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Geological mapping and Active tectonics from UAS-HR-DTM and PSInSAR: Case examples in the Longitudinal Valley and the Coastal Range (E. Taiwan)

Benoit Deffontaines[1,2], Kuo-Jen Chang[2,3], Samuel Magalhaes[4], Gregory Serries[4], and Gerardo Fortunato[4]

[1]Univ. Gustave EIFFEL, UGE, Saint-Malo, France (benoit.deffontaines@univ-eiffel.fr)
[2]Int. Res. Project D2E, CNRS-MOST France-Taiwan
[3]National Taipei Univ. of Technology, Taipei, 10654, ROC, Taiwan
[4]Alphageomega SAS, 62, rue du Cardinal Lemoine, 75005 Paris, France.

Taiwan island is the result of the active rapid collision of both Eurasian and Philippine Sea Plates with an annual average convergence rate close to 10 cm.y^{-1}. The relief of Taiwan is composed of the metamorphic slate belt of the Backbone Range (also called Central Range) and to the east the Coastal Range mainly characterized by volcanic affinity. In between those, lay the Longitudinal Valley (125km long and N020°E trending) which is the active crustal suture zone. The latter presents both inter-seismic creeping displacement (Champenois et al., 2013) and was hit by 7 major earthquakes of magnitudes larger than 5 during the last 70 years. It highliths the geohazards importance of this area for any Taiwan citizens.

In order to better constrain the seismic hazards and the earthquake cycles of the place, we settled several years ago numerous UAS surveys above the Coastal Range and the Longitudinal Valley (E. Taiwan) and acquired so many high-resolution photographs using several drones flying at 350 meters above the ground. After photogrammetric processing, we calculate both (1) a high-resolution Digital Elevation Model (UAS-HR-DEM) that takes into account buildings and vegetations, and (2) a Digital Terrain Model (UAS-HR-DTM) corresponding to the ground. Our ground validation (GCP's) leads us to get 7cm planimetric resolution (X, Y) and below 40cm vertical accuracy. This UAS-HR-DTM combined with field work and a detailed morphostructural analysis permit us to map into much details the structures and consequently to up-date the pre-existing geological mappings (*e.g.* CGS geological maps, Lin et al., 2009 ; Shyu et al., 2005, 2006, 2007, 2008). Then we combined our new structural scheme with various geodetic data (levelings, GPS...) and PSInSAR results (Champenois 2011, and Champenois et al., 2013) to locate, characterize and quantify the active tectonic structures, taking into account previous works (*e.g.* Yu et al., 1997; Lee et al., 2008; Hsu et al., 2009; Huang et al., 2010...). We then precise structural geometries and some geological processes as well as the location of active folds and active faults during the PSInSAR monitoring time-period.