Virgo_2019

by Artikel 21 Artikel21

Submission date: 05-Apr-2023 10:27AM (UTC+0700)
Submission ID: 2056258005
File name: Virgo_2019.pdf (1.56M)
Word count: 2025
Character count: 10674

Journal of Physics: Conference Series

Fracture indentification around the aum geothermal manifestation using 2d resistivity method

To cite this article: F Virgo *et al* 2019 *J. Phys.: Conf. Ser.* **1282** 012038

IOP Conf. Series: Journal of Physics: Conf. Series **1282** (2019) 012038 doi:10.1088/1742-6596/1282/1/012038

Fracture indentification around the aum geothermal manifestation using 2d resistivity method

F Virgo[a], Erni, A K Affandi, and M Y N Khakim

Physics Departement, Faculty of Mathematics and Natural Science, Sriwijaya University, 30662 Ogan Ilir, South Sumatra, Indonesia.

Email : [a] frinsyahvirgo@mipa.unsri.ac.id

Abstract. The research about fractures identification around the geothermal manifestations of The Airklinsar Ulu Musi (AUM) in South Sumatra Indonesia has been carried out. The specific identification was carried out using 2D resistivity method. There are at ease four measurement lines were properly used (The proper length is 384 m.). Those are direct parallel to each other (with the considerable distances are 150 m), and also to the possible strike of Barisan Mountain. Line 1 typically comprises a visible track that intersects some of the geothermal manifestations. The ultimate aim of the comprehensive study was to accurately determine the porous zone scientifically based on the local distribution of rock resistivity values. This porous region is analogous to an extensive area of the possible fracture that acts as a conduit for geothermal fluid to the earth surface. The satisfactory results sufficiently showed that the fracture zone pattern was only exist below Line 1 (with a possible distance of 256-288 m), with starting at a desired depth of five up to 35 m. The specific zone is accurately represented by the resistivity value ranging 15 up to 192 Ωm. Furthermore, it can be reasonably assumed that the fracture pattern below the Line 1 is precisely a possible crack. It extends inward (not extending in the possible direction of the other line) until it encounters the primary fault, the Sumatran Fault.

1. Introduction

The AUM geothermal is accurately located in the Empat Lawang Regency, South Sumatra Indonesia. There are naturally several specific manifestations, such some hot springs, warm ground and altered rock. The geothermal system is correctly representing an elevated temperature. The speculative potential is precisely ±13 MW suitable for effective use as an efficient power plant for local needs. In Figure 1, the local UTM coordinates are X: 247256 and Y: 9577991, with rock stratigraphy naturally included in the Hulusimpang Formation [1]. However, the specific recommendation of the precise location of the test drill to be properly used in the exploitation stage, in the published study there was no explicitly mentioned. For this possible reason, we will accurately identify fracture zone around the visible manifestations that can act reasonably as conduits for hot fluid rise to the earth surface. Guenergar at.al (2014) stated the possible fracture was reliably identified as a porous zone characterized by a low distribution of unique value of rock resistivity (±11.2 up to 113 Ωm).

2. Method

In this observational study no specific material was traditionally used. Necessary data properly obtained from direct measurements of the resistivity properties of surface rocks around geothermal manifestations typically using a Nainura NRD-300. Next the other restrictions exert are 2 12 Volt dry batteries as an ideal voltage source. 2 Garmin GPS 78s for correctly positioning the measuring point. 2 Lensatic compasses for accurately determining the desired direction and precise alignment of metering trajectories. 2 roll gauge for carefully specify the path length and spacing electrodes of measuration. Eight BF888S handy talkies that are precisely employ as communication equipment during the data acquisition process. And four rollers (@ 500 m) connector cables wield as an effective communicator from the primary device to the electric current and potential poles.

