GEOLOGIC CHARACTERISTICS OF THE MARIKINA VALLEY, PHILIPPINES

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ABSTRACT. *The study area is considered part of the southeastern edge of the Luzon Central Valley. Magnetic survey has been carried out using two proton precession magnetometers to measure magnetic field on selected locations on the study area. The main objectives of this study are; 1) to study the magnetic characteristic of the study area, 2) to delineate rock units and structures found in the study area, and 3) to support the theory of Marikina-San Mateo uplifted block. The study area is characterized by zones of high and low magnetic reading which are influenced to large extent by the lithology, mineral composition and structure of its underlying material. The high density of lineament in the central block is believed to be hosted by Guadalupe Formation and not by the Quaternary Alluvium and may represent faults related to upliftment of this block. Interpretation of the magnetic survey can be correlated with and highly supported by structural analysis of the San Mateo-marikina area, which is an uplifted block.*

INTRODUCTION

The applications of the portable magnetometer has the primary objectives of identification and description of spatial changes in the earth's field. The spatial variations or anomalies to be mapped for these applications are those which might occur over several feet or several thousands of feet and are usually caused by anomalous distribution of magnetic minerals or by iron objects or cultural features which may be of interest. The anomalies from naturally occurring rocks and minerals are due chiefly to the presence of the most common magnetic minerals, magnetite (Fe_2O_3) or its relative minerals, ulvospinel, titanomagnetite, maghemite, etc. which will collectively be referred to as magnetite. All rocks contain some magnetic from very small fraction of a percent up to several percent and even several tens of percent in the case of magnetic iron ore deposits. The distribution of magnetite or certain characteristics of its magnetic properties may be utilized in exploration or other mapping purpose.

OBJECTIVES

The main objectives of this study are; i) to delineate rock units and structures in study area (Fig.1), ii) to support the theory of the Marikina - San Mateo uplifted block, iii) to correlate the magnetic data with other geophysical data.

