi, C.J., Pimentel, C., Long, S.P.: In vivo temperature response functions of parametersre quired to model RuBP-limited photosynthesis, Plant, Cell and Environment, 26, 1419–1430, 2003.

30. **Figs 3, 5 and 7: Using both green and red in same plot makes the figure impossible to read for a color blind. I would change the colors by taking this point into consideration. In addition yellow line in Fig3a is not very clear. Maybe that could be replaced by a darker color.**

Reply: According to the referee's suggestions, the colors of the figures 3, 5 and 7 have been changed.

31. **Title: Should 'coupling' be 'coupled'? Same to Fig2.**

Reply: Yes, the word in 'coupling' in the title is changed as 'coupled'.