Reply to comment:

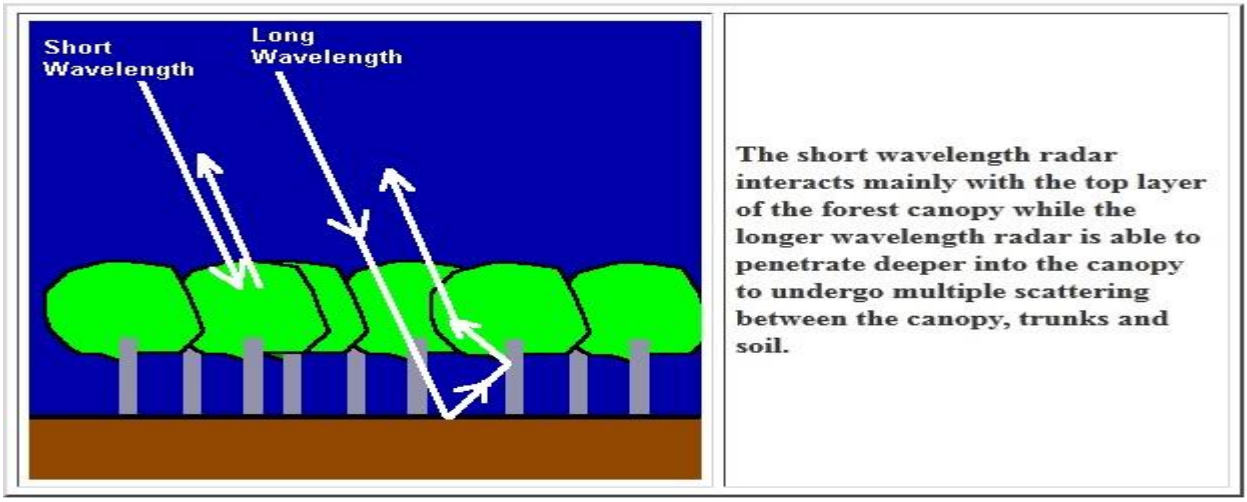
In this study, the results of the first attempt to use Phased Array type L-band Synthetic Aperture Radar-2 (PALSAR-2) data for the purposes of identification of high risk zones for geological origin hazards on tropical environments are presented for an area on Kelantan river basin, Peninsular Malaysia. This study included undertaking robust image processing and interpretation of a ScanSAR observation mode and two fine observation mode scenes associated with comprehensive fieldwork. Standard image processing methods were employed to extract geological information for mapping high potential risk and susceptible zones for natural hazards of geological origin, which is broadly user-friendly approach for geological societies. This study is the first time that L-band SAR remote sensing data is used for identification of high potential risk and susceptible zones for natural hazards of geological origin in tropical environments. It is dire need to apply this approach in Malaysia and other parts of South East Asia that have inaccessible regions and high potential zones for natural hazards of geological origin, which are hidden by dense rainforest. This study and approach used is quite innovative and unique in the field of geological remote sensing.

For your information, this study is not a GIS study to show all stages of producing GIS layers and statistical models. Your suspecting is created because your background is different field. Normally, in the field of geological remote sensing we exhibit the final map (which contains several overlain layers) and we interpret the extracted remote sensing data based on our geological knowledge and existed references in the study area. For your information, there is variety of results using similar image processing technique to satellite remote sensing data for different geological study areas due to different aspects of local geology.

Line 29-30: (The analysis of field investigations data indicate that many of flooded areas were associated with high potential risk zones for hydro-geological hazards such as wetlands, urban areas, floodplain scroll, meander bend, dendritic and sub-dendritic drainage patterns, which are located in flat topography regions). Please read it carefully, we mentioned hydro-geological hazards! It is obvious for all readerships. However, many thanks for your concern.

Line 199-200: (HV polarization is more suitable for lineament extraction and edge enhancement in tropical environments than other polarization channels, because cross-polarization is more sensitive to lineament and also enhances penetration (Henderson and Lewis 1998; Pour and Hashim, 2015a,b). Penetration is proportional to wave-length, and cross-polarization also enhances penetration (Henderson and Lewis 1998).) It is obviously clear for all readerships, we do not mean subsurface. See explanation as follows, which also could be found in introduction of this manuscript.

Explanation: We are really thankful for your kind concern. Longer wavelengths optimize the depth of investigation of the radar signal and allow radar to have complete atmospheric transmission. Generally, the approximate depth of penetration is equal to radar's nominal wavelength. P-band shows the greatest penetration compared to the other bands.



In particular, L-band microwave from PALSAR has ability to penetrate vegetation due to relatively long wavelengths (about 24 cm), making the data particularly useful for geological structural mapping in tropical environments (Igarashi, 2001; Rosenqvist et al., 2004; ERSDAC, 2006; Arikawa et al., 2010; Yamamoto et al., 2013; Pour and Hashim, 2013, 2014 a,b, 2015a,b; Shimada et al., 2015). The wavelength of the L-band is relatively long among microwaves (C-band: about 6 cm and X- band: about 3 cm), allowing it to travel all the way down to the ground through vegetation (Woodhouse, 2006). Not only can information be, obtained about vegetation but information of the ground surface can be obtained as well. Accordingly, L-band can observe the forest's underlying surface features as well as the canopy because of its penetration capability. Thus, in tropical environments, L-band SAR data is capable to provide the possibility of obtaining more useable geological structure information from the ground.