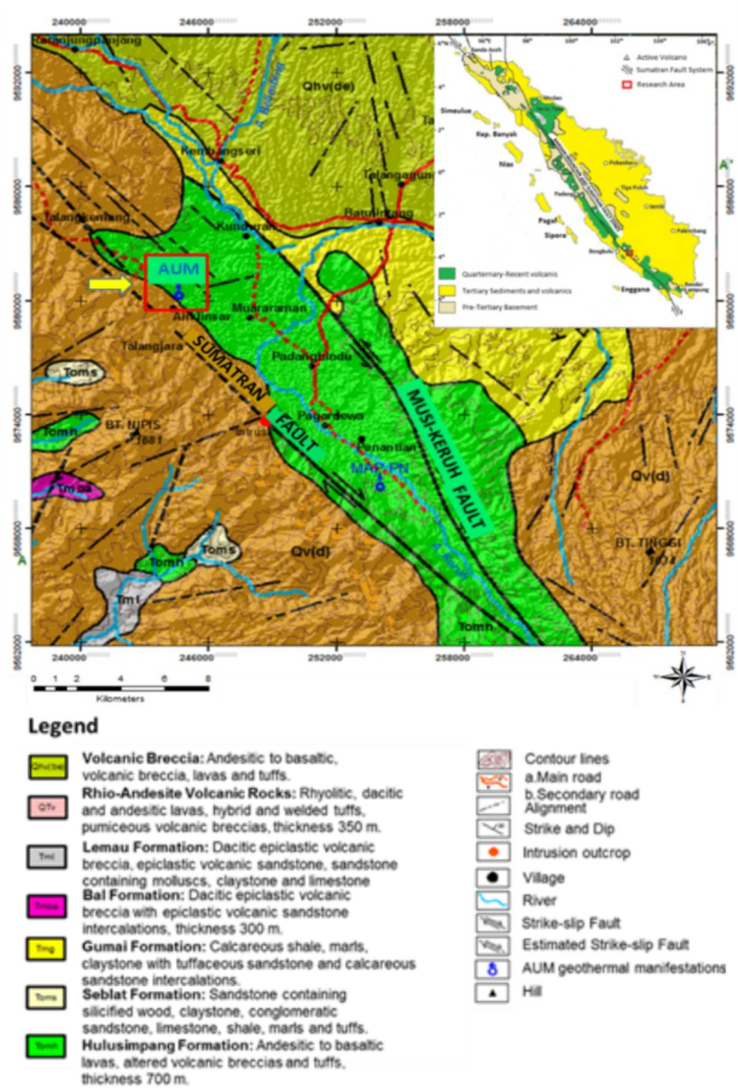


Figure 1. Regional Geological Map of Empat Lawang Regency of South Sumatra. The red box designated by the golden arrow represents the location of the study on the regional geological map. Inset: Possible position of the regional geological of the active research area on the map of Sumatra (Modified from [1]).

IOP Conf. Series: Journal of Physics: Conf. Series **1282** (2019) 012038 doi:10.1088/1742-6596/1282/1/012038

The electrode configuration typically used is properly 2-D Wenner. Typical measurements knowingly employing four specific lines of each effective length are 384 m. The sufficient distance between marked tracks is 150 m and the electrode spacing is 8 m. The metering layout can be seen in Figure 2, the red line strikingly illustrates the unique pattern of the desired level of standard measurement traditionally performed.

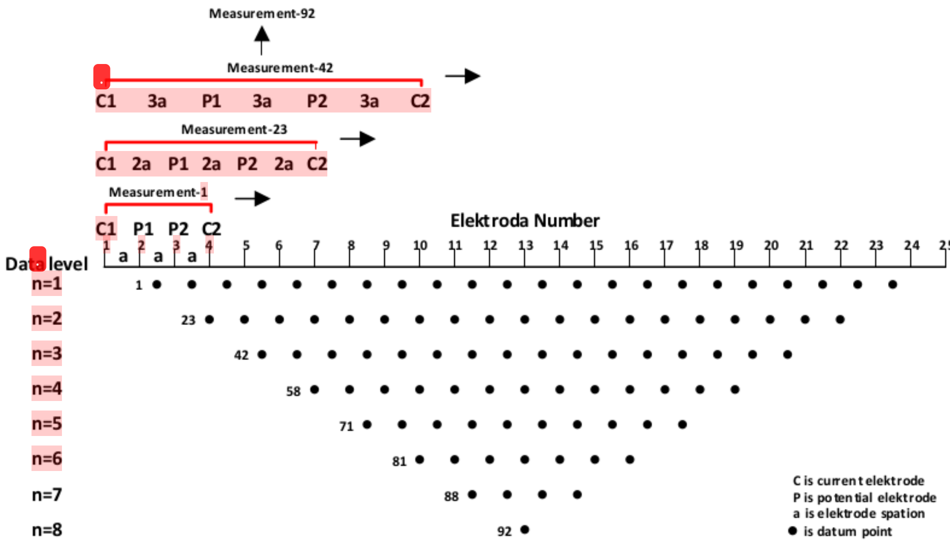


Figure 2. The layout of 2-D Wenner measurument (redrawn from [2])

