STM JOURNALS

Journal of
Remote Sensing & GIS

ISSN: 2230-7990 (Online)
ISSN: 2321-421X (Print)
Volume 12, Issue 1, 2021
DOI (Journal): 10.37591/JoRSG

http://techjournals.stmjournals.in/index.php/JoRSG/index

Review JoRSG

Estimation of Dolomite Resources in South Central Part of Anantapur District, Andhra Pradesh, India, Using Geospatial Techniques

B. Pradeep Kumar[1], K. Raghu Babu[1]*, B. Narayana Swamy[2], T. Madhu[2], P. Padma Sree[3], M. Rajasekhar[1]

Abstract

Dolomite CaMg $(Co_3)_2$, is the common rock forming mineral and composed of the carbonates of calcium and magnesium with an equivalent proportion. Dolomite is the primary integral of the sedimentary rock called dolostone and the metamorphic rock called as dolomitic marble. Our method is allowing to confidently determine the location and their boundaries of local geological structures that are likely to contain dolomite resources in the study area of Anantapur, AP, India. Geospatial techniques like Remote Sensing and Geographical Information System are very useful for the estimation of natural resources using the Band rationing techniques.

Keywords: Band rationing, dolomite, remote sensing and GIS, sedimentary, structures

INTRODUCTION

What's that dolomite? How and where were they formed? Geologists have studied this topic for more than six hundred years, using both field and laboratory-based methods [1, 2]. The typical rock forming mineral, dolomite CaMg $(Co_3)_2$, is composed of calcium and magnesium carbonates with an equal proportion. Count Dolomien first discovered the mineral in 1791 and named it after its discoverer [3]. The word dolomite describes a mineral sequence that involves chemical valuation and lattice structure arrangements. An array of natural Ca-Mg carbonates with a chemical composition similar to the ideal dolomite is encapsulated. For the most part, ancient carbonate rocks consist of two minerals: calcite or dolomite, with any noncarbonate process typically dominated by terrigenous or evaporative elements [4]. It is called limestone when a carbonate dominates; it is called dolomite (mineral) when it is dominated by dolomite (mineral) (the rock). Dolomite is the primary ingredient of the dolostone sedimentary rock and the dolomitic marble metamorphic rock. Crystallization of the mineral dolomite in the trigonal rhombohedral system. In the chemical industry, in stream ventures, as a flux in the processing of metals, in the glass industry for the manufacture of bricks, in ceramics, dolomite is used as a source of MgO (Magnesia) [5]. The structural characteristics of folds, faults and joints are very critical for new mineralization. Remote Sensing in the identification of line characteristics in the study area, satellite data plays a very crucial role. Dolomite is a mineral of rare carbonate. It is prevalent in ancient platform carbonates, but it is uncommon in Holocene sediments and is almost impossible to precipitate at ground surface temperatures in the laboratory without bacterial mediation. Some claim that widespread types of

***Author for Correspondence**
K. Raghu Babu

[1]Department of Geology, Yogi Vemana University, Kadapa, Andhra Pradesh, India
[2]Department of Geology, Sri Venkateswara University, Tirupathi, Andhra Pradesh, India
[3]Lecturer, Department of Geology, Government College (A), Anantapur, Andhra Pradesh, India

Received Date: December 17, 2020
Accepted Date: February 01, 2021
Published Date: March 02, 2021

Citation: B. Pradeep Kumar, K. Raghu Babu, B. Narayana Swamy, T. Madhu, P. Padma Sree, M. Rajasekhar. Estimation of Dolomite Resources in South Central Part of Anantapur District, Andhra Pradesh, India, Using Geospatial Techniques. Journal of Remote Sensing & GIS. 2021; 12(1): 19–25p.

dolomite are mainly associated with hypersaline brines, others that can be formed from schizohaline waters, or that the time needed to form large volumes of dolomite implies that the process must be primarily subsurface and likely related to the long-term circulation of seawater via platform sediments [6].

