

Muographic investigation of 1949 fault in La Palma, Canary Islands, Spain

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La Palma is a volcanic island which is located at the northwestern extreme of the Canary Islands, Spain. The 1949 volcanic eruption near the summit of the Cumbre Vieja, might have been accompanied by development of a west facing normal fault system along the crest of the volcano, considered to be the first surface rupture along a developing zone of flank instability (Day et al., 1999).

The investigations of density structure of volcanoes has been applied by using cosmic-ray muons (Tanaka et al. 2007-2014, etc). This technique, “muography”, turned out to be also available for the detection of hidden seismic fault (Tanaka et al., 2011).

So we consider that muography is also available for the 1949 fault in La Palma. There are some different conditions comparing to the investigation by Tanaka et al, 2011. The detected the ancient seismic fault which have 20m-wide mechanically fractured zone consisting of highly damaged rocks. In our case, the fault was made by large scale land slide and the slide length is just a few meter, or just a fissure caused by western flank instability of the island. Therefore the expected width of fault/fissure is just a few meter. To detect the narrow fault, the muon detector which has very high spatial resolution. In addition, it's difficult to get the continuous power supply near the fault.

The nuclear emulsion is a kind of photographic film which has a high sensitivity for high energy charged particles. It has very high spatial resolution intrinsically and doesn't need any power supply.

Our project team placed the Emulsion Cloud Chamber (ECC), which is realized by a sandwich of passive material plates, such as lead, interleaved with films, and it has the rejection power for background low energy particles (Nishiyama, Miyamoto, and Naganawa, 2014). The exposure started from January 2014 and it removed after 106 days and the effective sensitive area was 0.19m². The emulsion films were developed and they are under analysis.

The geological background of La Palma, the feature of the detector, the implementation, and the expected performance will be presented.