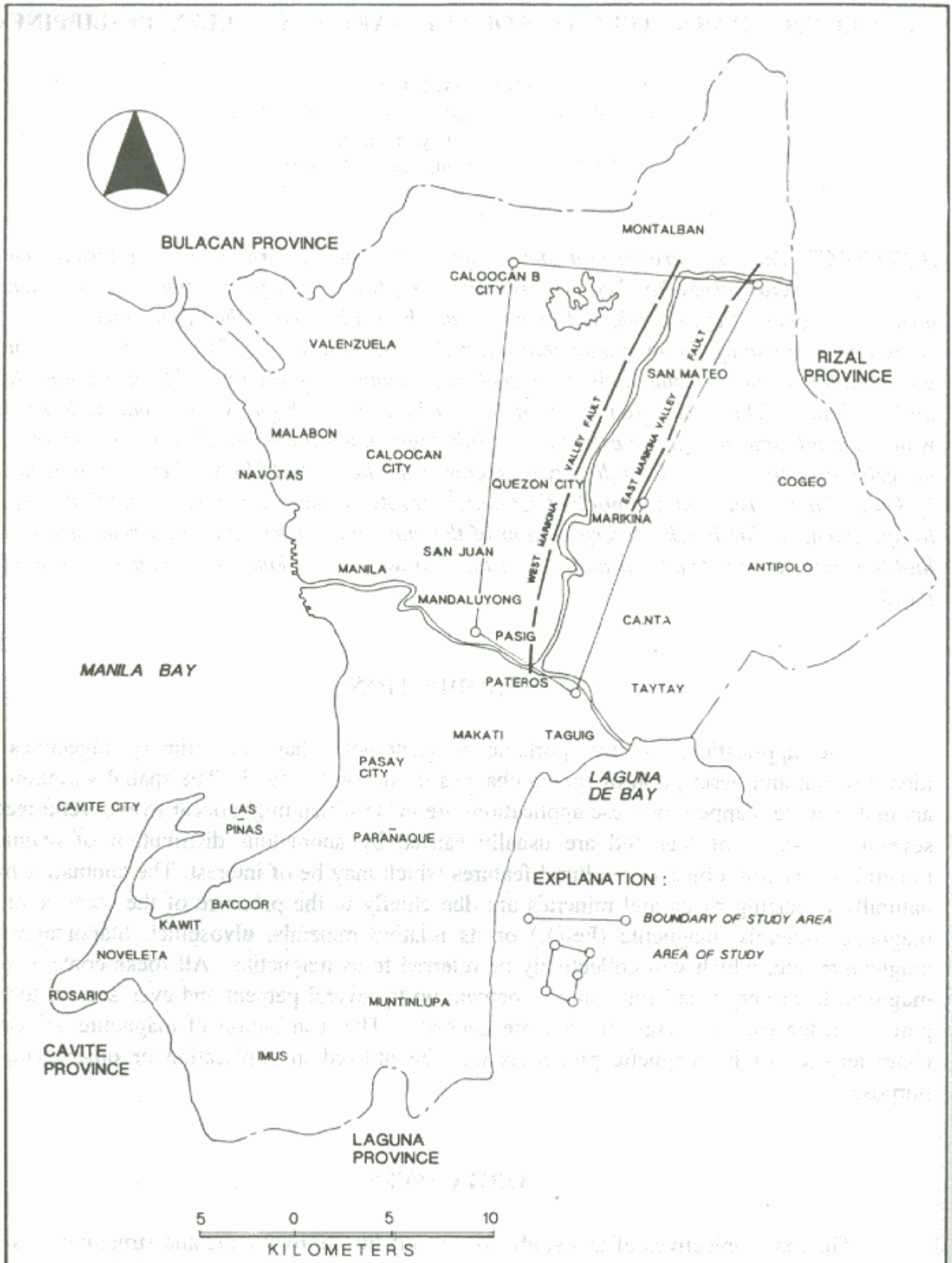

FIG. 1 : LOCATION OF STUDY AREA.

stored in a separate file. After storage, it is necessary to apply correction to the raw data. The MAG-PAC program utilizes two filtering techniques namely 5 point averaging and linear interpolation. Both filtering techniques were used and compared.

The corrected data can now be imported by another program for further processing. To generate diurnal curve or plot; the graphics capability of Lotus Symphony was used. Using a graphic plotter, a very neat and presentable diurnal curve was generated (Fig. 5). The spread sheet capability of the program treated the field data for the calculation of average, minimum value, maximum and the standard deviation. The calculated average of the five readings for that station will be the final values for that spot and will be used for contour generation.

LOCATION AND MORPHOLOGICAL FEATURES

The areas of investigation are the municipalities of Pasig, Marikina, San Mateo and Montalban and Quezon City, all in the Metro Manila and Rizal Province (Fig.1). These occupy a narrow north-northeast - south-southeast trending rectangular strip. It is bounded by latitudes 14°34' to 14°44' and longitudes 121°03' to 121°09'.

The latest movement of the Marikina Valley Faults gave rise to the present landforms in the study area. The area can be divided into three contrasting physiographic features: 1) the upland west of the Valley, 2) Marikina Valley, and 3) the mountainous area east of the Marikina Valley (Fig. 2). The upland is bounded on the east by the West Marikina Valley Fault and underlain by tuffaceous rocks while the Marikina Valley is covered by Quaternary Alluvium and delta deposits. The third physiographic feature is bounded on the west by the East Marikina Valley Fault and is underlain by basalt.

Figure 2 shows the composite column of rock units exposed in the study area (Faisal, 1990). Three lithologic units are present in the local mapping area, the Alagao Volcanics, Guadalupe Formation and the Quaternary Alluvium.

GEOLOGICAL STRUCTURE

The geologic map (Fig. 3) based on photogeologic interpretation and field observation for this study reveals four fault systems in the area: the Marikina, Nangka, Montalban and the Guadalupe Fault systems. Movements along these structures strongly influenced the morphology of the study area. Several secondary faults or fracture system can be observed traversing the fault zone and its vicinities. The rock formation within the fault zones and vicinities are controlled by heavy joints and fractures generated by the Marikina Faults. The joints are often unfilled by secondary materials. The presence of such discontinuities greatly influences the mechanical behavior of the rock.