Study Area

Anantapur District's Narpala Mandal research area is the southern-most district of Andhra Pradesh's Rayalaseema province. The district of Anantapur is between the northern latitude of 13° 40' and 15° 15' and the eastern longitude of 76° 50' and 78° 30'. There is a total geographical area of 19,130 sq.km in the district. The Mandal of Narpala occupies 268,86 sq.km, this mandal is bounded in the north by Peddapappuru, in the northeast by Putluru, in the south by Tadimarri, in the west by Bukkarayasamudram and in the southwest by Singanamala with the coordinates 14° 43' 14' N, 77° 48' 38' E. The position map of the study area is shown in Figure 1.

METHODOLOGY

The goal of the research is to explore and estimate the resources of dolomite in the study area. SOI topographical maps with a scale of 1:50,000 were used and the field position and Georeferenced (WGS 1984) were defined using GIS software and the base map was developed. The appropriate satellite data are freely downloaded from the official website of the United States Geological Survey. A sweeping field survey was carried out in the research area in and around the study region using GPS before the preprocessing of satellite imagery began (Global Positioning System). With a spatial resolution of 30 meters, Land sat-8 data was downloaded. Using ERDAS IMAGINE, layer stacking is done and the natural color component provided is 7, 6, 4. BHUVAN is another free and very useful source for this mapping, and I have prepared geomorphology maps and line maps using these maps, which are also extracted from this and drawn and analyzed in the GIS.

Software Used

ERDAS IMAGINE 2014, Arc GIS 10.4.

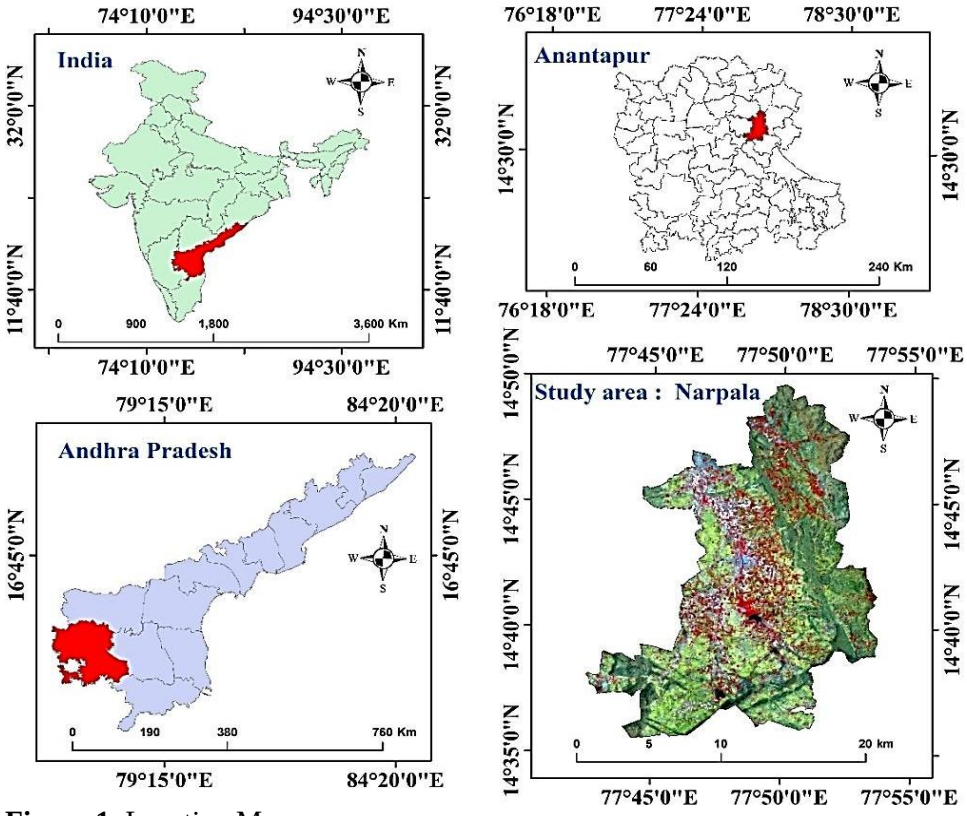

Figure 1. Location Map.