Measured data in the unique form of electric current and potential grades for each measurement position. Then by using the apparent resistivity equation [2] the accurate value is correctly calculated per depth level. The further step is traditionally to carry out 2-D modeling to reliably determine the actual value reasonably using Res2dinv software ver. 3.59. The possible results of this modelling are the distinct form of a vertical cross-sectional map that sufficiently illustrates the gradual change in the actual resistivity value to the depth function for each measurement path. Furthermore, the resulting map conveniently showed the qualitative analysis and interpretation stages of the distinct clusters of low iso-resistivity anomaly contours which adequately described the adaptive response of the physical properties of porous and flowing water saturated local rocks. The effective deployment of the porous zones is analogous to the fracture area and aquifer rocks (to accurately determine the specific pattern of groundwater flow) which are naturally below the surface. As a consistent whole, the completed stages of the research method can be seen in Figure 3.

3. Result and Discussion

Figure 4 (A) shows that below Line 1 to a distance of 192 m there is no porous zone pattern as an analogy of the fracture region. Distribution of resistivity values betwen 15-81,9 Ωm is suspected as claystone. This value is in the range of clay resistivity (1-100 Ωm) stated by [2]. Subsequently, it is ranging 192-448 Ωm is fathomed to obtain volcanic breccia. This is based precisely on observed variations in the resistivity value of breccia rocks (150-775 Ωm) published by [3]. While the considerable variation in resistivity values among 1049-2454 Ωm is expected to be tuff rock, because in [4] stated that variations in the resistivity value of Tuff rock are in contrast 2000-10000 Ωm. The fracture pattern can be seen in Figure 4 (B), which is at a distance of about 256 up to 288 m, starting at a desired depth of five up to 35 m. The specific zone is accurately represented by the resistivity value ranging 35 up to 192 Ωm. Furthermore, it can be reasonably assumed that the fracture pattern below the Line 1 is precisely a possible crack. This is positively related to the results of research conducted by [5], namely that the fracture is indicated as a weak zone that has a resistivity value of 11.2-113 Ωm with its lithology is tuff-sandstone. That extends inward (not extending in the possible direction of the other line) until it encounters the primary fault, the Sumatran Fault. Meanwhile, in Figure 6, based on the contour pattern that occurs and the value of resistivity, there are no both local distributions which sufficiently indicate a fracture zone.

Next, based on Figure 4 (A), it can be seen that the fracture pattern is thought to extend inward, so the position of the test wellbore point is best recommended at a distance below 256 m outside the fracture position. This is based on consideration to avoid the occurrence of blow ups or loss of pressure during drilling, if the position of the wellbore point is placed above the fracture zone.

