Preliminary determination of geothermal working area based on Thermal Infrared and Synthetic Aperture Radar (SAR) remote sensing

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Abstract. Remote sensing is one of the methods for geothermal exploration. This method can be used to map the geological structures, manifestations, and predict the geothermal potential area. The results from remote sensing were used as guidance for the next step exploration. Analysis of target in remote sensing is an efficient method to delineate geothermal surface manifestation without direct contact to the object. The study took a place in District Merangin, Jambi Province, Indonesia. The area was selected due to existing of Merangin volcanic complex composed by Mounts Sumbing and Hulunilo with surface geothermal manifestations presented by hot springs and hot pools. The location of surface manifestations could be related with local and regional structures of Great Sumatra Fault. The methods used in this study were included identification of volcanic products, lineament extraction, and lineament density quantification. The objective of this study is to delineate the potential zones for sitting the geothermal working site based on Thermal Infrared and Synthetic Aperture Radar (SAR) sensors. The lineament-related to geological structures, was aimed for high lineament density, is using ALOS - PALSAR (Advanced Land Observing Satellite - The Phased Array type L-band Synthetic Aperture Radar) level 1.1. The Normalized Difference Vegetation Index (NDVI) analysis was used to predict the vegetation condition using Landsat 8 OLI-TIRS (The Operational Land Imager – Thermal Infrared Sensor). The brightness temperature was extracted from TIR band to estimate the surface temperature. Geothermal working area identified based on index overlay method from extracted parameter of remote sensing data was located at the western part of study area (Graho Nyabu area). This location was identified because of the existence of high surface temperature about 30°C, high lineament density about 4 - 4.5 km/km2 and low NDVI values less than 0.3.

1. Introduction
Remote sensing is a common exploration technique for preliminary survey and aiding the complicated methods such as geology and geophysical surveys. Remote Sensing is the science and art of obtaining information about an object, area, and phenomenon through the analysis of data acquired by a device that is not contact with the object, area, and phenomenon under investigation [1]. In geothermal studies,