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Modeling Concealed structures of Cachar fold belt integrating seismic, geologic and land sat imageries with special reference to Bhubandar field-Assam and Assam Arakan Fold belt, India

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Summary

In Cachar fold belt, Assam, India, 22 Exposed and 6 concealed structures have been mapped till date. Banskandi, Bhubandar are concealed gas fields, the presence of which have been identified mainly based on geomorphic anomalies and seismic surveys. Present paper deals with the role of land sat imageries in firming up the concealed structures where the seismic data is poor(Fig:1). An attempt has been made in this in paper in quantifying the geomorphic anomalies by elevation contours derived from landsat image data. Google earth helped in quantifying the geomorphic anomalies by elevation contours. Geologic and seismic map overlays helped to a greater extent in integrating and firming the prospect.

Introduction:

The structures in Cachar fold belt are elongated aligned NNE to NE directions in the Barak valley. The geological map of the study area reveals two major high trends namely, Rengte anticline towards west and Teidukhan anticline towards east. Bhubandhar is a concealed structure located on the western rising flank of Rukni syncline, which is a low in between Rengte and Teidukhan. The general structural trend in the area is NE-SW. Balichara high, a concealed structure, west of Rengte anticline is envisaged on the basis of seismic mapping. Rengte high axis has been demarcated on the southern part on the basis of geological mapping (Fig:2&3).

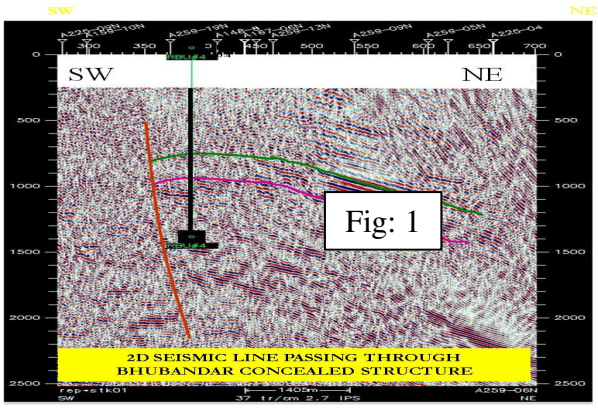

Fig: 1

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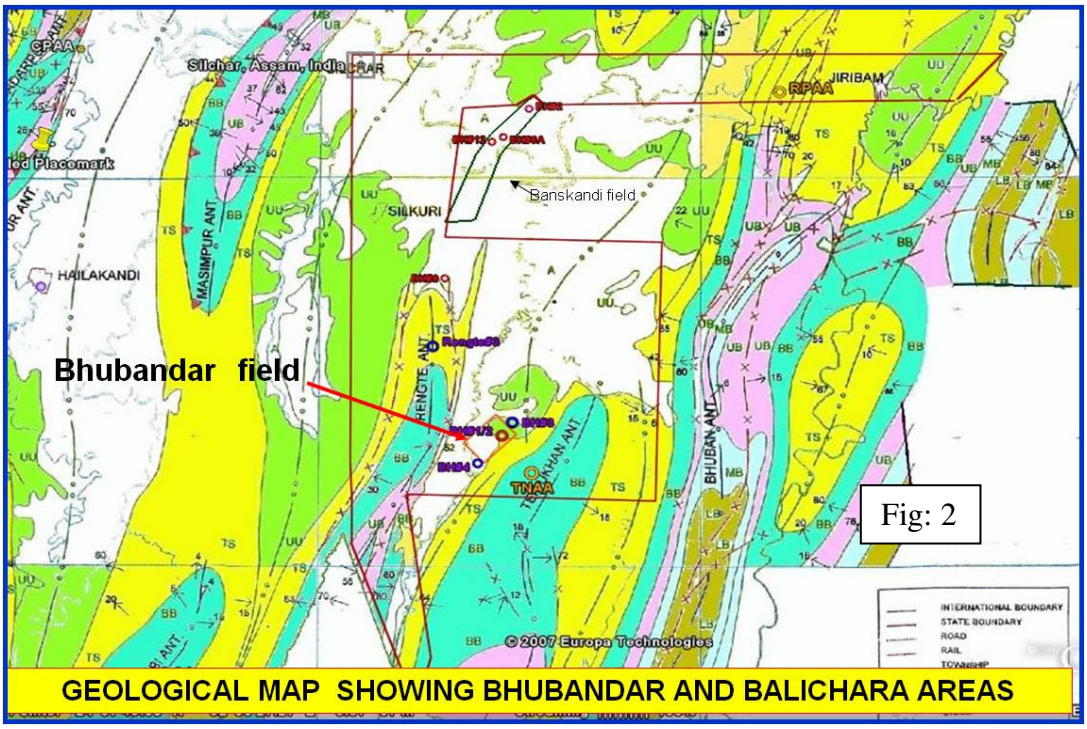