AGE		COLUMN	THICK-NESS (m)	NAME		DESCRIPTION
QUARTERNARY						ALLUVIAL AND MARINE DEPOSITS UN-CONSOLIDATED GRAVEL, SILT & CLAY
PLEISTOCENE			1,300 - 2,000	GUADALUPE FORMATION	DILIMAN TUFF	PYROCLASTICS - ANDESITIC AGGLO-MERATE, LAPILLI TUFF, TUFF SEDIMENTARY - TUFFACEOUS CON-GLOMERATE, SANDSTONE, SILTSTONE
					ALAT CONGLO-MERATE	NO EXISTING DATA IN STUDY AREA
PLIOCENE						
MIOCENE	LATE					
	MIDDLE		?	MADLUM FM.	ALAGAO VOLCANICS	BASALTIC AGGLOMERATE-VARIC-COLORED CLASTS OF PYROXENE BASALT PORPHYRY, TUFF HORNBLENDE DACITE, CHERT

Figure 2: Local stratigraphy of the study area (Faisal, 1990).

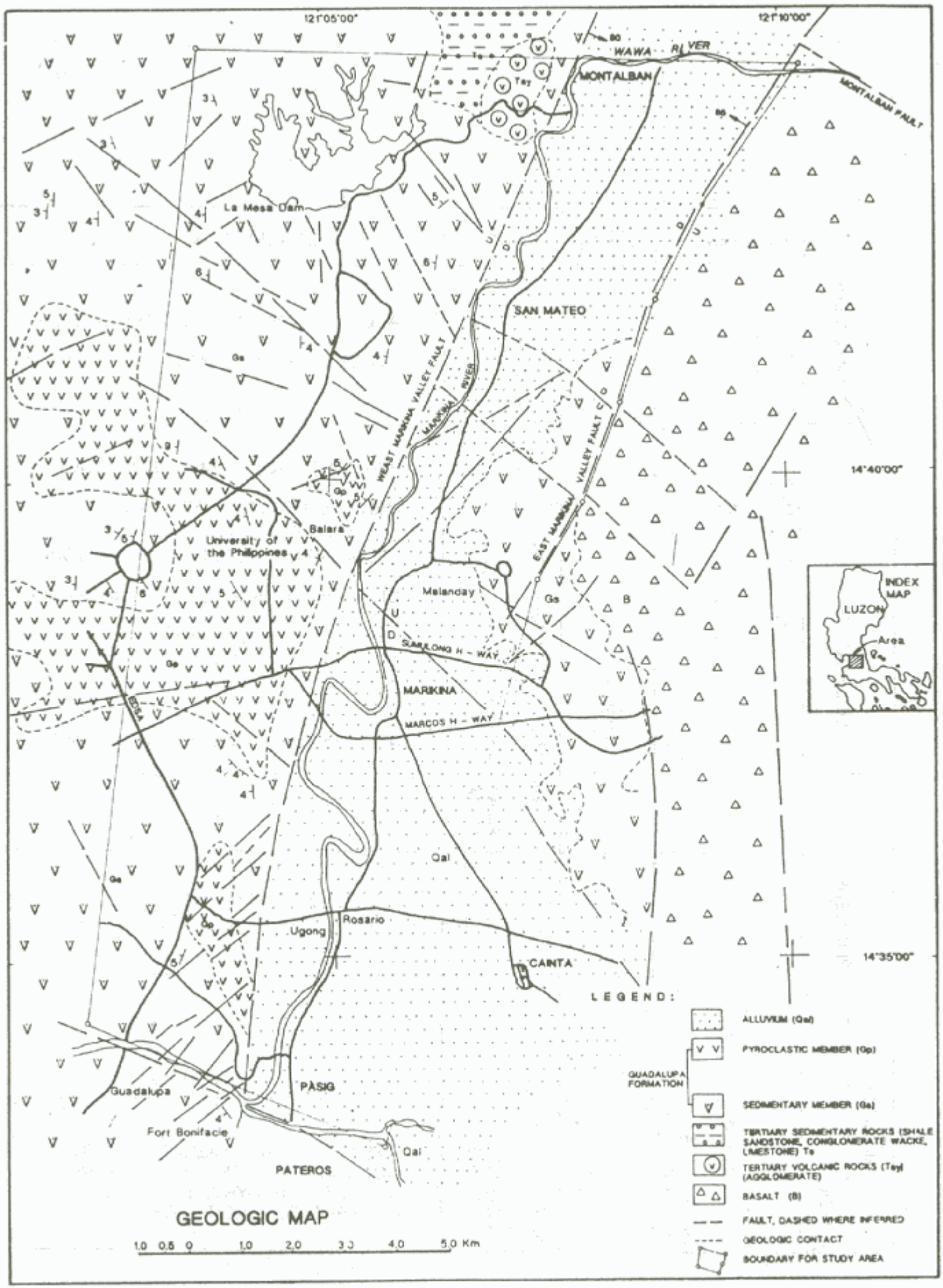

Figure 3: Geologic map of the study area (Faisal, 1990).

