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Application of UAS survey to Neotectonics: the active Longitudinal Valley Fault case example (E. Taiwan)

Benoit Deffontaines (1,2), Kuo-Jen Chang (2,3), Johann Champenois (1,2), Chyi-Tyi Lee (2,4), Ya-Ju Hsu (5), Rou-Fei Chen (2,6,5), Samuel Magalhaes (7), Gregory Serries (7), Gerardo Fortunato (7), Shih-Ting Lu (8), and Yen-Chiu Liu (8)

(1) LAREG - IGN - UPEM, Saint-Malo, France (benoit.deffontaines@univ-mlv.fr), (2) Lab. Int. Assoc. D3E N°536, CNRS-MOST France-Taiwan, (3) Department of Civil Engineering, National Taipei Univ. of Technology, Taipei, 10654, ROC, Taiwan, (4) Department of Applied Geology, Central Taiwan University, Chungli, 32001, ROC, Taiwan , (5) Academia Sinica, Taipei, ROC, Taiwan, (6) Chinese Culture University Taipei, ROC, Taiwan, (7) Alphageomega SAS, 62, rue du Cardinal Lemoine, 75005 Paris, France, (8) Central Geological Survey, MOEA, Taipei, ROC, Taiwan

Taiwan is among the activest neotectonic place in the World as it is the result of the rapid collision of both Eurasian and Philippine Sea Plates, with an annual average convergence rate of about 10cm.y-1. This active tectonic shortening generates the Taiwan relief which is characterized by two major mountain ranges: (1) the metamorphic Central Range from Eurasian continental origin, and (2) the eastern Coastal Range characterized by a volcanic Philippine Sea plate affinity. In between both runs the active interseismic Longitudinal Valley Fault (LVF), 150km long and N020°E trending, affected by several earthquakes of larger magnitude than 5 during the last 70 years, e.g., October 22, 1951 in Hualien M7.1-7.3, Novembre 25, 1951 in Chihshang M6.1 and in Yuli M7.3, Decembre 5, 1951 in Taitung M5.8 (Central Weather Bureau, 1952). Consequently, the detailed study of this major active seismic plate suture zone is a major concern for any Taiwan citizens.

Therefore, we settle an UAS survey above the Longitudinal Valley Fault zone and acquired 17483 high resolution photographs (Sony QX-1 camera with 20 megapixel resolution) through 2 drones flying at 350 meters above ground level height, by total 23 flight missions, cover a total area of 195 Km2. After photogrammetric processing, we calculate the high resolution Digital Terrain Model (DTM) of the LVF zone, (with a 11cm planimetric resolution and a 40cm vertical accuracy) and its immediate surroundings along a "buffer" zone of 2.5 km. This UAS DTM enables us through classical morphostructural interpretation to map into much details the active tectonics structures of the Longitudinal Valley Fault that we compared to the pre-existing published works (e.g.: CGS geological maps, Lin et al., 2009 ; Shyu et al., 2005, 2006, 2007, 2008).

So, we propose herein a detailed UAS survey of the Southern and Central part of the Longitudinal Valley Fault (1) to locate active tectonic structures; (2) to characterize those through field studies; and (3) to quantify them with various geodetic measurements taking into account GPS datasets (e.g.: Yu et al., 1997; Lee et al., 2008; Hsu et al., 2009; Huang et al., 2010), levelings, as well as PSInSAR data sets (Champenois et al., 2013). Then finally, we propose a new simple active tectonic model which has geodynamic implications.