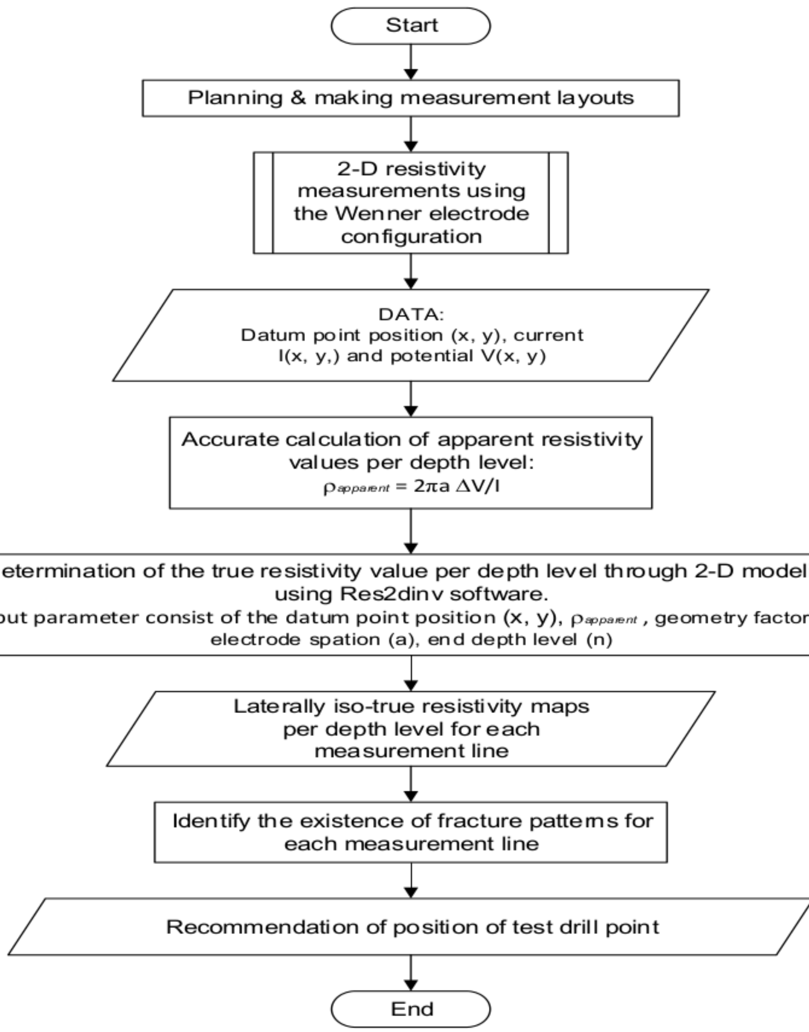
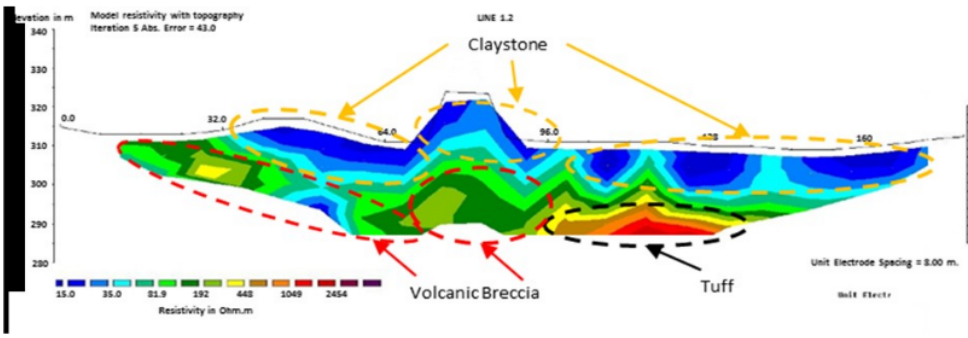
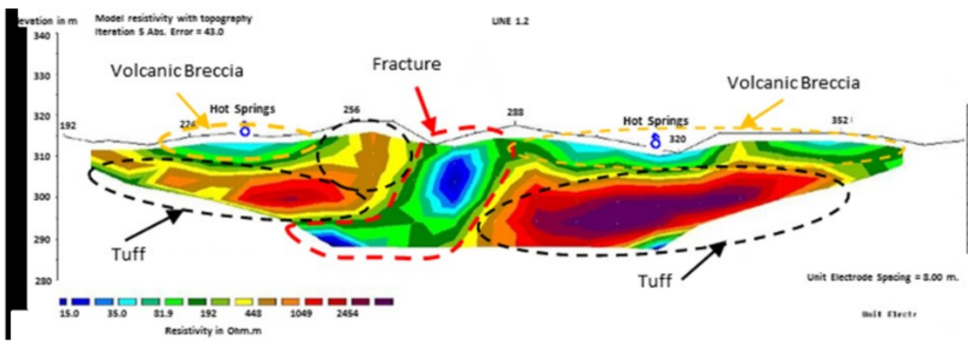


Figure 3. Flowchart of research method.