West Marikina Valley Faults (WMVF)

The WMVF is a steeply dipping continuous structure from the south (Pasig) to the north (Montalban). Its normal fault displacement is indicated by the east-facing linear scarp where the Guadalupe Formation is widely exposed in contrast to the topographic low (Marikina Valley) to the east where the alluvial deposit is thick. Outcrops in Ayala Height Subdivision and Loyola Grand Villas show an 85m and 56m respectively vertical displacements.

East Marikina Valley (EMVF)

The EMVF controls the eastern boundary of the Marikina Valley. It serves as the boundary of the basalt and the alluvium in the northern portion of the study area while it cuts the Guadalupe Formation in the central portion. The topographic break in the north indicates a minimum displacement of 400m. This structure is discontinuous in the southern part in Marikina and east of Pasig. This is attributed to a displacement towards the west and a subsequent burial a thick alluvial cover.

Montalban Fault

The Montalban Fault strikes N45W and dips steeply to the north east Oca and Potenciano (1968). It has a right strike-slip component as indicated by the displacement of the limestone ridges along the gorge in Montalban River at Barrio Wawa. Recent investigations are consistent with the observations of Oca and Potenciano(1968) that the northwest trace of the Montalban Fault is lost as it intersects the EMVF north of Montalban. This relationship suggests that the Montalban Fault is comparatively Older than the Marikina Valley Fault system.

Nangka Fault System

The Nangka Faults are located in the central portion of Marikina Valley (San Mateo-Marikina block). These are northwest-trending structures controlling the Nangka River and its vicinities. They are probably of strike-slip origin as indicated by the displacement of the river courses.

As this area is bounded by the north west lineaments of the Nangka Fault System, it is postulated that the Marikina-San Mateo is an uplifted block (Fig. 3). The high density of lineaments in the central block is believed to be hosted by the Guadalupe Formation and not by the Quaternary Alluvium and may represent faults related to the upliftment of this block.

Fault Systems in the Western Block of WMVF

These faults are mainly located within the Guadalupe Formation in the Western Fault block of the WMVF. These are generally north east and north west trending structures. The first group is concentrated in North Balara and in the vicinity of La Mesa Dam. These structures are believed to be part of the Nangka Fault System but lost their continuity to the

west as they were cut by the WMVF. The second group, located in the south western portion of the Fault block west of the WMVF, appears to control the course of the Pasig River.

