



## Preface: The use of remotely piloted aircraft systems (RPAS) in monitoring applications and management of natural hazards

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The use of remotely piloted aerial systems (RPAS) has shown a strong improvement in last years. Starting from typical applications like archaeology (Koutsoudisa et al., 2014; Mesas-Carrascosa et al., 2016; Lazzari and Gioia, 2017), today these systems are nowadays used in different domains including precision farming (Salamì et al., 2014), architecture (Roca et al., 2013; Dominici et al., 2017), study of natural phenomena (Gomez and Purdie, 2016; Giordan et al., 2017) and their effects (Giordan et al., 2018b), and study of human impact on Earth (Xiang et al., 2018). RPAS equipped with RGB photo cameras and the development of more efficient photogrammetric techniques (Westoby et al., 2012) had simplified the fast acquisition of a sequence of images and they had multiplied the possible uses of these systems that are now able to reliably and easily produce a digital surface model and an orthophoto (Nex and Remondino, 2014). These approaches can be very useful for the study of natural hazards, for which an on-demand system able to acquire high-resolution image datasets in a limited lapse of time can be very useful. The availability of a detailed representation of the hazardous natural process or its effects can be an important support for (i) comprehension of the evolution of the natural process that could create a hazardous condition, (ii) timely monitoring during emergencies, (iii) residual risk assessment, and (iv) first estimation of occurred damages. In this special issue, we selected and published different contributions presented in a thematic session of the European Geosciences Union General Assembly of 2016 and 2017. These sessions were dedicated to the use of RPAS in monitoring applications and management of natural hazards. The objective of the presented special issue is to provide the sci-

entific community with a wide description of possible uses of RPAS for the study of active natural processes and their impacts on environment and society. Giordan et al. (2018a) published a review of the possible use of RPAS for the characterization and management of landslides, floods, wildfires, volcanic activity, and earthquakes. Glacier evolution and related hazard assessment has been described by Fugazza et al. (2018), who presented the use of RPAS for the study of one of the most important glaciers in Italy, the Forni Glacier. The theme of landslides is considered by many authors with different approaches. Török et al. (2018) and Saroglou et al. (2018) focused their attention on rockfalls and their possible effects. Rock slope stability has also been considered by Salvini et al. (2018), to support the safety of rocky mining activities. Landslide identification and mapping is described by Fiorucci et al. (2018), who considered ultra-high-resolution images for the definition of landslide limits and their evolution. Peppà et al. (2017) presented a methodology for the definition of the landslide evolution too: in particular, their paper proposes the use of a multi-temporal dataset and a cross-correlation approach for the detection and measurement of morphological changes due to landslide activity. The geomorphological description and the potential risk of debris avalanche (i.e. a particular type of landslide) deposits related to the collapse of a volcano sector is presented by Hayakawa et al. (2018). Hayakawa obtained a high-resolution DTM using RPAS that was fundamental for the geomorphological description of the studied area. A similar approach was used by Chang et al. (2018), who focused their paper on landslides and used RPAS for the geomorphological investigation. In this paper, authors paid particular attention to the

triggering role of active faults. The theme of active tectonic processes is also considered by Deffontaines et al. (2018), who describe the characterization of active faults in Taiwan, with specific regard to the earthquakes that occurred on 21 September 1999 and 26 December 2006 using different datasets: GPS monitoring data, PS-InSAR time series, and mean- and high-resolution digital surface model (DSM) derived from old aerial photos and RPAS. The use of RPAS in post-earthquake scenarios is described by Cannioto et al. (2017), who presented how RPAS could help during search and rescue activities with the recognition of the shortest survey path in highly damaged areas. The use of RPAS for emergency investigation is described by Huang et al. (2017), who describe a methodological approach for the use of RPAS for emergency investigations of a single geo-hazard mission.

Another relevant topic is the effect of surficial water flow and related hazards. An automatic gully detection application is proposed by Feurer et al. (2018), who also suggest the fruitful use of kites for the acquisition of aerial images. Benassai et al. (2017) presented the study of rip current effects and hydrodynamic simulation results based on the use of RPAS, while the use of these platforms for the study of disastrous flood effects is presented by Izumida et al. (2017). Duo et al. (2018) proposed a methodology for the rapid mapping of impacts by extreme storm events on coasts based on the use of RPAS.

The collection of papers proposed to the *NHESS* readers provides a critical description of the state of the art in the use of RPAS for different scenarios. In particular, the sequence of papers can be considered an exhaustive representation of the state of the art of the methodologies and approaches applied to the study and management of natural hazards.

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