**Biogeosciences
Discussions**

Interactive comment on "Partitioning of catchment water budget and its implications for ecosystem carbon exchange" *by* D. Lee et al.

Anonymous Referee #2

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Advanced interpretation of land surface carbon exchange in spatial and temporal aspects as well as in bio-geophysical processes is indispensable to improve the accuracy and reliability of climate change prediction. This study by Lee and colleagues focuses on carbon budget in catchment- and decade-scale which not only induce scientific interests but also give important insight in making climate change policies because both drivers of human activities on terrestrial carbon budget and impacts of climate change on human society are most significant in inhabitable catchments. Moreover, the temporal scale of decades is consistent to that of political targets against the climate change. Even with its ambitious objective to relate transpiration and carbon balance in the catchment scale, this paper has some fundamental issues and unclearness.

1. The authors estimated catchment evapotranspiration ET by subtracting river dis-

charge Q from precipitation P first followed by partitioning ET into transpiration T and interception E_I, where Q is determined by a regression analysis to P. However this calculation sequence is wrong ordered. Interception by vegetation is actually the first process of precipitation partitioning occurs above ground before decomposition of Q and T in underground processes. Therefore, E_I should be subtracted from P to make net precipitation $P - E_I$ prior, and consequently Q should be estimated by a regression to $P - E_I$. You may think this difference of sequence being trivial but you should be aware that a regression between Q and P already implies the dependence of E_I (as a constituent of ET) on precipitation amount or intensity that you predicted afterward.

2. Monthly precipitation interception was estimated by using Eq. (4) after Groen and Savenije (2006) which calculates the ratio of interception to gross precipitation employing two parameters D and β. β is well defined as "amount of rainfall on a rainy day (mm d^{-1})" and was well determined from long term meteorological record by applying statistical analysis. In the other hand, both definition and determination method of D "the daily interception threshold (mm d^{-1})" by "correlation between rainfall and throughfall+stemflow" are unclear and should be described in detail. Also observation method and results of interception reported by Kim *et al.* (2005) should be discussed because the article is not easily accessible. D seems to be rather a stochastic parameter than a deterministic one such as "canopy storage capacity" often used in physical canopy water balance models of precipitation interception. It is preferable to refer literatures discussing the parameters and accuracy of similar models if exist.

3. Estimated annual water balance of Q, ET, E_I and T in Han River basin was shown in Table 1 over a long period between 1966 and 2007 and it, as already mentioned above, fundamentally depended on a regression between Q and ET defined by observations in relatively short period between 1966 and 1979 with missing 3 years. A simple question is if the catchment characteristics affect-

ing precipitation partitioning have not changed over the full evaluation period. Present land use of Han River basin was briefly described but its temporal change possibly induced by urban and cropland development during the study period was not shown in the paper. Deforestation and reforestation were active after big wars in last Century commonly in Asian countries and probably also in Korea. These changes in land use, forest cover and/or biomass must modify interception, drainage to river and transpiration. Probable variations or reliability ranges of the estimats should be predicted and discussed.

4. A limited information was shown on the biometric NPP evaluation method and its data source (Kim, 2006) is also not easily accessible, which is, inferred from its title, based on tree ring analysis. Inter-annual change of NPP over a few decades depends not only on climatic condition or water stress change but also on stand growth. Tree ring growth is potentially able to reflect the components of NPP including woody biomass growth, litter production and stem density decrease however the relationships are changeable in different growing stages. From the reverse sight, sensitivity of NPP to tree ring growth must be variable by the growing stages. I wonder if you could successfully reproduce the growth dependent NPP change by using tree ring analysis.