GEOLOGICAL MAP SHOWING BHUBANDAR AND BALICHARA AREAS

Fig: 2

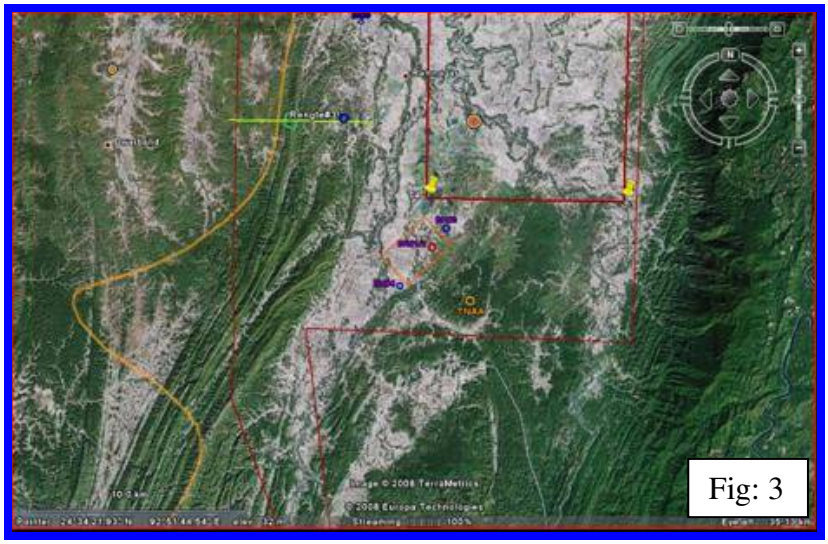
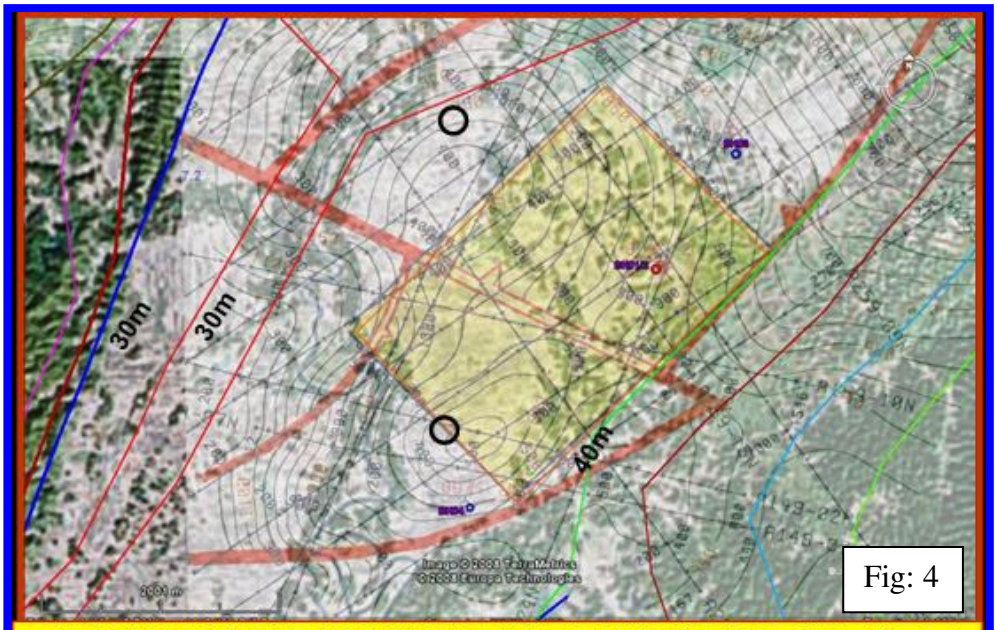
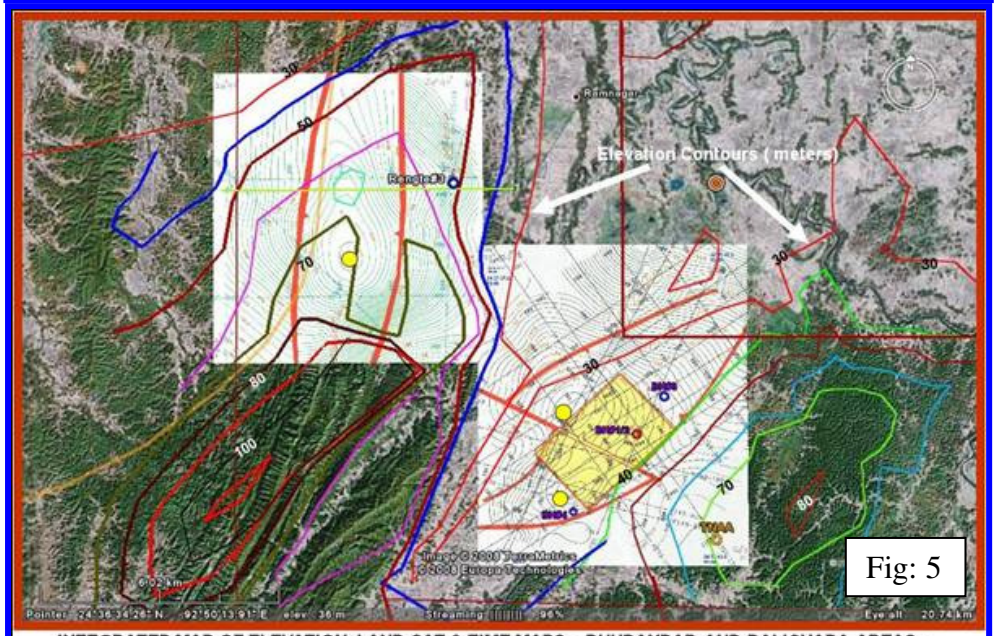