Data Used

Indian Remote Sensing (IRS) satellite data of Landsat-8 is used. Survey of India (SOI) topo sheets are used. SRTM DEM data have been downloaded freely from USGS earth explorer and used. The following Table 1 shows the data used for the study area.

RESULTS AND DISCUSSIONS

Geology

There are well-marked groups of older groups of metamorphic rocks in the geological formations of the Anantapur district belonging to the Archean era and a younger group of sedimentary rocks belonging to the Proterozoic age. Hornblende-biotite gneiss, biotite gneiss, migmatites, hornblende-gneiss, gray granite and pink granites occurring in the western part of the Narpala Mandal are the main rock types present in the study area [7]. On the eastern side of the sample are quartzite, archose with conglomerates and dolomite, chert, mudstone and some simple sills. Lime stone and chert in Dolomitic. Overlying quartzite is present in this area (Figure 2).

Table 1. Data used for the Study Area.

	Data used	Spatial resolution	Date of acquisition
Satellite data	Landsat 8 SRTM DEM	30 m 60 m	2018-April-27 2000
Ancillary data	SOI maps-57F/1, 57F/2	1: 50, 000	1962
Collateral data	Soils, Climate etc.		

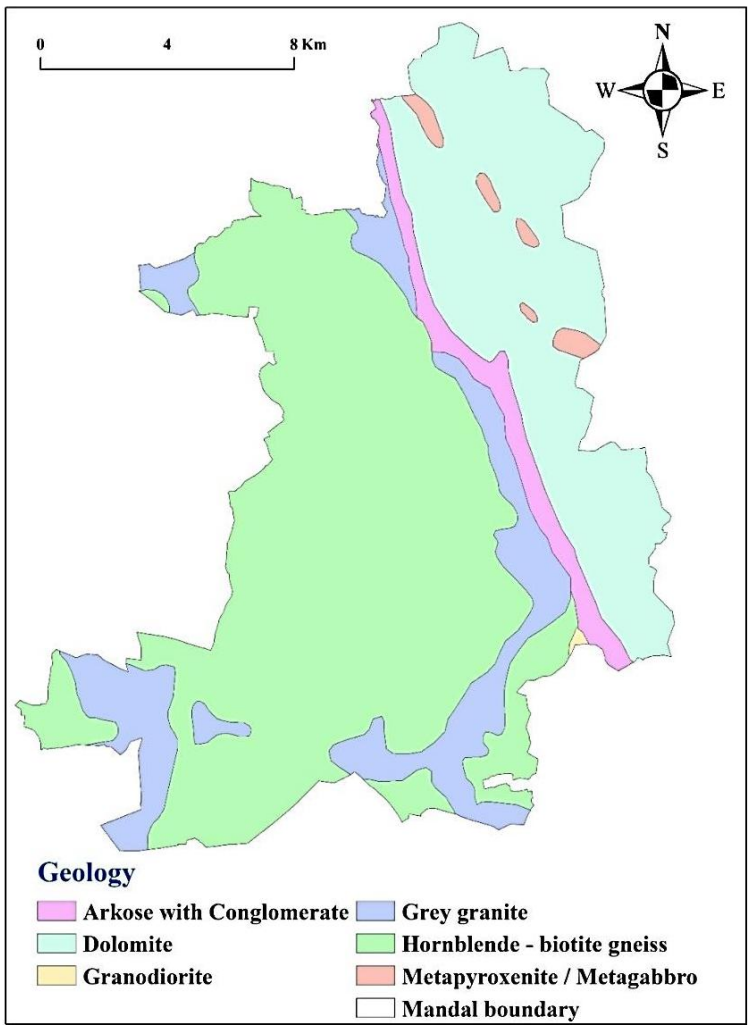

Figure 2. Geology.

Geomorphology

Geomorphology takes into account the origin and function of landforms, the mechanisms involved in weathering and erosion. The study area has denudation roots in the entire mandal [7]. Denudation is an erosive mechanism by which rocks are broken and separated from the soil. The two major processes affecting denudation are endogenous and exogenous processes. Some portions of this mandal are also of structural origin (Figure 3).

