# Detecting the boundaries of gravity anomaly sources using the vertical and tilt derivative

Snežana Ignjatović, Ivana Vasiljević, Branislav Sretković



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# DETECTING THE BOUNDARIES OF GRAVITY ANOMALY SOURCES USING THE VERTICAL AND TILT DERIVATIVE

**Snežana Ignjatović[1a], Ivana Vasiljević[1b], Branislav Sretković[1c]**

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## Abstract

*In geophysical exploration, it is important to define the boundaries of anomaly sources that are not visible on the surface. Information about the boundaries of sources can help during geophysical–geological modeling of the survey area. A model of the survey area can help in better defining the geological structure and geological development of an exploration area. This paper presents how the procedures of vertical and tilt derivative on gravity data can help to detect the boundaries of anomaly sources. The Žagubica basin is taken as a study area. The results obtained for the survey area bring the new information.*

***Keywords****: gravity data, boundary, Žagubica basin*

## 1. INTRODUCTION

During geophysical–geological modeling of the survey area, it is particularly important to define the boundaries of anomaly sources under the surface. The results of the models can help in different explorations such as geology, archeology, exploration of the environment, civil engineering, etc.

This paper presents the procedure of vertical and tilt derivative to detect the boundaries of gravity anomaly sources. The Žagubica basin is used as a practical example.

The data for research were acquired from the Gravity Database of Serbia [1]. The geophysical software packages Oasis Montaj and Golden Software Surfer were used in processing and analysis the gravity data.

## 2. THEORETICAL BACKGROUND AND FIELD EXAMPLE

The procedure of vertical derivative (first vertical derivative) and tilt derivative can help in detecting the boundaries of gravity anomalies sources.

The first vertical derivative (VDR) can be expressed as [2]:

$$\mathrm{VDR} = -\partial \mathrm{f}/\partial \mathrm{z}, \quad (1)$$

where f – gravity field (in paper the Bouguer anomaly),

$\partial \mathrm{f}/\partial \mathrm{z}$ is the first-order derivative of the gravity field in the vertical direction z.

It is characteristic for the vertical derivative that it has zero over the boundaries, it is positive over the source and negative outside of a vertical side of the source [2, 3,4].

The tilt derivative (TDR) is based on the ratio of the first vertical and total horizontal derivative [2, 3,4]

$$\mathrm{TDR} = \tan^{-1}\left[\frac{\partial g/\partial z}{\partial g/\partial h}\right], \quad (2)$$

where:

$$\partial g/\partial h = \sqrt{(\partial g/\partial x)^2 + (\partial g/\partial y)^2},$$

$\partial g/\partial x$, $\partial g/\partial y$, $\partial g/\partial z$ are the derivatives of the gravity g in the x, y, and z directions.

The TDR passes through zero above or near the boundaries, and it is positive when lying over the source structure and negative outside the source region [2, 3,4].

The Žagubica basin is used for a field example. The Žagubica basin is situated in east Serbia. The basin is located south of the Kučaj, Crni Vrh and Beljanica mountains, and north of the Homolje mountains. The Žagubica basin is composed of the Lower Cretaceous sediments and Upper Cretaceous sediments. In the survey area, the dominant structures have directions the NW-SE and NE-SW. These structures have a regional character and surround the basin. These structures influenced the formation and development of the Žagubica basin [5].