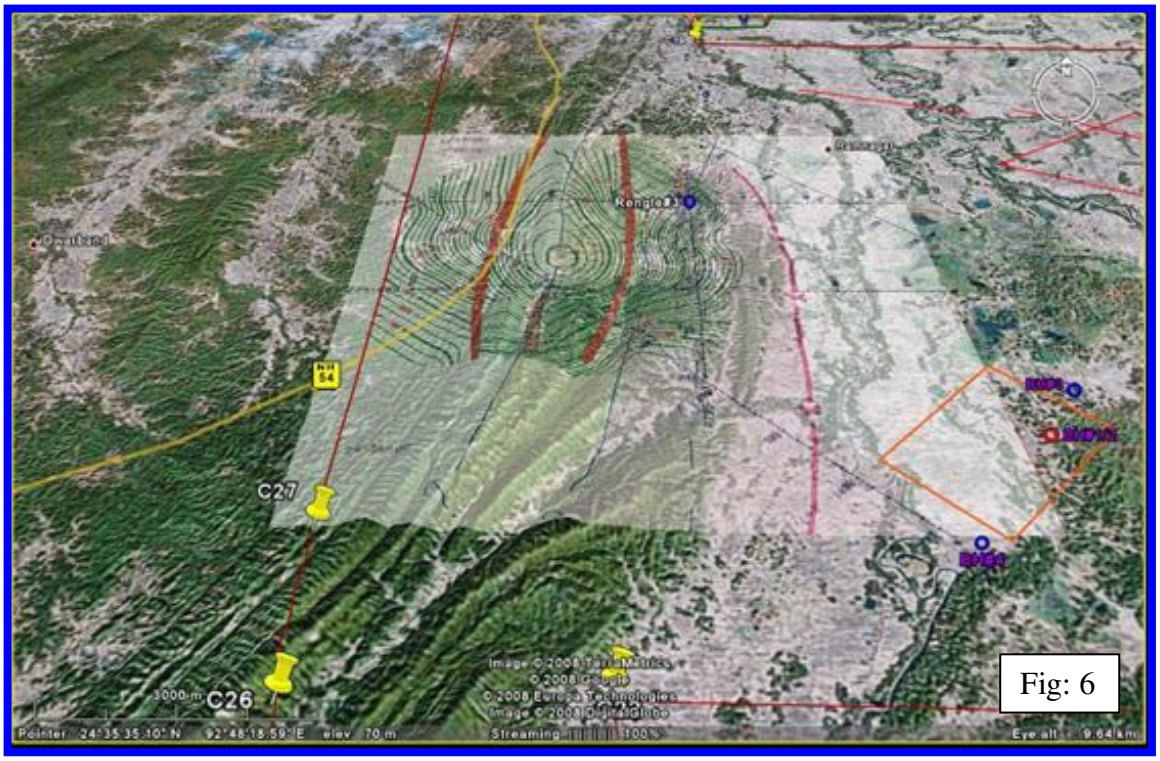
Fig: 3



LAND SAT AND TIME MAP OVERLAY BHUBANDAR AREA Note Rivulet surrounding the structure (R-BU-4&5



INTEGRATED MAP OF ELEVATION, LAND SAT & TIME MAPS – BHUBANDAR AND BALICHARA AREAS – NOTE THEN NORTHERN PLUNGE OG THE CONCEALED PART OF THE EXPOSED STRUCTURES IS CEARLY DEFINED BY ELEVATION CONTOURS



The generalized stratigraphic column of the area is given in (Fig: 7). 4 wells were drilled in Bhubandar of which one well is gas bearing. One gas zone has been identified in Upper Bhuban formation. The seismic data acquired in this area is poor. An attempt has been made to remodel the area using well data, field geological data, land sat mageries and seismic data.

Theory and method:

The scanty 2D seismic data has been utilized in broadly bringing out the structural picture of the Bhubandar prospect in the subsurface at Upper Bhuban. The two way time map was overlain on geological map using Google earth overlay facility. The elevation data of Google earth has been used in contouring the elevation data. Integrating all the data the general trend of the prospect was conceived.

The regional paleo depositional model was utilized integrating facies analysis model in understanding the hydrocarbon play.

Analysis

Bhubandhar anticline (NE-SW trend) at Upper Bhuban level is dissected by a fault FF, (Fig-4, 5 & 6). It is bounded by two longitudinal reverse faults F1-F1 & F2-F2 which are laterally displaced towards east by F-F. The wells drilled on the NE block produced gas from Upper Bhuban. The well drilled on the SW block went dry.

