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RESEARCH ARTICLE

GEOLOGY AND GEOMORPHOLOGICAL FEATURES IN THANJAVUR DISTRICT, TAMILNADU USING SPATIAL TECHNOLOGY

***Surega, R. and Baskaran, R.**

Department of Induatries and Earth Sciences, Tamil University, Thanjavur 613 010

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ABSTRACT

Geology and geomorphological map is a very effective tool in management of natural resources and helps in various types of planning and developmental activities. In the present study, geomorphological map for the Thanjavur district was prepared using aerial photographs on 1:50,000 scale, satellite imagery of IRS-ID LISS III false colour composites, generated from bands, 2, 3 and 4 an SOl topographic sheets validated ground truth. Since large part of the study area is inaccessible, remotely sensed data have played an important role in detailed mapping. The study area is mainly underlain by, Precambrian rocks. Quarternary and recent formations are confined mainly to the sedimentary area. The criteria adopted for the identification and grouping of landforms of specific genetic type are the overall underlying geology, geomorphology formation processes, and association of forms. The landform units, each having its own features, were identified under the satellite imagery.

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INTRODUCTION

Geomorphological mapping involves the identification and characterization of the fundamental units of the landscape. Geomorphic unit is defined as an individual and genetically homogeneous landform produced by a definite constructional or destruction geomorphic process (Fairbridge, 1968). Each part of the land surface is the end product of an evolution governed by parent geological material, geomorphological processes, past and present climate and time (Demek, 1972). Detailed information on geomorphic units and their processes in an area is very useful in evaluation and management of land resources, environmental planning and developmental activities (Cook and Doornkamp, 1974; Crofts, 1974; Panizza, 1978; Demek, 1982). Geomorphological features are manifestations of underlying parent materials and the nature and duration of geomorphic processes that have produced the associated geomorphic units (Wright, 1993). The geomorphic position on a topo sequence plays a vital role in classification of geomorphic units. Delineation and characterization of geomorphological features and analysis of their processes is of immense help in the fields of pedology, hydrology and environmental engineering applications. The remote sensing techniques have become the most efficient tools for geological, structural, geomorphological studies and their mapping because of its synoptic view, multi-spectral, multi temporal capabilities (Krishnamurthy and Srinivas, 1996). The geomorphic units have specific set of characteristics that determine its image signature. High resolution satellite data provides reliable source of information to delineate and generate comprehensive and detail inventory of geomorphic units in an area (Mukerjee, 1982). The geomorphological mapping of a terrain and analysis of their processes also help in soil resources mapping, groundwater potential zones identification, landscape ecological planning, hazard mapping and other environmental applications (Reddy et al., 2001). In the present study, Thanjavur district has been selected for delineation and characterization of geomorphological units using IRS-ID LISS III satellite imagery and analysis of their processes based on the field observations.

Study Area

Thanjavur is located at 1008'0"N to 10048'0N" and 7909'0"E to 79015'0"E. The city is an important agricultural centre located in the Cauvery Delta and is known as the "Rice bowl of Tamil Nadu". Thanjavur district covered a total geographical area of 3602.86 Sq. Kms. The district has well laid out roads and railway lines connecting all major towns within and

Corresponding author:* **Surega, R.
Department of Induatries and Earth Sciences, Tamil University,
Thanjavur 613 010

outside the state. For administrative purpose the district has been bifurcated into 8 taluks and 14 blocks.

