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# Ambient noise tomography of Peninsular Malaysia: New insight to regional geological characterization

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Seismic tomography represents the subsurface "slice picture" or cross section of the Earth's interior, inferred from the waves' characteristic information that propagate through the crustal and uppermost mantle layers. Thus, ambient noise tomography is a subsurface tomographic analysis that produced by incorporating surface wave group velocity travel time information which derive from the interferometry of ambient noise recording data. In this study, the seven-months duration data recorded from seven weak-motion sensors located within the Peninsular Malaysia were processed, cross-correlated and interpreted. The cross correlation between a long enough ambient signal will yield the surface wave dispersion signal, which often reliable for the surface wave tomography analysis. As demonstrated by several seismological investigation, the Green's functions can be extracted which subsequently yield Rayleigh and Love waves velocity for the tomography analysis. In this study, the ambient noise data was processed according to procedure describe by Bensen et al., (2007), before the dispersion analysis was conducted using multiple filter technique. The fast-marching method (FMM) was incorporated for arrival time's forward and inverse modelling tomographic algorithm. From the result obtained, the group velocity maps indicate a correlated feature with the geological structures of the region. The main striking feature is the high velocity recorded at the West side of Peninsular Malaysia, in between IPM and FRM stations. This high surface wave velocity which close to 4.0 km/s is attributed to the granitic block of Titiwangsa / Kledang ranges, that lies in NNW-SSE direction. Comparatively, the Eastern block of Peninsular Malaysia region contains the velocity with an average of 2.8 km/s, which relatively stable from short to long periods. Nevertheless, a slower velocity is detected near to KTM station, that occurred during the 15 s and 20 s period. One possible explanation for this sudden velocity drop is the subsurface suppression underneath the Kenyir hydro-electric dam, as a result of water pounding impact from the large-scale reservoir. Another distinctive feature that deduced from the ambient noise tomography work is the distinctive blocks separation between Sibumasu and Indochina, which clearly evident on the shorter period. For the deeper depth (>30 km) and longer period, a velocity contrast between Central Belt and Eastern Belt can be clearly seen where the Eastern Belt possess a slower velocity. Within the Western part of peninsular, a clear Kuala Lumpur and Bukit Tinggi fault zone is drawn as the velocity disparity is recorded nearby the FRM station. Slower velocity anomaly that visible from Klang, Selangor is pass through Kuala Lumpur and Bukit Tinggi, before oriented towards Southern part of Peninsular Malaysia. These findings are comparable with the surface outcrops and geological map obtained from Malaysia Mineral and Geoscience Department (MGD). The first in-kind tomography analysis of Malay Peninsula has provided the solution for the velocity ambiguity in the complex geological structure.