Lineament Density

Remote sensing is widely used for mineral exploration [2], especially for mapping regional lineaments, detecting ore deposit-related hydrothermal altered rocks and providing basic data on geology. For lineage mapping, remote sensing images provide ample information. Study on lineaments is very useful in mineral exploration [7]. Many of the igneous, sedimentary and metamorphic activities involved in the new mineralization formation process are dominated by liniments (Figure 4).

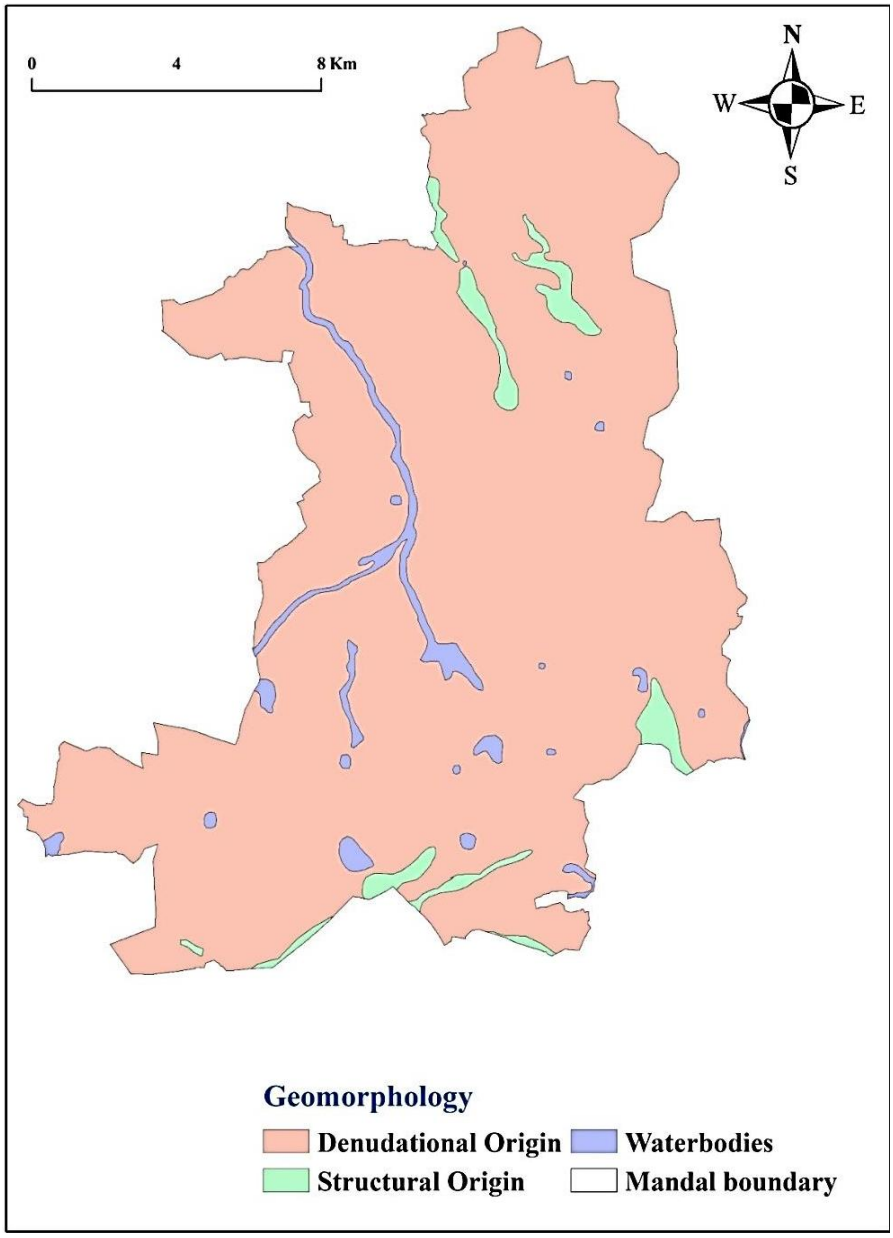

Figure 3. Geomorphology.