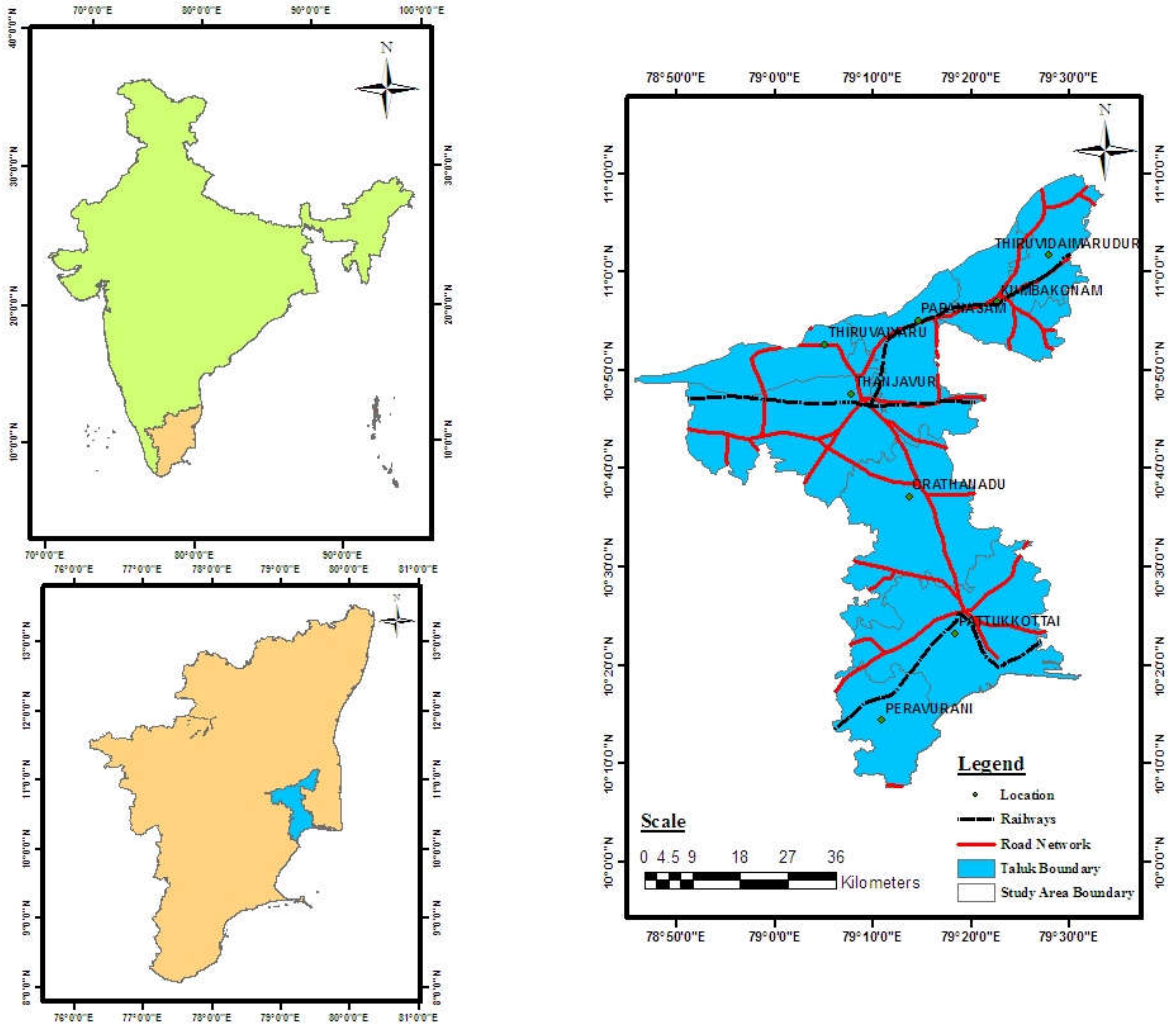

Fig 1. Location map of the study area

Methodology

The IRS-ID LISS-III satellite data of March 2017 pertaining to the study area was collected and registered to Survey of India (SOI) topographical map scale is 1:50,000. The surface lithological analysis of the study area has been carried out through visual interpretation of the satellite data. The boundaries of the geological units have been modified based on the image characteristics and field observations.

Geology

The geological analysis and delineation of different geological units of the study area have been carried out through visual interpretation of the satellite data based on the distinct characteristics of different formations (Fig.2). The granitoid gneiss formations occurring in the study area belong to highly sedimented gneiss of lower Proterozoic to Archaean age (Krishnan, 1982). The sedimentary rocks show grayish black and gray color on the imagery and occur as intrusive within the sedimentary rocks. They occupy mainly central and southern parts of the study area.

Geomorphology

The area reveals very interesting geomorphic features. A Geomorphological map of the area is prepared and interpreted. The geomorphic map portrays the surface configuration, nature and proportion of material and intensity of the process in operation. On the basis of image interpretation elements like tone, texture, size, shape, relief, pattern, association etc, various Geomorphological units were identified in (Fig. 3) They are 1) Alluvial plain 2) Upland 3) Pediplain 4) Coastal Plain. The reported earlier by Agarwal and Mishra (1992), Venkateswara Rao (1998) and Obi Reddy *et. al.,* (2000). The description of the geomorphologic units and associated features is given below.

1. Alluvial Plain

A level or gently sloping tract or a slightly undulating land surface produced by extensive deposition of alluvium, usually exhibit adjacent to a river where periodic overflows exhibited on its banks. It may be situated on a flood plain, a delta or on alluvial fan. The Thanjavur district is fully covered by the alluvial plain. The alluvial plain is predominantly found in the present watershed.

2. Upland

The upland areas are mainly founded in NW part of the study area. The upland is mainly generated in river side of the features. The features are land elevated above other land. The features are higher ground of a region or district an elevated region. The land or an area of land lying above the level where water flows or where flooding occurs.

