

Interactive comment on “Rainfall pattern greatly affects water use by Mongolian Scots pine on a sandy soil, in a semi-arid climate” by Hongzhong Dang et al.

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General comments: Drought is the key limiting factor on afforestation in the arid and semiarid areas, also is the main reason for degradation of the artificial forests. The study presented a theme of great interest: the response of sap flux density of Mongolian Scots pine (*Pinus sylvestris* var. *mongolica*) to increasing levels of drought from wet to moderate-drought, severe-drought and extreme-drought, as well as its relationship with variable precipitation, soil moisture and groundwater table. It is very useful with regard to explaining the degradation of Mongolian Scots pine forests, and guiding afforestation and management of Mongolian Scots pine forests. The MS is suitable to publication in this journal. However, some small problems need to be

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modified in the present version of the manuscript. Response: We thank referee and greatly appreciate the thoughtful and constructive comments. We have fully considered the referee's comments in the revision and improved the manuscript listed as supplement. Special comments: 1. In abstract, what is MP on Line 27? It should be listed in the beginning sentence. Response: MP means Mongolian Scots pine, we replaced it with the full name in revised text. 2. In order to understand the sandy soil conditions, suggest author to provide more details, including texture and nutrient content about the soil at the research area at the part 2.1 Site description. Response: We added related information about soil profile in Line 82-85 in revised manuscript, that is: The soil is sandy with a sedimentary aeolian sand layer more than 3 m and an ancient alluvial sand layer with the total depth more than 126 m (Jiao, 1989). The mean bulk density of the upper 2 m soil layer is 1.61 g cm⁻³. The mean soil texture is 83 % of sand (> 0.05 mm), 9 % of silt (0.05–0.002 mm) and 8 % of clay (< 0.002 mm). The organic matter content is 0.3–1.0 g kg⁻¹. 3. In conclusion, authors considered that the degradation in this MP plantation was attributable to the combined effects of rainfall, the sandy soil and groundwater table. So some information on growth status of Mongolian Scots pine in research area should be provided at the part 2.2 Trial plots and sample trees. Degradation or not? Response: We added the growth related information in Line 91-92 of revised manuscript, that is : The growth of trees in the experiment was normal in 2013, however, the leaves of trees in 2015 turned to grey slightly. The obvious defoliation or death did not occurred in 2015. There was no obvious degradation discerned in our short measurement period (three years). 4. How many sets of soil moisture sensors were installed? Where the soil moisture sensors were installed? Inside or outside of the plot? How far were they from plant stand? Response: We added the soil moisture sensors related information in Line 136-138 of revised manuscript, that is: Three placements in experiment area were measured. Each placement was set between four neighborhood sample trees. 5. In Fig.4, Fig.5 and Fig.8, regression equations should be carried out significance test, and significant coefficient should follow the linear regression equations in figures.

Response: We added the significance in all statistical figures in revised manuscript. 6. The driving factors for the degradation of artificial forests not only include drought, pest and fire disaster, but also include man-made factors, especially high afforestation density. In discuss part, the author should discuss the planting density can be loaded by variable rainfall in research area. Whether the degradation of MP was related to the planting density? And can you put forward or suggest the rational plant density of MP on the sandy soil in the different areas with different rainfall? Response: We added the planting density related discussion in section 4.4, Line 295-298 of revised manuscript. We agreed that the degradation of Mongolian Scots pine was related to the stand density. 7. Throughout the MS, there are several spelling errors. For example, “sapflow” on Line 101 should be “sapflow”, “annualprecipitation” on Line 87 should be “annual precipitation”. Response: We check the spelling errors throughout full text. 8. Precipitation and rainfall were used in MS, including Figure. However, some scholars consider the Precipitation and rainfall are different. Precipitation should be in any form, covers all forms of water being released by the atmosphere, include rainfall, snow, drizzle, sleet. Response: We use precipitation to indicated total water capture in the text as a general term, but use rainfall when refer to the water capture by rain event during the growing seasons. 9. In conclusion, first sentence “The relationships between sap flux and atmospheric demand, soil and groundwater table were analysed to show to what extent and how the water use of MP in sandy soil is limited by drought.” should be deleted or removed. Response: We realized the incorrectness and deleted it.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2017-69/bg-2017-69-AC2-supplement.pdf>

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