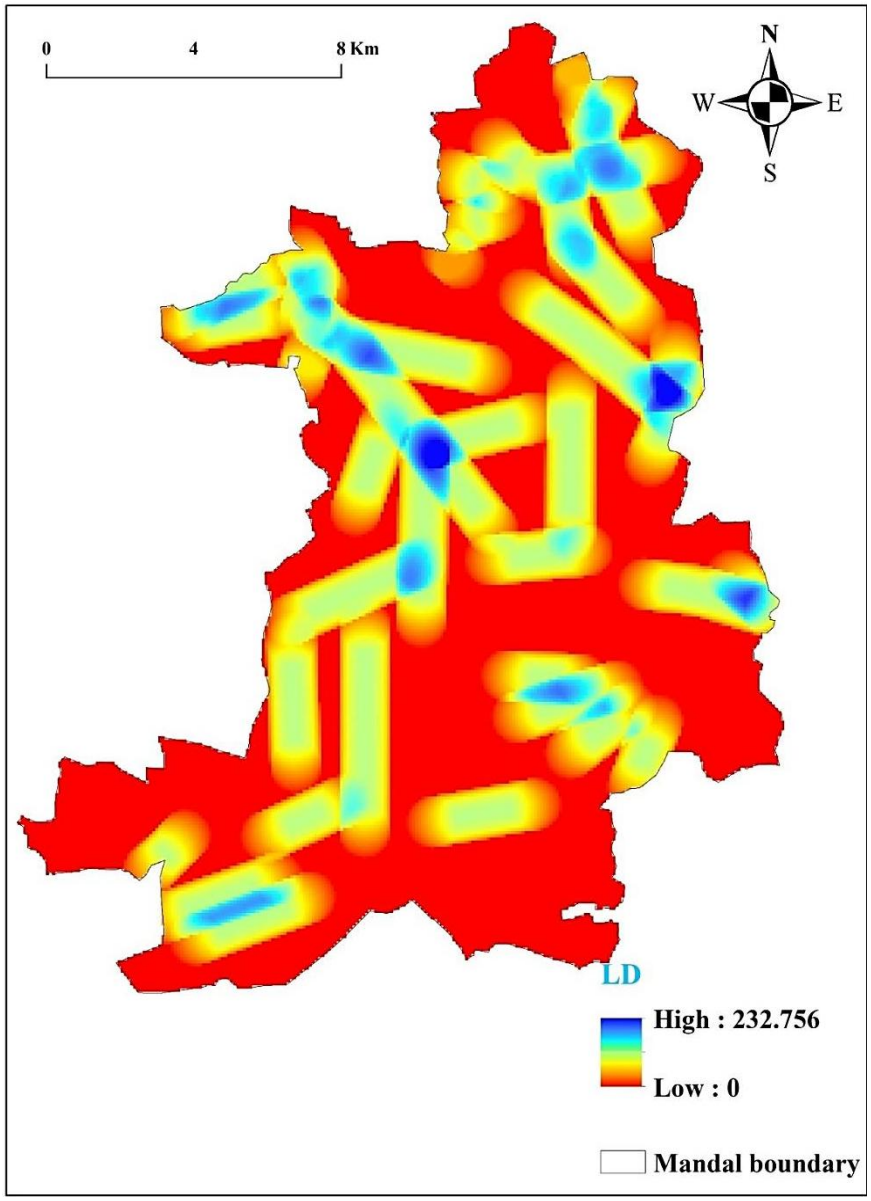

Figure 4. Lineament Density.