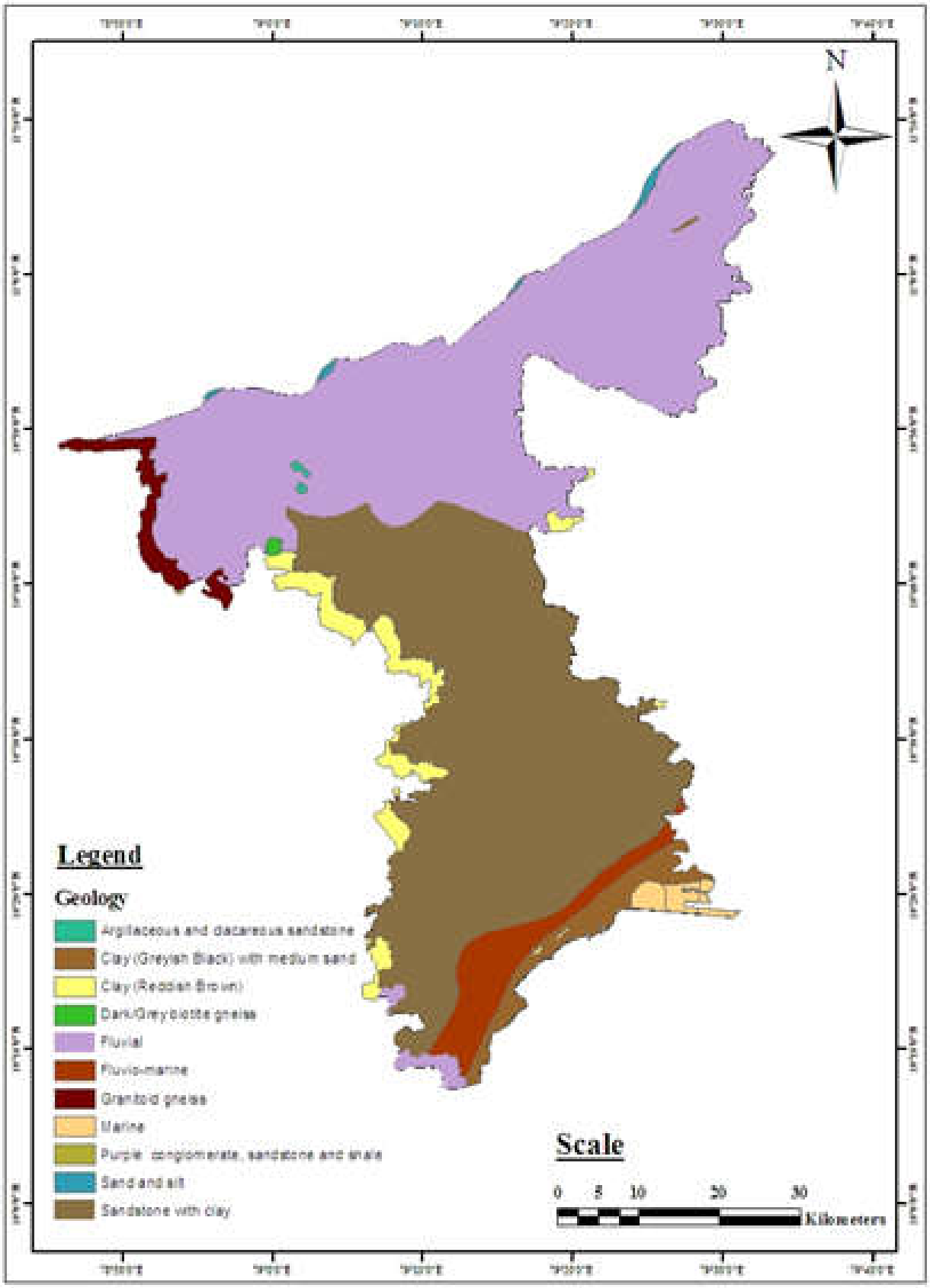

Fig 2. Geology map of the study area

3. Pediplain

The pediplain areas are founded by southern side of the pattukottai area center portions are founded in the features. These features are mainly for agriculture activities. The extensive slightly inclined denudation plain, relative to the mechanism of the formation of pediplain there is no unanimous opinion. It is considered that the main and necessary condition of forming pediplena is the long absence of the motions, which create inclines, and the fixed attitude of the basis of denudation, which determines the descending development of relief and leveling off under any climatic conditions.