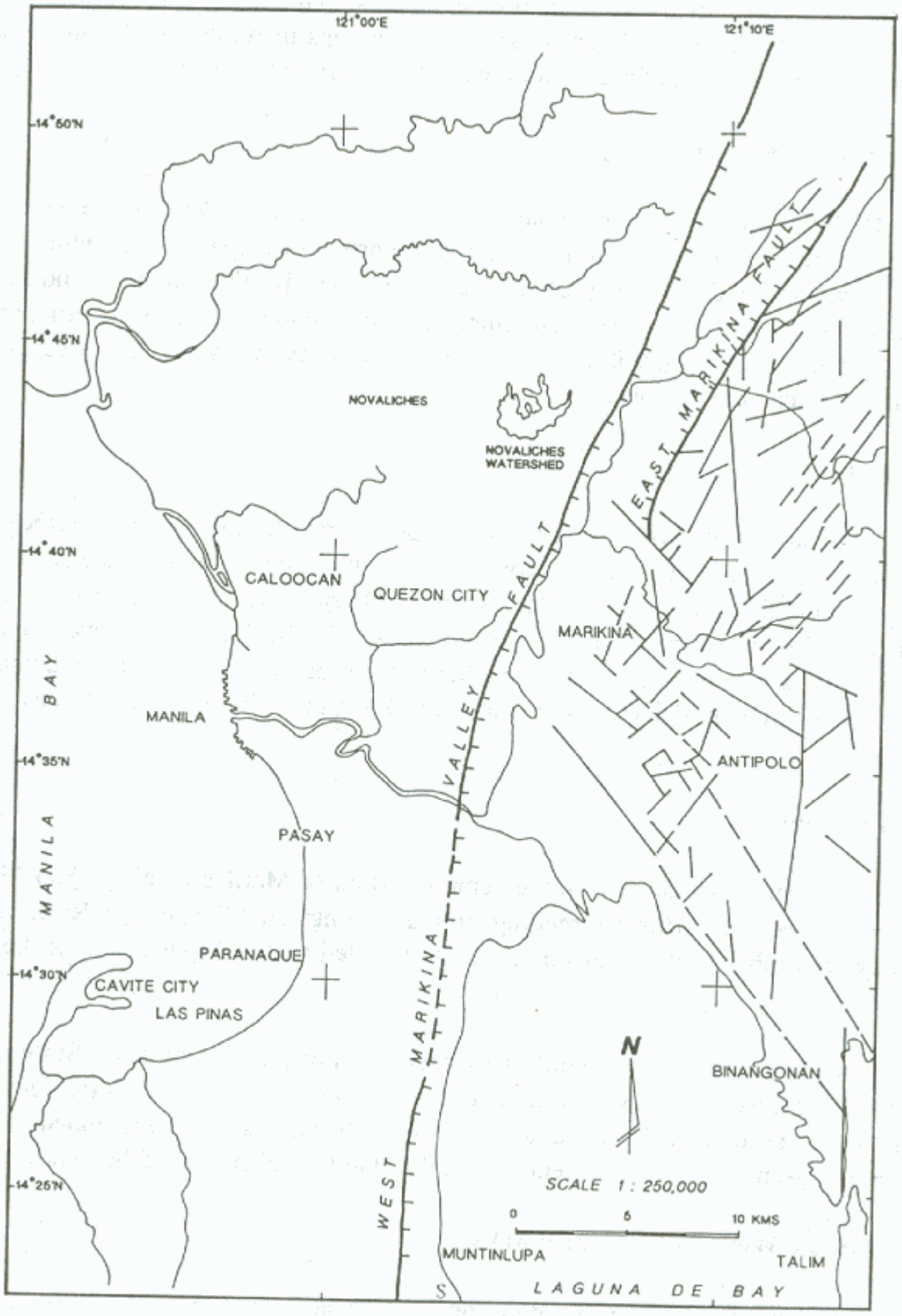

Figure 4: Structural map delineated from landsat imagery (Faisal, 1990).

Figure 5: Diurnal Plot from the study area (University of Philippines base Station).

Fault Systems in the Eastern Block of EMVF

The faults are mainly located within the Cretaceous Basalt Formation in the eastern block of the EMVF. Several faults were inferred from aerial photographs and landsat imagery (Fig. 3 and Fig. 4).

INTERPRETATION

The study area is characterized by zones of high and low magnetic readings which are influenced to a large extent by the lithology and mineral composition of its underlying materials (Fig.6). In the uplifted fault block west of the West Marikina Valley Fault, three high magnetic zones and one of low magnetic values were delineated. The first high magnetic zone is located at the vicinity of the University of the Philippines campus while the second in the vicinity of La Mesa Dam. Both are underlain by the Diliman Tuff. Third high magnetic zone is found in the northwestern portion of the study area within the boundary of Dilimin tuff and Tertiary rocks consisting of basalt, andesite, basaltic agglomerate and vitric tuff. These three high magnetic zones are underlain by rock units which have high to moderate Fe contents. The low magnetic zone is located in the vicinity of La Mesa Dam and coincides with the lithologic contact of Diliman Tuff and Tertiary Rock. Low magnetic values are probably caused by structure-related gouge in the host rocks, considering their proximity to the West Marikina Valley Fault.

In the Marikina Valley east of the West Marikina Valley Fault, the alluvial sediments have low magnetic values except in the San Mateo-Marikina area where magnetic readings are high. This indicates a thin alluvial cover and subsequent shallow occurrence of the underlying Guadalupe Formation due to upliftment and erosion of the alluvium. The San Mateo-Marikina block is bounded in the north and south by low magnetic zones which represent the downthrown segments.

Interpretations of the magnetic survey can be correlated with and highly supported by the structural analysis of the San Mateo-Marikina area, which is an uplifted block. Displacement along the Marikina Fault are indicated by displacements of magnetic anomalies in the study area along the Marikina Fault system.

