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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Use of a remotely piloted aircraft system for hazard assessment in a rocky mining area (Lucca, Italy)" *by* Riccardo Salvini et al.

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We prepared a point by point response to referee 2.

RC -Dear Authors, This paper shows not only survey results of complex morphologies using RPAS and SfM-MVS but also a practical application for disaster prevention using those high resolution data, therefore, very interesting. Since detailed measurement procedures, advantages and disadvantages of RPAS and SfM methods are also well explained, I think that this paper is worth to be published. However additional explanations and reconsiderations for the following points should be desired. Although high resolution 3 dimensional data were obtained using RPAS, does the present stability

analysis need that high resolution data? Since the higher resolution of data, the higher costs of data acquisition, processing and handling, appropriate resolution according to the purpose would exist.

AC -We consider high resolution of data always useful in slope stability analyses because it allows the identification and measurement, with high precision and detail, of joints and potential unstable blocks and rock masses at any height above the open pit floor. As written in the Acknowledgments section, that part of the present study has been undertaken within the framework of an agreement with USL1 of Massa and Carrara (Mining Engineering Operative Unit - Department of Prevention) aimed to that purposes. Furthermore, high detail and accurate geometrical data allow deterministic kinematic analyses and the creation of reliable stability models. Costs of data acquisition, processing and handling are not a problem if compared with that of slope safety and risk reduction for workers.

RC -Page 3, lines 10-13: Even though this paper deals with management of natural hazard, detailed description of a real victim would be not necessary in this paper discussing survey method and its application.

AC -The suggestion has been applied and the sentences eliminated.

RC -Figure 4: Although GCPs are located only in the bottom of cliff, is there any effect on the accuracy of 3D model of the cliff?

AC -Although GCPs of the zenithal flight are located at the bottom of cliff, there is not any effect on the accuracy of 3D model of the cliff because they are well spatially distributed, redundant, the flight altitude is low and some photos are inevitably convergent; in particular, this last characteristic allowed us to build an accurate 3D model even in the surroundings of vertical quarry walls. Furthermore, it must be considered that frontal flights, on the perpendicular to the rock faces, have been executed ad hoc and the related photos used to build a separate frontal model as shown in Figure 6.

RC -Figure 6: Although the number of GCPs looks too much, how did you decide their locations and number?

AC -We decided to measure a great number of GCPs (21) because we had to orient, as more accurate as possible, 448 images.... GCPs location has been decided in a way to have an optimum spatial distribution (Figure 6) both in space, considering the V shape of the "Piastrone" quarry, and in elevation from the open pit floor.

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