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Multisensor of Remotely Sensed Data for Characterizing Seismotectonic Activities in Malaysia

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Seismically induced events pose serious hazards yet are difficult to predict. Despite remarkable efforts of mapping, monitoring and modelling of such great events at regional or local scales, the understanding of the processes in the Earth's dynamic system remains elusive. Although Malaysia is in a relatively low seismic hazard zone, the current trend and pattern of seismotectonic activities triggered a series of fundamental study to better understand the relationship between the earthquakes, recent tectonics and seismically active fault zones. Several conventional mapping techniques have been intensively used but shown some limitations. Remote sensing is the preferable mean to quantify the seismic activity accurately in a larger area within a short period. Still, only few of such studies have been carried out in this subduction region.

Characterization of seismotectonic activities from space in a tropical environment is very challenging given the complexity of its physiographic, climatic, geologic conditions and anthropogenic activities. There are many factors controlling the success rate of the implementation mainly due to the lack of historical earthquakes, geomorphological evidence, and proper identification of regional tectonic patterns. In this study, we aim at providing better insight to extract and characterize seismotectonic activities by integrating passive and active remotely-sensed data, geodetic data, historical records, GIS-based data analysis and in-situ measurements as well quantify them based on field investigation and expert knowledge. It is crucial to perform spatiotemporal analysis of its activities in the most seismically induced region in North-Western Sabah.

A comprehensive geodatabase of seismotectonic events are developed and allowed us to analyse the spatiotemporal activities. A novelty of object-based image method for extracting tropical seismically active faults and related seismotectonic features are introduced and evaluated. We aim to develop the exchangeable and transferable rule-set with optimal parameterization for such aforementioned tasks. A geomorphometric-based remotely sensed approach is used to understand the tectonic geomorphology in processes affecting the environment at different spatial scales.

As a result of this study, questions related to cascading natural disasters, e.g. landslides can be quantitatively answered. Development and applications of seismically induced landslide hazard and risk zonation at different scales are conceptually presented and critically discussed. So far, quantification evaluation of uncertainties associated to spatial seismic hazard and risks prediction remains very challenging to understand and it is an interest of on-going research. In the near-future, it is crucial to address the changes of climate and land-use-land-cover in relation to temporal and spatial pattern of seismically induced landslides. It is also important to assess, model and incorporate the changes due to natural disasters into a sustainable risk management.

As a conclusion, the characteristics, development and function of tectonic movement, as one of the components for geomorphological process-response system is crucial for a regional seismic study. With newly emerging

multi-sensor of remotely sensed data coupled with the satellite positioning system promises a better mapping and monitoring tool for seismotectonic activities in such a way that it can be used to map, monitor, and model related seismically induced processes for a comprehensive hazard and associated risk assessment.