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A New Integrated Coal Prospecting Tool For SE Asia: A Remote Sensing and Geophysical Approach

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Introduction

SE Asia has high coal potential but many parts are under-prospected because of the dense forest which makes it difficult to use conventional methods of ground exploration. The methodology to be used here will commence with a pilot study of eastern Kalimantan, a well known coal producing area. The pilot study area of around 400-200 km² would include active coal mines and neighboring geologically contiguous areas of forest where the Integrated Coal Prospecting tool could be ground tested.

Project Aim: The aim is to build a new Integrated Coal Prospecting Tool for tropical forested areas like SE Asia.

Methodology: It is planned to use multi-source remote sensing technology to map the coal-bearing area. Initially, a regional scale remote sensing survey, on the scale of the Kutei Basin will be carried out to study the regional geological framework, followed by a narrowed down approach and finally ground survey of the pilot study area(s). For example, the Kutei and/or Barito Basins in E Kalimantan will provide an excellent pilot study area since the geology is reasonably well known and working coal mines are situated in areas where the forest has been partially cleared. The methodology will have an integrated approach of three components: i) purely remote sensing techniques from microwave, multispectral and hyperspectral data for regional, local and detailed surveys; ii) geophysical investigations from satellite based GRACE mission and airborne LiDAR survey for regional and local surveys and iii) published field based geological surveys to ground truth the pilot study area(s).

GRACE gravity data will be used to characterise and understand the geotectonic traces that were retained after repeated crustal movements. Positive gravity anomalies will reflect uplift zones, anticlinal belts and raised fault blocks. Low gravity anomalies reflect sedimentary basins, synclinal belts, fault depressions and graben structure and the concealed structure of the basement of the basin. The latter are likely to conceal coal fields.

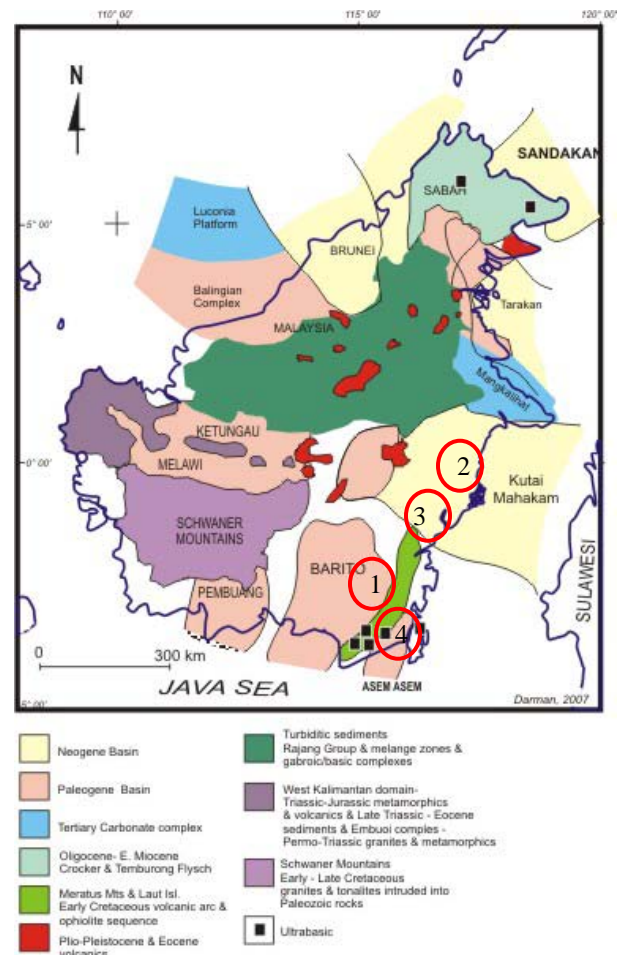


Fig. 1. Areas of interest in Kalimantan circled in red(1-4)

Multi-criteria analysis of satellite, airborne and ground truth data from the pilot study area(s) will be brought together into a multilayered GIS

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platform through geospatial integration and spatial statistical techniques to build a new Integrated Coal Prospecting Tool for tropical forested areas like SE Asia.

Results so far: We have used the literature and low resolution Google Earth to locate open cast coal mining areas in K Kalimantan (see Fig. 2)



Fig. 2. Low resolution Google image of coal mining area (1) in Fig. 1 (circled). Yellow scale bar is ~3 km.



Fig. 3. Closer view image of coal mining area in Fig. 2 showing (black) coal seams dipping gently towards the NNW. Yellow scale bar is ~0.5 km.

High resolution false colour SPOT images of a coal mine in E Kalimantan show details of the geology including the fold structures (Fig.4).

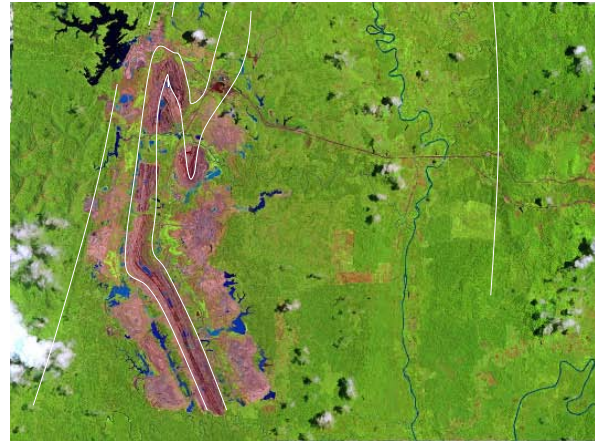


Fig 4. False colour SPOT image of coal mine in SE Kalimantan (area 1 in Fig. 1) reveals fold structures in coal measures (pink). Image is ~ 20 km across.

LiDAR successfully penetrates forest cover and reveals coal seams (Fig. 5.)

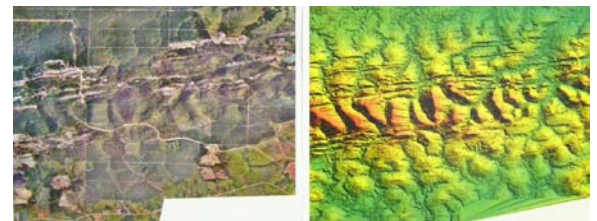


Fig. 5. Coal mining area in Kalimantan: Ortho-colour image on the left. LiDAR digital terrain map (DTM) on the right, with forest cover removed showing exposed coal seams. Images are ~ 0.75 km across.

The advantage of this prospecting tool will be that it may pick up vegetation associated with coal seams and then literally “see through the trees” to map the ground surface details. If the prospecting tool works in Kalimantan then it should work in other forested areas in SE Asia e.g. Malaysia, Java, Sumatra, New Guinea, Philippines.

Contact

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