Responses to Reviewers' Comments

Reviewer 1:

Dear Authors,

many details are included and the paper have certainly improved from the first version. However, I have still some doubts about it, since my main comment is not properly assessed: it is not clear to what extent the paper is presenting some new findings respect to previous research on the topic.

Response: Thanks for the comment. The text has been added to respond this comment. (Page 13, lines 407-413)

"Based on measurement results of two field campaigns, two new findings respect to previous researches on the topic can be emphasized. The first finding was that the measured results of surface velocity using UAV-based LSPIV were better than those using terrestrial fixed station-based LSPIV. The second finding was that the tracer can enhance the image recognition using UAV-based LSPIV. However the tracers were distributed inhomogeneously, leading to limited improvement of the LSPIV measurement results by the tracer."

The manuscript is still dominated by the presentation of a case study and, it is difficult to evaluate the scientific soundness of the work and to generalize the results. I agree that this contribution should have practical value for this topic but can be not considered totally a novelty.

Response: Thanks for the comment. I totally agree the Reviewer's comment. Text has been added in the revised manuscript. (Page 3, lines 112-113)

"The main contribution of this study is the value of practical application, not entirely emphasized on novelty."

Other comments:

Respect to the answers provided and the descriptions included in the main text, please focus on the settings used for your application rather than on generalized and didactic contents (e.g. answer to points 3); in other cases, please move general background parts (e.g. answer to point 10) in the introduction section or in the discussion if it can be useful for comparative analysis.

Response: Thanks for the comment.

1. **Text has been modified in the revised manuscript. (Pages 5-6, lines 199-213)**

"PIVlab has been widely used by many researchers in image surveying and mapping. The software used for velocity analysis consists of three main steps: image preprocessing, image evaluation, and postprocessing. The image

preprocessing techniques implemented in PIVlab include histogram equalization, intensity highpass filtering, and intensity capping. In this study, FFT with multipass analysis is adopted for image evaluation. Postprocessing includes data validation, interpolation, smoothing, and exploration. The postprocessing is employed to display the measurement results of surface velocity. A detailed description can be found in Thielicke and Stamhuis [59].”

In image preprocessing, the main step is to enhance the characteristics of the tracer in the images. The original image and the enhanced image are shown in Figure 3. There are more ripples on the right side of Figure 3b, so after preprocessing the image, the captured river surface ripples appear to be white, and the area on the right side of the image where the flow velocity is faster has more ripples. On the left side of the image, the flow velocity is slow, and the ripples on the river surface are not obvious, so the area on the left is black.”

2. The sentences have been moved to “Discussion” section, Section 4.3. (Page 17, lines 516-532)

“Experiments of artificially seeded tracers were utilized to simplify the identification of moving patterns on the water surface, especially under low flow conditions [66]. Pizarro et al. [56] used particle tracking velocimetry (PTV) and particle image velocimetry (PIV) to measure stream surface flow. A tracer seeding metric called the seeding distribution index (SDI) based on seeding density and trace clustering was introduced to identify the optimal spatial distribution of tracers. They found that the error reductions were 15.9% and 16.1% using PTV and PIV, respectively. Pizarro et al. [67] also introduced the novel idea of optimizing image velocimetry by selecting two reasonable criteria, i.e., the maximization of the number of frames and the minimization of the dimensionless SDI. The shooting frames were analyzed using LSPIV to estimate the surface flow velocities and river discharge rates. They concluded that the proposed framework might reduce the errors of the computed discharge errors by 0.4% and 0.12% for two study cases in rivers. Meselhe et al. [65] suggested that a seeding particle density of 10-30% of the surface flow area was a good guideline to adopt in various field applications using LSPIV. In this study, the experiments with wood shavings revealed that the selected tracer size was too small and that the tracers were distributed inhomogeneously. Therefore, tracer seeding did not improve the LSPIV results.”

Figure 4: I think that this figure is not strictly necessary.

Response: Thanks for the comment. Figure 4 in the previous manuscript has been erased.

Section 3: This section is still dominated by the description of the three hydrological events and of the methods and material used rather than to the results.

Response: Thanks for the comment. The title of section 3 has been revised as "3. Measurement Results". The titles of section 3.1 and section 3.2 have been revised as "Section 3.1. Measurement results on May 31, 2019 under low-flow condition" and "Section 3.2. Measurement results on June 15, 2019 under high-flow condition". See page 7, line 267, page 7, line 287, and page 12, line 374.