



EGUsphere, referee comment RC1  
<https://doi.org/10.5194/egusphere-2022-735-RC1>, 2022  
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## **Comment on egusphere-2022-735**

Anonymous Referee #1

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Referee comment on "Adaptively monitoring streamflow using a stereo computer vision system" by Nicholas Reece Hutley et al., EGU sphere,  
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This is an interesting comparison of a variety of techniques for discharge estimation with a view to evaluating the CSVG stereophotogrammetry method for deriving discharges from surface velocity measurement, including the use of an (unspecified) adaptive learning algorithm. I do think, however, that the paper could be significantly improved, in part because the details of the CSVG method are kept almost deliberately vague as if to not give too much away (without actually saying so, though implied by the software code not being made available). However, this makes it really frustratingly difficult to understand what lies behind some of the results. It is suggested, for example, that the method can produce comparable discharge estimates to traditional rating curve and ADCP methods – but only really if a local water level measurement is available (not that this is really a problem these days when low cost methods are available). In the points below I have suggested many places where more detail is needed – if not in the paper directly then referenced to material in the supplementary file.

Some specific points are follows:

I would suggest that the results are reordered somewhat so that each site is considered in turn as because the Paterson site is so different from the others – from the photo it would appear that this is only site where a downstream (rather than cross-channel) camera view is used with a flow that does not seem to have developed a uniform flow profile. The reasons for the failures here need more discussion (as shown in Fig S7).

L83 para. Yes, but what technological advances do you mean? Those in the current study? Those to come (in which case more detail needed). Might be better moved to end.

L118. Not clear how this 40m relates to the 10m on L156, and how the camera resolution and the 120 degree field of view create the 0.1m analysis resolution?

L124. What do you mean by adaptive learning (you also refer to machine learning later)? No details are given. And here you do not mention the issue of going from surface velocities to profile or mean velocities (see comment on L221)

L158. Why the first percentile (indeed what does the first percentile mean)?

L168. What is this minimisation problem? Since it will affect the estimates it needs more explanation – at least in the supplementary file

L187. Motions out of the water surface? Some hint here of a limitation but these are on a surface, needs more explanation. And filtered how? As NANS, or with some replacement strategy?

L190 Continuity of streamlines imposed how? What assumptions about the nature of the streamlines?

L198 "multiple measurements of the same water level over time in different conditions to combine these measurements into a complete velocity profile" – totally obscure. Different measurements at the same water level should give you an estimate of variability of estimates at that water level, but why does it tell you anything about the profile. In fact you do not seem to consider the profile at all – only using data from elsewhere to estimate a coefficient to convert to mean velocity.

L204. Why exponential? Are there not theoretical 2D cross-sectional distributions that you could have tried (though presumably would not be valid for the Paterson site). And in fitting the distribution, what if it is the highest values that are not available?

L221 – should not values of  $a$  be considered uncertain (and should this uncertainty not be propagated into the discharge estimate (see the cross-section you show in Figure S3)

L230. You do not say where these adapted learning distributions come from (and should that not also be associated with an uncertainty estimate using e.g. Bayes updating). You mention an "envelope" but that never appears later in the results.

L237. We do not need quality codes – we need proper uncertainty estimates. You surely

have the information to be able to do so.

L261. Why NSE? That seems inappropriate for a rating curve since NSE scales by the observed variance which is here over the depth values). That is more like a regression so is not a correlation coefficient more appropriate?

L280 Table 1 – there seem to be some inconsistencies in presentation here (e.g. water levels of 135m and 0.31m are clearly not both relative to local datum?)

L311. More detail needed on the ADCP for clarity– was averaging over multiple transects or other filtering of anomalies down

L373. But Figure 3 does not really support this – either there appears to be little difference or for Paterson it seems disadvantageous.

L373. But is it not the large percentage that is greater than 0.5 m that is more significant (as clear in Figure 5)? It is unclear why a stereophotogrammetry method can be >0.5m in error for so much of the time. Is this a result of the particular camera system used? It is off the shelf but has only 120mm separation between the lenses.

L425. Well yes (look at the photo)! So should you not present this as a "test to failure" type of site? You would not actually have had to go much further downstream to have been more successful.

L470. This appears to be a combination of trend in cross-section/rating as well as statistical observational variability for that depth. So when you refer to the "latest rating curve" – what period of observations is used to define that curve? (Also Figs 7,8, Table 6, etc later)

L502 Why do you refer to correlation plots without giving correlation coefficients?

L521 What do you actually mean by learned discharge rating curve? Is it purely a filtered estimate over time that will average out error, or is other data input to the process (you have not said how it works earlier). Clearly if you input the actual levels (or weight by error relative to the measured level) you are going to get much closer to the "latest rating curve" as shown in the other plots (and Figs S5, or even S7).

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