



Uncertainty analysis of discharge measurements using large scale PIV

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For 10 years now, Large Scale Particle Image Velocimetry (LSPIV), a local remote sensing image-based method, has been increasingly used for non contact rivers survey. LSPIV is a statistical identification of displacement flow from images on natural scale of rivers. This includes measurements of surface velocity distribution and discharges for very different sizes of rivers with sections as small as few meters and as large as hundreds of meters, without and with seeding of the flow, and with different sensing systems. This study presents recent real-time results from a permanent location at the Iowa River, Iowa City. Data collected during the system's first year of operation shows that, even if the LSPIV discharge measurements are consistent with traditional measurement methods, they are also more variable. The major causes of the variability observed are due to the deployment in the field of the PIV technique. This includes problems of illumination, seeding, recording, transformation and processing. Laboratory experiments were conducted in order to assess the error sources. Unfortunately, in both field and laboratory experiments, it is impossible to control all the error sources. To deal with this situation, a numerical simulator of the LSPIV method was developed. It can test the velocity calculation error of each variable by changing a variable at a time among the total number of variables that affect the velocity calculation.