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Re. Evaluation of the PhD Thesis of Ms. Ye Su

Dear Sir / Madam,

It has been a pleasure to read the PhD thesis of Ms. Ye Su, entitled “Hydrologic processes and dynamics in the changing climate and environment: Lessons learned from multiple temporal and spatial scales”. The goal of the thesis is to better understand land use change and climate change on hydrological processes and dynamics. This is an important topic because both land use change and climate change affect streamflow and water resources at multiple scales. The thesis focuses on the upper Vydra catchment in the Czech Republic that is affected by a pine beetle outbreak, the heavily managed arid Aral Sea Basin, and uses data from two sites in the US in the evapotranspiration model studies. The thesis summarizes the seven! manuscripts that are included in the appendix of the thesis. These manuscripts are all published in international peer-reviewed journals. In addition to being a very impressive number of manuscripts, the contents of the manuscripts are very broad, ranging from trend detection and statistical analyses, to time series of Electrical Conductivity (EC) and event responses, to evapotranspiration observations and modeling, and a new method to describe celerity and velocity. The methods are also very varied and suggest that Ms. Ye Su has a broad understanding of fieldwork, trend analysis, hydrological modeling (and climate models), and theory to describe flow and solute transport.

The first manuscript is a trend analysis study looking at the effects of mountain pine beetle related forest loss and climate change on streamflow in the upper Vydra catchment. The work is important because these mid-elevation mountains are particularly vulnerable to climate change. The focus on different time scales (annual, seasonal, low flow and high flow periods) is useful because the seasonal and event based trends are much clearer and larger (and likely also more important for water management) than the trends in annual flow.

The second manuscript is a modeling study for the very large Aral Sea basin. It uses climate model outputs to model the anticipated changes in streamflow and nutrient transport. The work is novel in that it focuses on water recycling. Although the projections are interesting, land use change and water management changes may be the more important factors that will determine water and nutrient transport to the Aral Sea. Furthermore, the build up of nitrogen in the groundwater may not be fully described, but this can be discussed during the defence.

The third manuscript is the first first-authored manuscript. It focuses on the response of EC of streamflow in sub-catchments of the Vydra basin. The work clearly shows how mountain pine beetle infestation and forest loss can affect stream water quality (which nicely complements the work of the first paper on water quantity). The work is original in its approach to analyse responses at different time scales (event to annual time scales). This field-based work certainly contributes to our understanding of forest disturbance on hydrological processes and dynamics.

The fourth manuscript is a novel theoretical development to describe the difference in the velocity and celerity. The focus on explicitly describing velocity and celerity in models is relatively new and this work is a fine contribution to this growing field. Future field and lab studies are needed to test the usefulness of this method to describe both the hydraulic response and the tracer response in the soil.

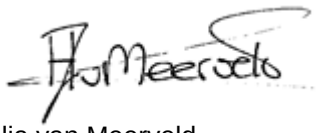
The fifth and sixth manuscript are model studies to describe evapotranspiration. The model is applied for sites in Misouri and Florida. The manuscripts show that vapor transport may be important and that exclusion of this process may lead to an underestimation of the total evapotranspiration.

The seventh manuscript is the second first-authored manuscript. This manuscript is also field-based and focuses on the transpiration response of a recovering forest. The work is original because very few sapflow studies have looked at regenerating vegetation. It clearly shows the importance of the vapor pressure deficit in controlling evapotranspiration and how common models may not accurately describe the effect of environmental variables on stomatal conductance and thus evapotranspiration.

The thesis or summary text that describes these seven manuscripts is useful and gives a good overview of the main findings and also the contributions of these studies to advancing hydrological sciences. Two of the study sites (the Czech site and Aral sea) are described but the sites for the ET model application are not. The thesis text could have been a bit more detailed, particularly with regard to the hydrological processes that are studied, and/or give more background information that couldn’t be included in the manuscripts. I particularly would have preferred clearer descriptions of the author contributions. Ms. Su is the first author for two of the manuscript and corresponding author for two other manuscripts but it is not clear what her contribution was for the manuscripts for which she isn’t the first author.

The thesis text and manuscripts are logically structured. The figures are all clear and useful. The manuscripts of the thesis certainly contribute to our knowledge on how land use change (particularly pine beetle attack and forest disturbance) and climate change affect streamflow, evapotranspiration and nutrient transport, and help to advance this line of hydrologic research. I look forward to discussing the thesis at the defence.

Sincerely,



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