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Interactive comment

Interactive comment on "Can riparian vegetation shade mitigate the expected rise in stream temperatures during heat waves in a pre-alpine river?" *by* H. Trimmel et al.

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All comments of Referee#1 will be addressed within an author comment. Prior to that the authors would like to address the general comments regarding scientific novelty, aim and scope of this study. We agree that a more precise delimitation to other studies, presentation of the scientific novelty and a clear overview of this study would greatly facilitate readability. The aim and scope of this study were summed up at the end of the Introduction Pg.4, line 16-24, but this section will be enlarged and clarified.

We propose following alternative formulation:

"Many studies have already addressed the influence of riparian vegetation on stream

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water temperature using field measurements. Other studies cope with different methods to predict stream temperature and few try to answer the question on how climate change might increase stream water temperature. Mainly air temperature is used as a surrogate for stream temperature and energy flux variations at different river sections are not considered. One result or trend may however not be transferred from one river to other. Statements of the riparian vegetation's potential to mitigate influence of climate change are only reliably valid for a given type of stream and for a given climate zone. The novel aspect of the present study is to investigate the influence of climate change and of riparian vegetation on the same river and attempt to make a realistic forecast of the riparian vegetation's potential to mitigate climate change in a specific river.

During the project BIO_CLIC vegetation cover and river morphology was recorded continuously along the river, stream temperatures were recorded at 11 sites as well as main tributaries of the eastern Austrian river Pinka (Holzapfel and Rauch 2015, Holzapfel et al. 2015). This data was used to setup and validate the 1D energy balance and hydraulic model Heat Source (Boyd and Kasper 2003) for the river Pinka. Further Heat Source was used to analyse the mean influence of different meteorological, hydrological and shading parameters during heat wave conditions along a 22.5 km long uniform reach. Existing vegetation was found to be responsible for 4 times as much influence on temperatures as topographic or bank shade on average (1.68 °C). This was reported during a different article by Trimmel et al. 2016.

The aim of the present article is (1) to estimate the magnitude of stream temperature rise during extreme heat events caused by the expected rise in air temperature until the end of this century compared to the last observed period and (2) to investigate the ability of riparian vegetation to mitigate the expected water temperature rise.

In the present article stream temperature was simulated with the 1D energy balance and hydraulic model Heat Source (Boyd and Kasper 2003) for 49km along a diverse section including upstream forested regions and tributaries for each 500m along the

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river, which amounts to a total of 103 sites. First the longitudinal changes of energy fluxes were analysed during the maximum heat wave, which took place in eastern Austria during summer 2013. Future heat wave episodes, which are likely to occur during the climate periods 2016-2045, 2036-1065 and 2071-2100 in the study region, were selected. Regional climate scenarios, which have been produced within the ENSEMBLE project (Hewitt et al. 2004) were further processed and the meteorological data extracted. The future upstream model water temperature was simulated according the methodology of Caissie et al. (2001). Heat Source was used to simulate the stream temperature of the river Pinka for 12 future episodes and three vegetation scenarios."

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