(A)



(B)

Figure 4. (A) The iso-true resistivity distribution map of Line 1 of 192 m (B) The iso-true resistivity distribution map of Line 1 with a possible distance of 192 – 384 m.

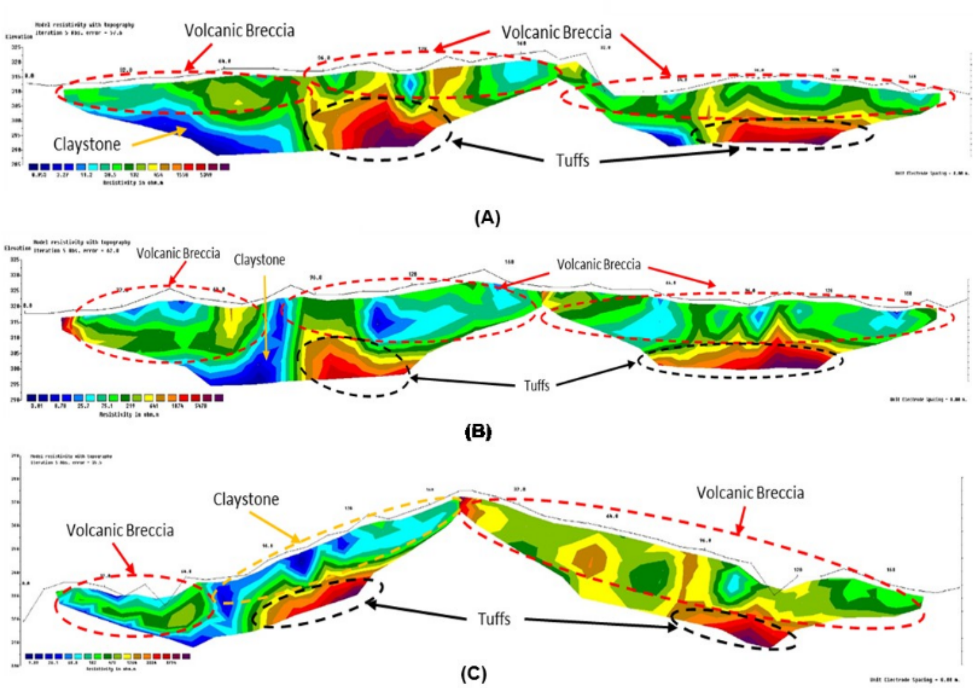


Figure 5. (A) The resistivity distribution map of Line 2 (B) The resistivity distribution map of Line 3 (C). The resistivity distribution map of Line 4. Of the three lines above, there is typically no resistivity distribution which sufficiently indicates a fracture zone.

4. Conclusion

The fracture zone which controls the existence of the AUM geothermal manifestation is expected to be at a distance of 276 m from the starting point of line 1, identified having a resistivity value of 15-192 Ωm. Then, the position of the test wellbore is recommended at a point length below 256 m.

Acknowledgement

The researcher elegantly expressed a humble gratitude to Sriwijaya University, for the necessary funding through the grand Competitive Featured Research scheme, Fiscal Year 2018. Therefore this research can be satisfactorily completed.

References

[1] Virgo F 2017 *Research Geophysics and Geochemistry In Pasemah Air Keruh Geothermal Prospect Area Of South Sumatra* (Doctoral Dissertation, Gadjah Mada University) **135** p
[2] Loke M H 2000 *Electrical Imaging Surveys For Environmental and Engineering Studies; A Pratical Guide To 2-D and 3-D Surveys* (Malaysia)
[3] IODP Publication. 2012. *Physical Properties*, www-odp.tamu.edu/publications/149_IR/chap.06/c6_12.htm
[4] Telford W M, Geldart L P and Sheriff R E 1990 *Applied geophysics second edition* (United Kingdom: Cambridge University Press) p 290
[5] Guenergar A, Harmoko U and Widada S 2014 *Youngster Physics Journal* **3** 279-282

Virgo_2019

ORIGINALITY REPORT

3%	%	3%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

2%

★ U. E. Sibilski. "Application of remote and ground sensing studies in the development of a typical groundwater monitoring programme", International Journal of Environmental Studies, 4/2007

Publication

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		