Band Ration

Band Ratio (BR) images enhance the contrast between the characteristics by dividing the brightness values into a reflectance curve at peaks and troughs, after removing the atmospheric conditions from the image. Rationing of spectral bands increases compositional information while removing other forms of surface information about the earth. For illustrating certain characteristics or materials that cannot be seen in the raw bands, this method is very useful [3]. For qualitative detection of minerals, band ratio transformation is useful. Since it has absorption in the blue zone, where it has a high reflectance in the red region, the 4/2 ratio is useful for mapping iron oxides. In this research, the ratio of 6/7 was used for its ability to map kaolinite, montmorillonite, and clay minerals. All of these features have a high band 6 reflectance and a low band 7 reflectance of the picture of Landsat 8. Due to the high reflectance of these minerals in this ratio, the 6/5 ratio has been used for mapping ferrous minerals (Figure 5). Band ratios are arithmetical combinations of various bands that enable semi-quantitative analysis of the distribution and intensity of particular absorption or emission characteristics. The BR method is considered to minimize the inter-band correlation of multispectral image data effectively.

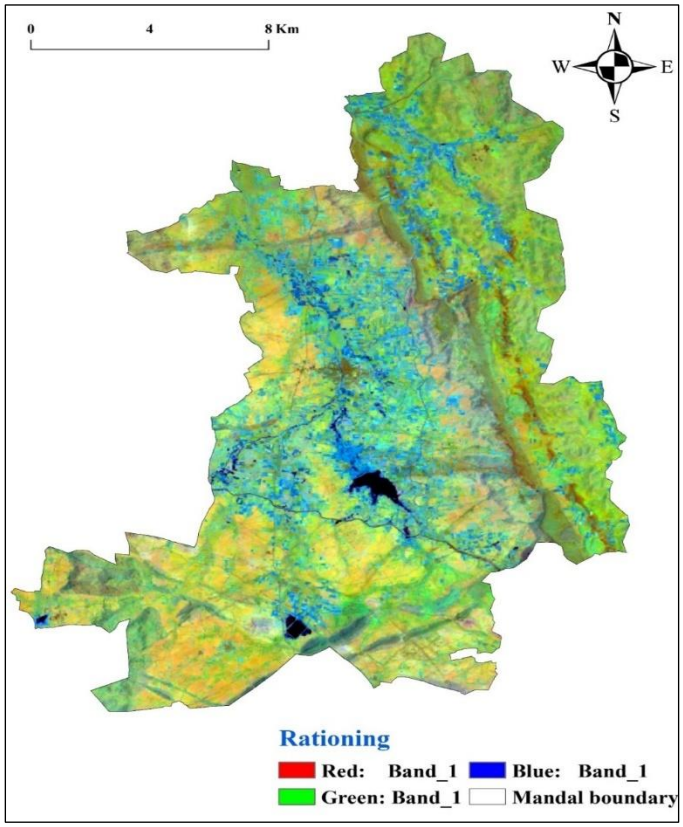

Figure 5. Band Rationing.

