Correlation between gravity and magnetic data and its impact for geological structural phenomena in Kuningan, West Java, Indonesia

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Abstract: Kuningan district is located in the eastern part of west java province. It has uniquely geological feature. In the western part of this district is dominated by volcanic products from the eruption of mount ciremai, while in the eastern part it is dominated by tertiary rocks formation. Geophysical investigations have been conducted to identify subsurface phenomena in eastern part of Kuningan i.e. Lebakwangi sub-district. The results showed that the fault zone has a magnetic anomaly value and bouguer anomalies are inversely proportional, the higher the magnetic value the lower the bouguer anomaly value. faults have a tendency towards the northwest - southeast. The study area tends to be covered by the young volcanic deposits of mount ciremai eruption that overlay the tertiary rocks beneath it so that the existence of the faults tends to be disguised. The inverse geophysical data has an impact on the interpretation of the existing fault structure at the study area where the hanging wall footwall tend to be disguised. Need further geological and geophysical research to further identify the presence of faults in this study area.

1. Introduction

Geological structures encountered in the research area in Lebakwangi District, Kuningan Regency, West Java Province, is a symptom of regional dispersal of structures. The structure of Java Island in general is west-east, the Bogor Zone is restricted by a Northwest-trending fault-based faults. The research area includes the eastern tip of the Bogor Zone which is folded strongly to produce an anticlinorium that trails west-east. In addition there is a fault - a cesarean that causes a shift from anticline axes and occurs after the deposition of Halang Formation [1].

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Geophysicists study all the earth's contents both visible and not directly visible by measuring physical properties with adjustments generally on the surface. Geophysical methods commonly used for Geological Structure Exploration [1,2,3,4]. The aim of this study is to analysis Correlation between Gravity and Magnetic Data. The Hypotesis of this study is there is Correlation between Gravity and Magnetic Data.

2. Regional Geology
The area of Kuningan Regency is largely composed of sedimentary and volcanic rocks, the rest being alluvium deposits that have been deposited since the Miocene. Stratigraphically and grouping from old to young, the rock consists of a Pemali Formation with a thickness of 500 m spread over the southwest and southeast; Formation Rambatan with 300 m thick, narrow spread in the south; Formation of Lawak with 150 meters thick, spread in the east; Kumbang Formation with thickness close to 2000 m spread in the south; Halang formation with a thickness of more than 400 meters, spread over the south and east; Members of Lebakwangi Halang Formation with narrow spreading in the center and southeast; Members of Mount Hurip Halang Formation with thickness 200 - 400 meters spread in the southwest; Cijerang Formation scattered in the north and center; Gintung Formation with thickness of 800 meters spread in the north; Cipedak Lahar sediment which is estimated as a result of the eruption of old Ciremai Mountain, spread in the middle around the valley of the river Cisanggarung; The results of the undiminished Old Fires are scattered in the north and south of Mount Ciremai; Breccia The result of the Old Firm spreads extending from the west to the middle; Lava Result of Old Fires scattered in the northern and southern slopes of Mount Ciremai; Unexplained Young Lava Lava that spreads in the west to the middle; Lava Young Apes are spread sporadically in the east and south; River steps with a thickness of less than 20 meters, spread over the east; Alluvials are sporadically scattered around the Darma Reservoir, the Cisanggarung River valley, and the Cijangkelok River valley [1].

3. Methods
Data collection is done throughout the study area, with points that resemble the track grid (Figure 1a & 1b) [5,6,7,8]. These paths are selected to determine the subsurface sections produced in the research location.

![Figure 1a. Gravity Datum Points](image1.png)

![Figure 1b. Magnetic Datum Points](image2.png)

Statistical interpretation of results between Magnetic data and gravity data using statistical analysis test Pearson product Moment (PPM) and Spearman. Based on this data, Ho is that there is a correlation between Gravity and Magnetic Data. H1: $\mu_1 \neq \mu_2$ that there is no a correlation between Magnetic and gravity data.
after obtained the necessary data, then performed data processing. Processing on gravity data is done by performing correction-correction on field data that has been obtained. Next is filtered using Oasis Montaj software to find out the variation of gravity anomaly from Gravity survey result data.

**Figure 2. Study Flow Chart**

### 4. Result and Discussion

#### 4.1 Result

The results of data processing shows data anomaly bouguer quite varied. The bouguer anomaly value in the study area ranged from 106 mGal - 162 mGal. Regions with low bouguer values are located in the northeast of the study area, marked by a purple to blue value, while regions with high bouguer values are in the southwest of the study area. High bouguer anomaly values in the southwest region are thought to be derived from tertiary-tertiary rocks that are the basement of the study area. The results of data processing shows the value of the total magnetic anomaly is quite varied. The total magnetic anomaly value in the study area ranged between -300 - 200 nT. Regions with low magnetic anomaly values are located in the southwest of the research area, characterized by purple to blue values, while areas with high total anomaly magnetic values are in the northeast direction of the research area. The low magnetic anomaly value in the southwest region is thought to be derived from tertiary tertiary rocks that are the basement of the study area.

The total magnetic anomaly value is quite varied. The total magnetic anomaly value in the study area ranged from -300 - 200 nT. Region with a low magnetic anomaly values are in the southwest area of research, characterized by values of purple to blue, while the region with the high value of total magnetic anomaly located in the northeast area of research. The low magnetic anomaly value in the southwest region is thought to be derived from tertiary tertiary rocks that are the basement of the study area.

Bouguer Anomaly Map and Magnetic Total Anomaly Map indicate there is a geological structure in the direction of regional geological structure that is northwest-southeast direction. The line of this structure is as if by separating the block located in the southwest with the northeast of the research area. The northeast block is thought to be a foot wall block while the block to the southwest is a block of hanging wall.
4.2 Discussion

There is inverse correlation between magnetic and gravity data. The results showed that the fault zone has a magnetic anomaly value and bouguer anomalies are inversely proportional, the higher the magnetic value the lower the bouguer anomaly value. Faults have a tendency towards the northwest - southeast. The study area tends to be covered by the young volcanic deposits of Mount Ciremai eruption that overlay the tertiary rocks beneath it so that the existence of the faults tends to be disguised. The inverse geophysical data has an impact on the interpretation of the existing fault structure at the study area where the hanging wall footwall tend to be disguised. Need further geological and geophysical research to further identify the presence of faults in this study area.
5. Conclusion
From result of Gravity and Magnetic data processing, can be obtained information that there are indication of structure at research location, pattern of structure (fault) and alignment that have direct relative northwest-southeast, which is almost same with pattern of alignment and its regional structure. From this study we can conclude that there is inverse correlation between magnetic and gravity data in the research area.

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