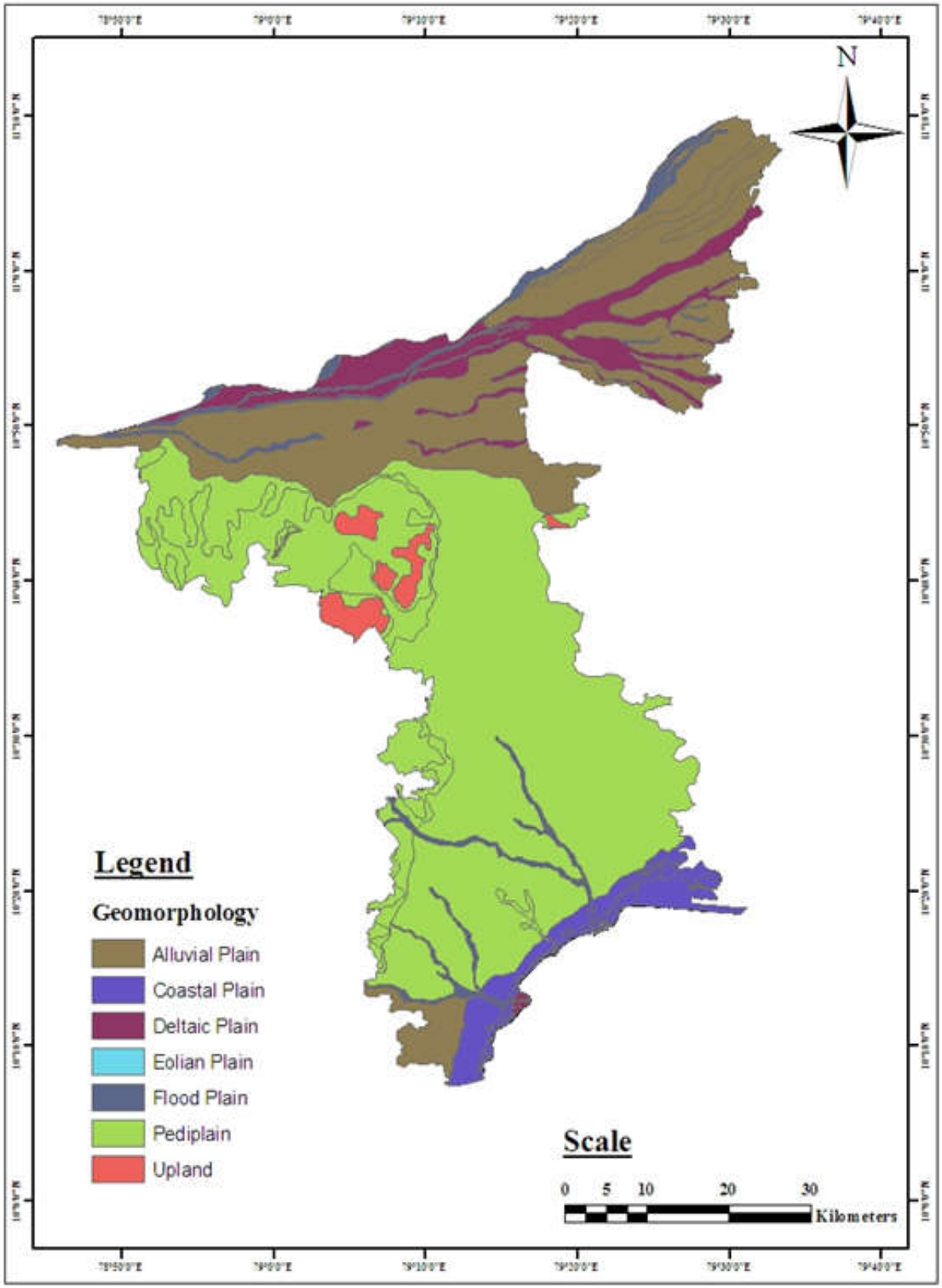

Fig. 3. Geomorphology map of the study area

4. Coastal Plain

The Coastal plain areas are mainly for Pattukottai taluk of the southern part. The taluk is mainly founded in younger coastal plain and older coastal plain deep areas are founded. Younger coastal plain areas are small size of the area. Older coastal plain areas are large size of the area. The areas are mainly for present day sea levels were also observed in the study area, indicating the higher sea levels in the geological past. These sediments are mainly composed of sand, silt and clay in which the sand content nearly constitutes 60% of the total area.

Conclusion

The details obtained in the present study have clearly demonstrated the capabilities of IRS-ID LISS-III data in

delineation and characterization of distinct geological and geomorphological units and analysis of their processes with selected field observations. The present landforms are the result of multiple cycles of erosion, diverse lithology and structure. The detailed landform map can provide vital information for planning and management (Fairbridge 1968) of the natural resources in the region, viz. by monitoring soil erosion and suggesting soil conservation methods, landscape ecologic planning etc. These can also help to improve the socio-economic conditions of the area through sustainable development.

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