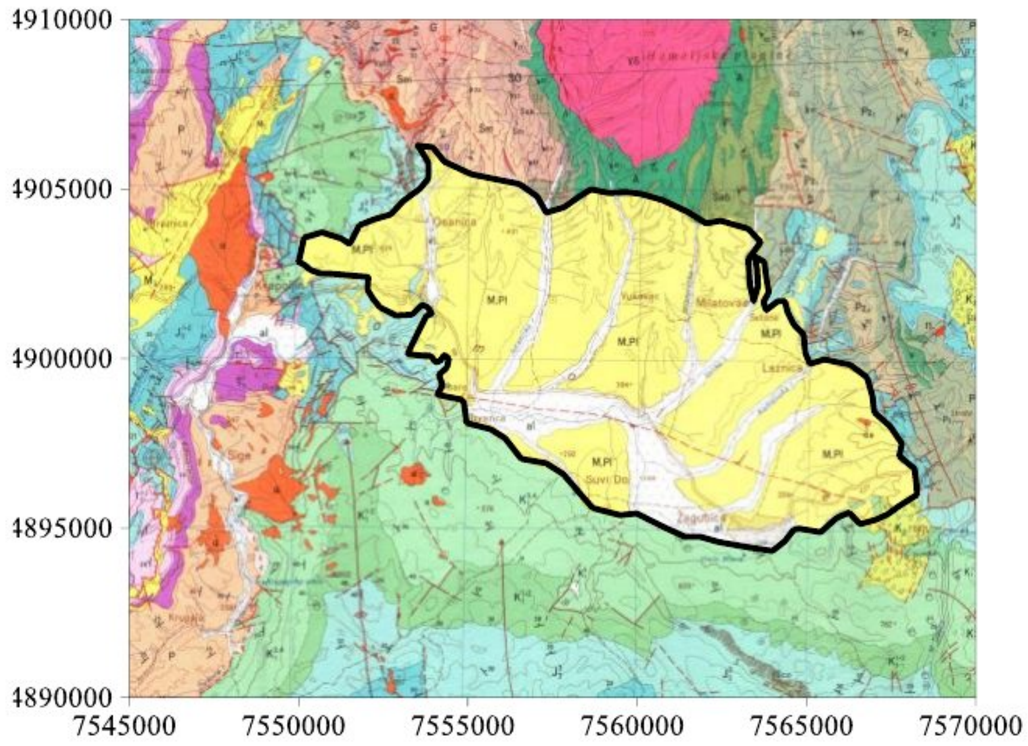


**Figure 1.** *Geological map of the Žagubica basin (black line-geological boundary of the Žagubica basin) [6]*

## 3 RESULTS AND DISCUSSION

Gravity data for the study area were obtained from the Gravity Database of Serbia [1]. The gravity data was used to create the Bouguer anomaly (gravity anomaly) map. The Bouguer anomaly map was done with a density value of 2.40 t/m$^3$.

The data filtering was done to eliminate or reduce errors and disturbances in the measured signal. The filtered map of the Bouguer anomaly is shown in Figure 2. This map is the basis for further processing data.

The minimum values of anomalies were detected in the east and central parts of the map (Figure 2). A source of anomaly in the central part is the Žagubica basin (Figure 1).

The source of anomaly in the east part is the part of the Žagubica basin which is not detected on the surface. These minimum values of anomalies indicate existence of two basins under the surface.

