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Interactive comment on "Impacts of extreme precipitation and seasonal changes in precipitation on plants" *by* M. J. B. Zeppel et al.

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This paper presents a new review on how altered precipitation patterns impacts vegetation of grassland and forest,mainly focusing on the studies of manipulative precipitation experiments. The key point of the impacts is how altered precipitation patterns drive the changes of soil water content, which is already supported in previous studies (e.g., Knapp et al. (2008)). Although the authors have reviewed many literature in this area, especially from the studies of experiments, the reviews is not completed. As we know, one of the strengths of manipulative experiments is that they permit the examination of any combination of precipitation dynamics one wants to explore. The problem with manipulation experiments is that they did not incorporate the entire micro- and macro-environmental aspects of variable weather, and that the scale of manipulation exper-

iments is sufficiently small that border effects can alter the results from what might be expected of more pervasive, naturally-occurring weather phenomena. Hence, only reviews of experimental studies might be not sufficient. Some studies investigated in natural environments need be added. Natural experiments have more power to study the nuances of the problem than manipulations and rain exclusion, as the response functions are highly nonlinear and the results depend on which treatments are made and when the rain is applied or removed. In this case, long-term measurements of natural variability in field settings either from eddy covariance flux tower (e.g., Ross et.al.,2012, Biogeoscience,007-10024) or remote sensing (e.g., Zhang et.al., 2013,J. Geophys. Res. Biogeosci., 118, 148–157) at ecosystem scale can be quite useful, in addition to the manipulative experiments.

As stated in the paper, two different types of altered precipitation patterns were used in their conceptual framework: 'reduced precipitation' and 'amount remained constant'. However, there is another type of altered precipitation patterns in the real world: annual precipitation amount increased with the increase of extreme events and longer dry periods because total rainfall amount and large storms are strongly interrelated in natural settings (e.g., Zhang et. al., 2013). Therefore,only two assumptions of altered precipitation patterns are not sufficient and could not represent the 'real' response of vegetation to these changes.

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