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Video monitoring in the Gadria debris flow catchment: preliminary results of large scale particle image velocimetry (LSPIV)

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Large scale particle image velocimetry (LSPIV) is a technique mostly used in rivers to measure two dimensional velocities from high resolution images at high frame rates. This technique still needs to be thoroughly explored in the field of debris flow studies. The Gadria debris flow monitoring catchment in Val Venosta (Italian Alps) has been equipped with four MOBOTIX M12 video cameras. Two cameras are located in a sediment trap located close to the alluvial fan apex, one looking upstream and the other looking down and more perpendicular to the flow. The third camera is in the next reach upstream from the sediment trap at a closer proximity to the flow. These three cameras are connected to a field shelter equipped with power supply and a server collecting all the monitoring data. The fourth camera is located in an active gully, the camera is activated by a rain gauge when there is one minute of rainfall.

Before LSPIV can be used, the highly distorted images need to be corrected and accurate reference points need to be made. We decided to use IMGRAFT (an opensource image georectification toolbox) which can correct distorted images using reference points and camera location, and then finally rectifies the batch of images onto a DEM grid (or the DEM grid onto the image coordinates). With the orthorectified images, we used the freeware Fudaa-LSPIV (developed by EDF, IRSTEA, and DeltaCAD Company) to generate the LSPIV calculations of the flow events. Calculated velocities can easily be checked manually because of the already orthorectified images.

During the monitoring program (since 2011) we recorded three debris flow events at the sediment trap area (each with very different surge dynamics). The camera in the gully was in operation in 2014 which managed to record granular flows and rockfalls, which particle tracking may be more appropriate for velocity measurements. The four cameras allows us to explore the limitations of camera distance, angle, frame rate, and image quality.