Using Unmanned Aerial Vehicles for Post-Earthquake Field Reconnaissance: the 2016 August 24 Mw 6.0 Amatrice (Central Italy) Earthquake

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Abstract

The usability of Unmanned Aerial Vehicles (UAV) during the disaster response phase has increased a lot over the last few years. It is a fast and cost effective way for providing ultra-high resolution images of the affected area and conducting a rapid post-earthquake field survey. This approach is very important as it offers rapid: (a) assessment of the earthquake environmental effects (EEE), (b) safe first building inspection and evaluation of damage degree, (c) identification of sites suitable for emergency shelters, (d) tracking displacement of affected population, (e) assistance in search and rescue (SAR) operations by locating damaged infrastructures and scanning of buildings for survivors, (f) assistance of relief teams by transport of light equipment, devices and products as well as (g) mapping of newly established conditions for faster restoration and recovery.
On August 24, 2016 an Mw 6.0 earthquake struck Central Italy resulting in 299 fatalities. A scientific team comprising NKUA and NTUA members arrived in the affected area immediately after the earthquake in order to assess damage and assist civil protection authorities. Taking into account the restricted access to the affected settlements due to collapsed buildings and landslides, the use of small UAV was considered the most appropriate earthquake damage assessment technique. During the first three days of the aftershock sequence, repeated flights were conducted and high resolution images of the most affected settlements were respectively produced. Based on these images, the dominant building types and building damage as well as the extent and type of EEE were initially and safely detected and the seismic intensity of the main shock was evaluated by applying seismic intensity scales. Moreover, it was also observed that damage induced by the main shock and its largest aftershocks presented many similarities, such as spatial homothetic motions among others, indicating the prevalence of the vertical component of the earthquake ground motion. Taking into account only these high-resolution images along with field macroseismic observations, it is concluded that the main shock and its largest aftershocks present similar parameters (shallow, normal-faulting, near-field events) and the observed damage were typical of such earthquakes.

Key words*: UAV; drones; field survey; building damage; earthquake environmental effects*