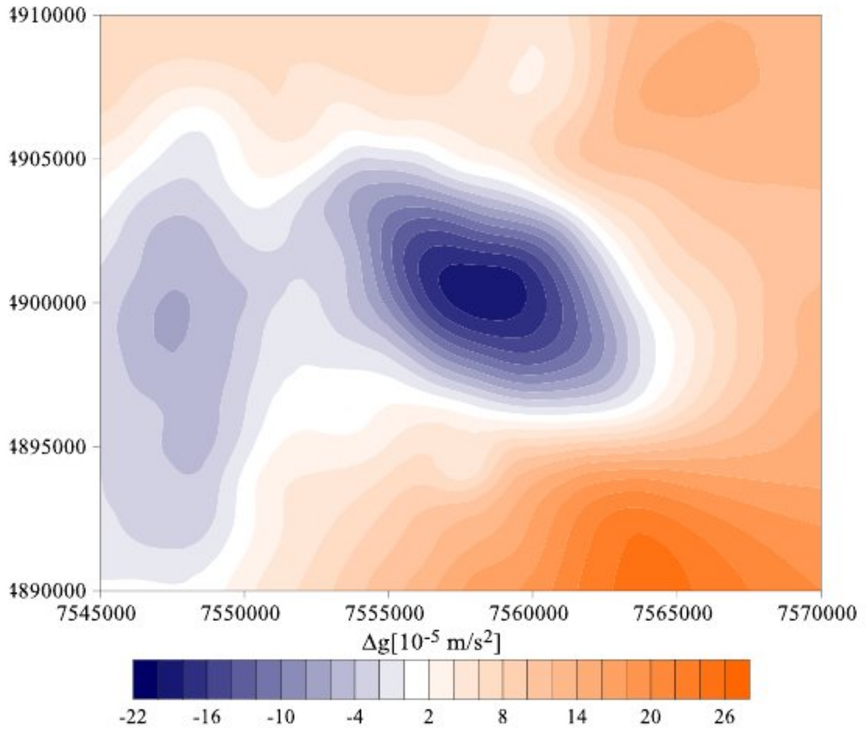


**Figure 2.** *Filtered map of the Bouguer anomaly*

For detecting the boundaries of these gravity anomaly sources, the procedures of vertical and tilt derivative are applied. The procedure VDR and TDR are applied on the Bouguer anomaly map.

The results of the vertical derivative are shown in Figure 3. In the east and central parts of the map, the black dash lines mark the positions of boundaries of anomaly sources. The results of VDR show existence of two basins under the surface.

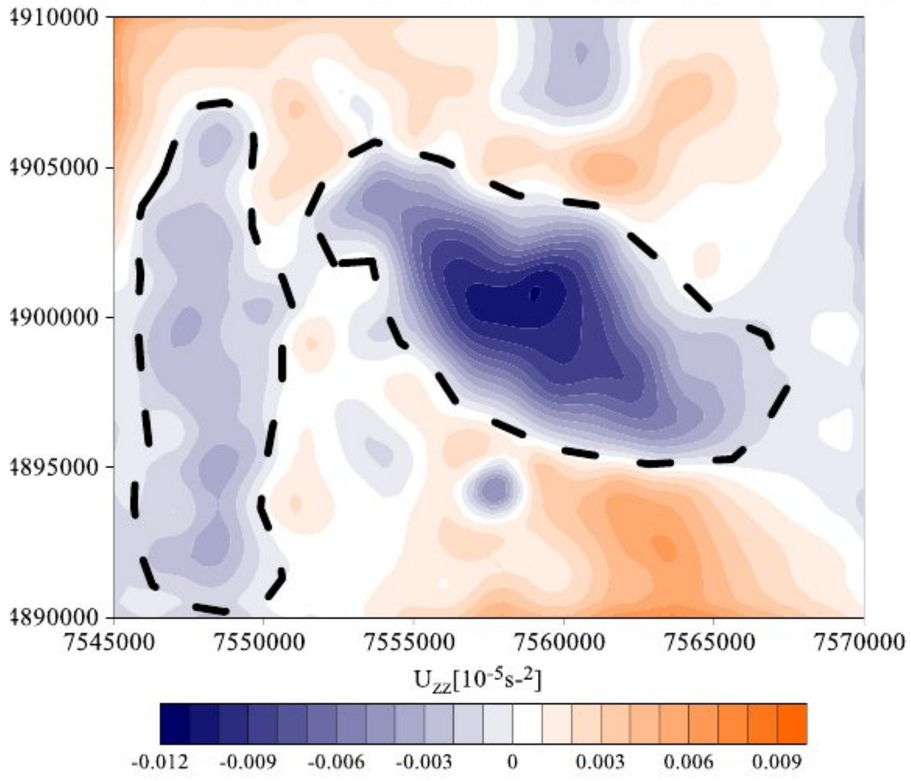


**Figure 3.** *Map of vertical derivative (black dash lines – boundaries of anomaly sources)*

Figure 4 shows the results of tilt derivative. The positions of the boundaries of anomaly sources are marked with the red dash lines in the east and central parts of the map. The results of TDR indicated that under the surface exist two basins.