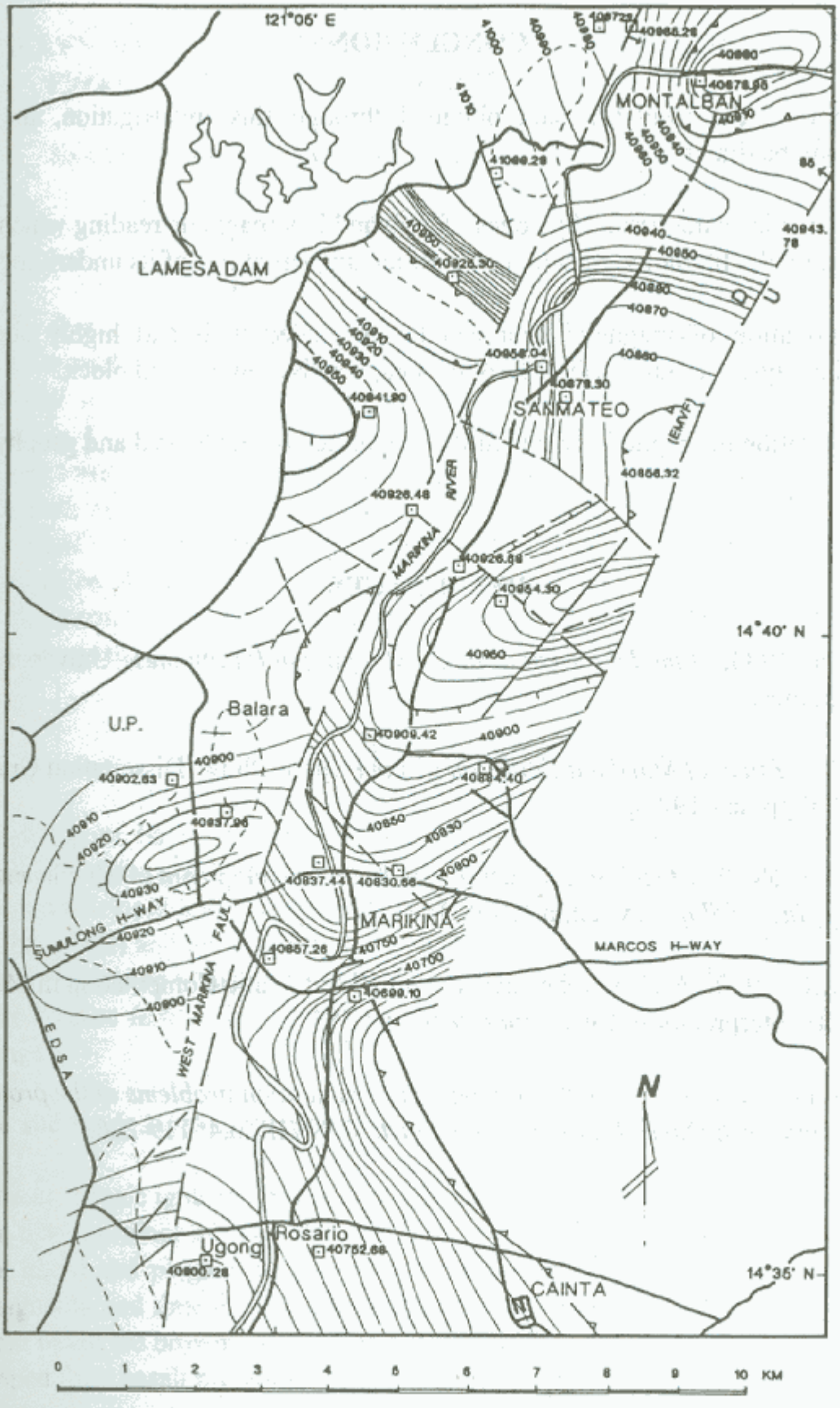

Figure 6. Total magnetic intensity map of the study area (Faisal, 1990).

CONCLUSION

In light of the available data obtained through this investigation, the follov conclusions may be drawn:

1. the study area is characterized by zones of high and low magnetic reading which are influenced by the lithology, mineral composition and structures of its underlying materi

2. the interpretation of magnetic data can be correlated with and highly supported structural analysis of San Mateo-Marikina area, which is an uplifted block.

3. the interpretation of magnetic data is further supported by geological and geophysical data.

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