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Structural analysis of the Bentong-Raub Suture Zone using PALSAR remote sensing data, Peninsular Malaysia: Implications for sediment-hosted/orogenic gold mineral system exploration

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The Bentong-Raub Suture Zone, genetically related to numerous sediment-hosted/orogenic gold deposits, comprises major lineaments and form-lines in the Central Gold Belt of Peninsular Malaysia. This suture zone of Peninsular Malaysia is also one of the major structural zones in Sundaland, southeast Asia [1]. It forms the boundary between the Gondwana-derived Sibumasu terrane in the west and the Sukhothai arc in the east. The Central Gold Belt formed along the margin of Gondwana and at the site of collision between Sibumasu and the Sukhothai arc [2].

This investigation has used Phased Array type L-band Synthetic Aperture Radar (PALSAR) satellite remote sensing data to analyze major geological structures in Peninsular Malaysia and provide detailed characterization of lineaments and form-lines in the Bentong-Raub Suture Zone, as well as to define implications for sediment-hosted/orogenic gold exploration in tropical environments. Major transcrustal lineaments (such as the Bentong-Raub Suture Zone and Lebir Fault Zone), areas of ductile deformation related to crustal shortening, brittle disjunctive structures (such as faults and fractures), and a collisional mountain range (Main Range Granites) were detected at the regional scale using PALSAR ScanSAR data. The major geological structure directions of the Bentong-Raub Suture Zone are N-S, NNE-SSW, NE-SW, and NW-SE, which are derived from directional filtering analysis of PALSAR fine and polarimetric data. The pervasive array of N-S faults in the study area and surrounding terrain is mainly linked to the N-S trend of the suture zone. N-S striking lineaments are commonly cut by younger NE- and NW-trending lineaments. Three generations of folding have been discerned from remote sensing structural analysis. Gold trends along lineaments are associated with the intersection of N-S, NE-SW, NNW-SSE and ESE-WNW faults and curvilinear features in shear and alteration zones. Compressional structures, such as a

NW-trending thrust, ENE-oriented faults in mylonite and phyllite, recumbent folds, and asymmetric anticlines in argillite are areas of high potential for gold discoveries. Lineament analysis on PALSAR satellite remote sensing data is a useful tool for detecting the boundaries between the Gondwana-derived terranes and other major geological features with high favorability for sediment-hosted/orogenic gold deposits, particularly in inaccessible regions in tropical environments.

References:

[1] Metcalfe I (2013a). Tectonic evolution of the Malay Peninsula. Journal of Asian Earth Sciences. 76: 195-213.

[2] Metcalfe, I (2013b). Gondwana dispersion and Asian accretion: Tectonic and palaeogeographic evolution of eastern Tethys. Journal of Asian Earth Sciences 66, 1-33.