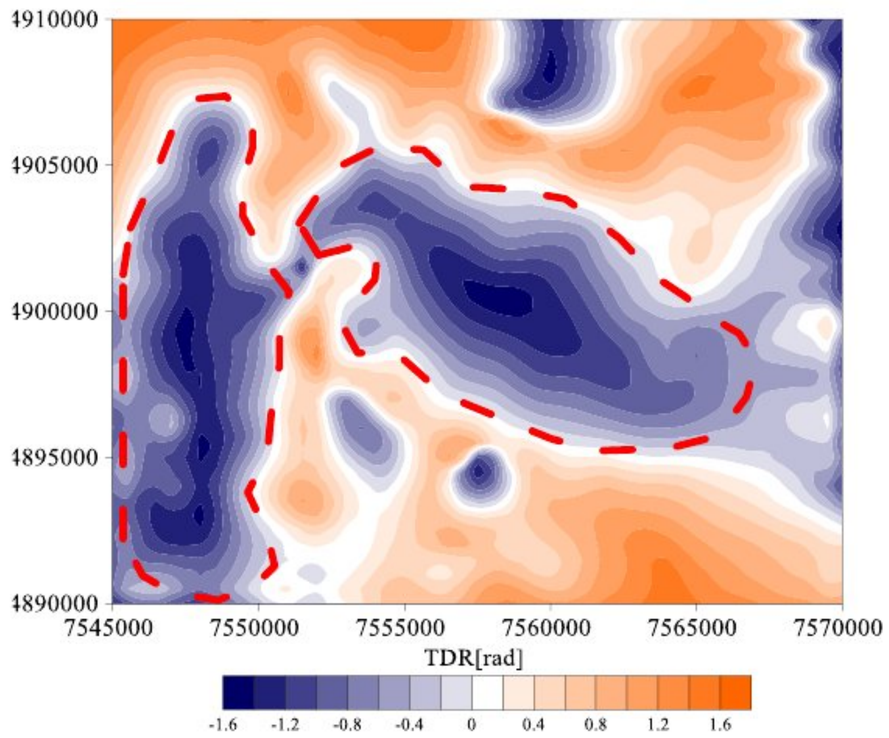


**Figure 4.** *Map of tilt derivative (red dash lines – boundaries of anomaly sources)*

## 4. CONCLUSION

The positions of the boundaries of anomaly sources can be detected and defined using the procedures VDR and TDR on gravity data. The results in this paper bring the new information about the Žagubica basin. The results of VDR and TDR show the existence of two separate basins in the subsurface. These results can help to better defining the geological development of a survey area.

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## REFERENCES

[1] Geophysical Data Base, Fund of the Department of Geophysics. University of Belgrade, Faculty of Mining and Geology, Belgrade (In Serbian)
[2] GETECH. Advanced Processing and Interpretation of Gravity and Magnetic Data, Getech Kitson House Elmete Hall Leeds, UK, 2007.
[3] Miller G.H, Singh V. Potential Field Tilt-A New Concept for Location of Potential Field Sources, Journal of Applied Geophysics 32, 1994, pp. 213-217.
[4] Ignjatović, S., Geological-Geophysical Model of a Part of the Timok Magmatic Complex, Doctoral Dissertation, University of Belgrade, Faculty of Mining and Geology, Belgrade, 2014, p.148 (In Serbian)
[5] Petrović, D., Vasiljević, I., 3D model of the Žagubica Basin, XV Congress of Geologists of Serbia, Proceedings of Abstracts (National Congress with International Participation), Serbian Geological Society, Belgrade, 2010, pp. 448-449 (In Serbian)
[6] Antonijević, I., Đorđević, M., Veselinović, M., Krstić, B., Kalenić, M., Anđelković, J., Možina, A., Karajičić, Lj., Rakić, B., Banković, V., Jovanović, S., Sheet Žagubica, OGK SFRJ 1:100000. Federal Geological Institute, Belgrade, 1963 (In Serbian)

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