

## ***Interactive comment on “Combining flow routing modelling and direct velocity measurement for optimal discharge estimation” by G. Corato et al.***

**Anonymous Referee #3**

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### GENERAL COMMENTS

The essence of the paper can be summarized as follows: The authors propose a methodology for the estimation of discharge hydrograph corresponding to the automatic stage hydrograph recorded during a flood event at a gauging site, where also the sporadic direct water surface velocities are measured for different water levels. Use of these surface velocity measurements in velocity entropy model enables the estimation of mean flow velocity and subsequently the Manning's roughness values corresponding to different water levels (flow depths) at this site. Employing these Manning's roughness values as reach averaged estimates enables the routing of recorded stage hydrograph in the downstream reach using the hydraulic routing method proposed by Arico et al.

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(2009) which in turn also estimates discharges for different water levels recorded at the gauging site.

### UTILITY OF THE PROPOSED METHODOLOGY

Both these methods, viz., the velocity entropy model (Moramarco et al., 2004) and the stage hydrograph routing method of Arico et al. (2009) are not new. But the ingenuity of the proposed methodology arises from the combined use of these methods for determining the Manning's roughness values at different water levels and the subsequent use of the same for stage hydrograph routing and the consequent estimation of corresponding discharge hydrograph at the gauging site. The authors, based on their field experience, state that the surface flow velocity measurement is not tedious, time consuming and dangerous as the conventional river velocity measurements normally practiced in many countries. Accordingly, the proposed methodology is a boon to hydrologists and engineers engaged in hydrometric measurements by overcoming the professional hazard associated with the conventional velocity measurements.

### DIFFICULTY OF THE PAPER

However, the seemingly simple approach as summarized above apparently appear to be complex, as also pointed out by the first two reviewers, due to complicated presentation coupled with language problem. In this regard, this reviewer agrees with the format of presentation as suggested by Reviewer-2, with emphasis on paying proper attention to overcome the language problem.

### SPECIFIC COMMENTS:

1) The word “optimal” is used only when many feasible solutions are examined and the best among them is selected. The authors do not estimate discharge based on this consideration. They measured the direct surface velocity sporadically, as they have stated in number places in the text, and, therefore, the title may be changed to “Discharge estimation by combining flow routing and sporadic measurements of surface

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velocity;” 2) Many researchers who study this paper would be curious to know, like this reviewer, that if the surface velocity during a flood can be measured by ‘no-contact’ method as stated in the paper, and subsequently the average velocity can be estimated, then why not adopt this technique for the direct surface velocity measurement at specified regular intervals over the entire duration of flood event without involving flood routing; 3) Question pertaining to general applicability of the method : How the assumption of wide rectangular channel concept used in Eqn. (11a) is valid when flood occupies flood plains and flow moves at a section with significantly different velocities. Under such condition the flow section cannot be considered as wide rectangular. 4) Again this question is related to general applicability of the method: How the linear variation of input stage hydrograph applied in Eqn. (11b) is valid for all field conditions considering the nonlinear nature of the rise of input stage hydrograph. 5) The derivation made by this reviewer shows that the right side of Eqn. (3) should be  $Q/T$  rather than  $Q$  as given in the paper. 6) Some of the comments related to language: i. Solid velocity (also pointed out by Reviewer-2): Whether the authors imply the mean velocity of flow area? (The authors need to use standard technical terminologies) ii. Change ‘roughness Manning coefficient to ‘Manning’s roughness coefficient’. iii. Change ‘occurring in’ to ‘recorded at’. iv. Change ‘analysis outcomes’ to ‘outcome of analysis’. v. Change ‘practice hydrology’ to ‘hydrological practices’. Many such language problems remain in the draft paper.

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