Geomorphology and Petroleum Prospects of Cauvery Basin, Tamilnadu, Based on Interpretation of Indian Remote Sensing Satellite (IRS) Data

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ABSTRACT

Geomorphological studies of the Cauvery basin, Tamilnadu were carried out using IRS images with special emphasis on identification of zones of hydrocarbon occurrences. The basin exhibits landforms of fluvial and fluvio-marine plains. Two major trends of lineaments and 15 circular anomalies have been identified. The NW-SE trend appears to be younger and might have played an important role in migration and entrapment of hydrocarbons. Six circular anomalies are associated with known oil/gas wells. The study has identified probable zones of hydrocarbon occurrences.

Introduction

The Cauvery Basin occupies most of the coastal plains of Tamilnadu and Pndicherry and extends offshore into the Bay of Bengal. Geological and Geophysical surveys have been carried out in this basin by ONGC since 1958. Bhave (1990) has given an account of the surveys carried out by ONGC in this basin till date. Kumar (1983) summarised the stratigraphy of Cauvery basin. The tectonic framework of the basin has been inferred by the geophysical data (Balakrishnan and Sharma, 1981; Kumar, 1983; Bhave, 1990; Sudhakar, 1990). Geomorphological and morphotectonic studies have been carried out by many earlier workers based on air photos and Landsat images (Varadarajan, 1969; Babu, 1981; Varadarajan and Balakrishnan, 1982; Mahajan et al., 1984).

The launching of IRS provided an additional input to remote sensing community engaged in resources exploration. In the present study Black & White IRS LISS-2 bands 2 and 4 images of 28.6.88 on 1:500,000 scale were visually interpreted for geomorphological and morphotectonic studies of Cauvery basin. The emphasis was laid on deciphering morphostructural configuration and neotectonic movements.
which may help in identifying the probable zones of petroleum occurrences.

**Geomorphology**

The geomorphological map of the basin prepared on the basis of interpretation of IRS imagery is shown in Fig. 1. The lateritic uplands occur along the western margin of the basin and form the regional erosional plains. The Cauvery river, flowing through the uplands, has migrated anti-clockwise from a pivotal point within the uplands, before occupying its present position, as evident from the position of various paleochannels. The former distributaries of the Cauvery river can be better traced on IRS images than on the Landsat images. These paleochannels coincide with the valley forms identified by topographic analysis. Levees occur along some of these paleochannels.

The Cauvery delta lacks the protuberance which is regarded as one of the most essential elements of a delta. The recent longshore wave action has made a smooth and straight coastline fringed by beach ridges and occasional swales. A few estuaries and lagoons have developed along the coast indicating submergence. Three broad stages of delta formation, during recent past, can be postulated on the basis of beach ridges and traces of paleochannels. The probable position of the old shorelines are shown as strand lines in Fig. 1.

**Neotectonics and Morphostructures**

Quite a good number of major and minor lineaments can be seen on IRS images. The major lineaments are shown in Fig. 2. Even though the regional trend of the basin, as inferred from geophysical data, is in NE-SW direction, lineaments oblique to this trend are also common. These later trends would affect the migration and accumulation of hydrocarbon.

A study of bathymetric profiles have shown that the shelf is steep near Portonovo and then widens up towards Vedaranniyam. This, in conjunction with lineaments analysis, leads to the inference that the northern part of the basin has experienced more recent tectonic activity than the southern part.

About 15 circular anomalies (morphostructures) have been identified on IRS images, most of which are not discernible on Landsat images. Most of these morphostructures are associated with gravity high/low or nosings and the seismic studies have confirmed the presence of subsurface structures in some cases. These morphostructures might have been possibly developed due to Quaternary movements as drape over structures.

**Petroleum Prospects**

The Cauvery Basin has developed as a pericratonic basin and the initial framework is influenced by the structural framework of the craton. The later tectonic activities, developing at any subsequent stages of basin development, should result in the development of younger structural trends which control the migration and entrapment of hydrocarbons generated within the basin.

The Cauvery basin exhibits a number of horsts and graben structures as evidenced by geophysical studies (Kumar, 1983). There are five major sub basins separated by four horsts (Fig. 2). These are parallel to the NE-SW trending Eastern Ghat trend. Only a few major lineaments along this trend could be seen on IRS