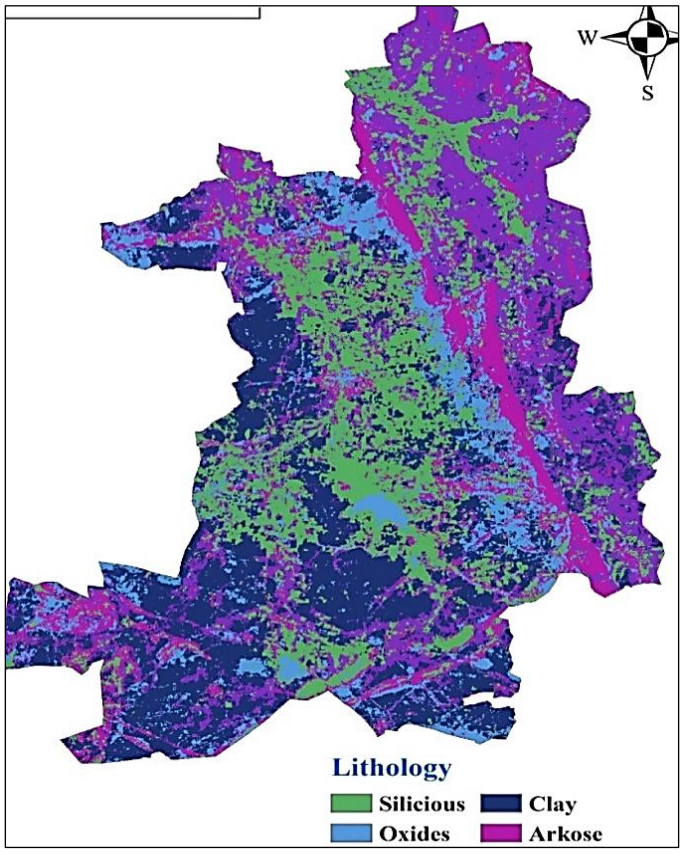

Figure 6. Lithology-Resultant Band Rationing.

After the band rationing technique in the Arc GIS software, the estimation of resources has been fallowed (Figure 6). The geometric calculation method is adopted in the same Arc GIS software to delineate the resources in sq.km. The results reveal that the estimated dolomite resources are 70.27 sq.km, Arkose with conglomerates are 10.95 sq.km, clay minerals are 148.40 sq.km, oxides are 36.29 sq.km, and Silicious minerals are 2.94 sq.km.

CONCLUSION

Most implications can be taken from this study regarding the application of the ratio technique to multispectral satellite data. First of all, multispectral channel ratio is perhaps the simplest technique in multispectral satellite data to reduce a large proportion of the topographic influence. Secondly, with great caution, direct inference should be made from these findings to those that can be predicted from the ratio of satellite data. The band rationing technique is very useful for the estimation of dolomite resources and this is also extendible for the various resources identification and estimation.

Acknowledgments

The first author B. Pradeep Kumar, greatly thankful to Department of Science and Technology (DST), Government of India, for financial support through Inspire programme (Sanction order No. DST/INSPIRE Fellowship/2017/IF170114). Also thankful to USGS for remote sensing data utilization, Department of Geology, Yogi Vemana University for necessary facilities for carrying out my research work.

REFERENCES

1. Abdullah A, Nassr S, Ghaleeb A. Landsat ETM-7 for lineament mapping using automatic extraction technique in the SW part of Taiz Area, Yemen. Global J Human Social Sci. 2013; 13(3): 35–37p.
2. Abdelhamid G, Rabba I. An investigation of mineralized zones revealed during geological mapping, Jabal Hamra Faddan—Wadi Araba, Jordan, using LandsatTM data. Int J Remote Sens. 1994; 15(7): 1495–1506p.
3. Aydogan D. Extraction of lineaments from gravity anomaly maps using the gradient calculation: Application to Central Anatolia. Earth planets space. 2011; 63(8): 903–913p.
4. Banerjee A. Estimation of dolomite formation: Dolomite precipitation and dolomitization. J Geolog Soc India. 2016; 87(5): 561–572p.
5. Friedman GM, Sanders JE. Origin and occurrence of dolostones. In Dev Sedimentol.1967; 9: 267–348p.
6. Kumar BP, Babu KR, Rajasekhar M, et al. Assessment of land degradation and desertification due to migration of sand and sand dunes in Beluguppa Mandal of Anantapur district (AP, India), using remote sensing and GIS techniques. J Ind Geophys Union. 2019; 23(2): 173–180p.
7. Kumar BP, Babu KR, Rajasekhar M, et al. Identification of land degradation hotspots in semiarid region of Anantapur district, Southern India, using geospatial modeling approaches. Model Earth Syst Environ. 2020; 6(3): 1841–1852p.
8. ˆPradeep Kumar B, Raghu Babu K, Rajasekhar M, et al. Change Detection of Land Use/Land Cover using Geospatial Techniques: A Case Study of Narpala Mandal, Anantapur District, Andhra Pradesh, India. J Remote Sens GIS. 2019; 10(2): 6–12p.
9. von Morlot A. Ueber Dolomit und seine künstliche Darstellung aus Kalkstein. Braumüller und Seidel; 1847.
10. Van Tuyl FM. The origin of chert. Am J Sci. 1918; 4(270): 449–456p.