Special studies have been carried out to confirm the geomorphic anomalies in the Bhubandhar & Balichara areas by integrating time maps, landsat images and elevation maps the integrated map (Fig-4) suggests a rivulet bifurcates just north of these structures and surrounds the prospective area which is a geomorphic high. The

geomorphic high has been quantified using elevation contour map. The elevation contour (30m) broadens and surrounds prospective area and steepen just north of Rengte structure supporting the existence of cross fault. The northern plunge of the concealed part of both Bhubandar and Balichara structures is clearly defined by elevation contours.

A cue from Major tectonic event in fold belt reveals that during Upper Pliocene to Early Pleistocene, Folding and upliftment of Tripura- Cachar Fold belt took place, resulting in development of N-S oriented thrust related anticlines. It is evident from the **regional understanding** that the major clastic input was from NE to SW during Middle Bhuban-Upper Bhuban (Middle Miocene) (Fig: 7). Structures came into existence during upper Pliocene to Early Pleistocene. This post depositional uplift appears to have facilitated formation of up dip pinch outs in the northern plunge part of the structures (Fig: 9).

Entrapment mechanism: Electro log correlation brings out an intriguing fact of selective entrapment of hydrocarbons. The reasons for absence of hydrocarbons in the other stratigraphic levels are not clear, though all the other requisites like cap, reservoir, and structure exist (Fig: 8).

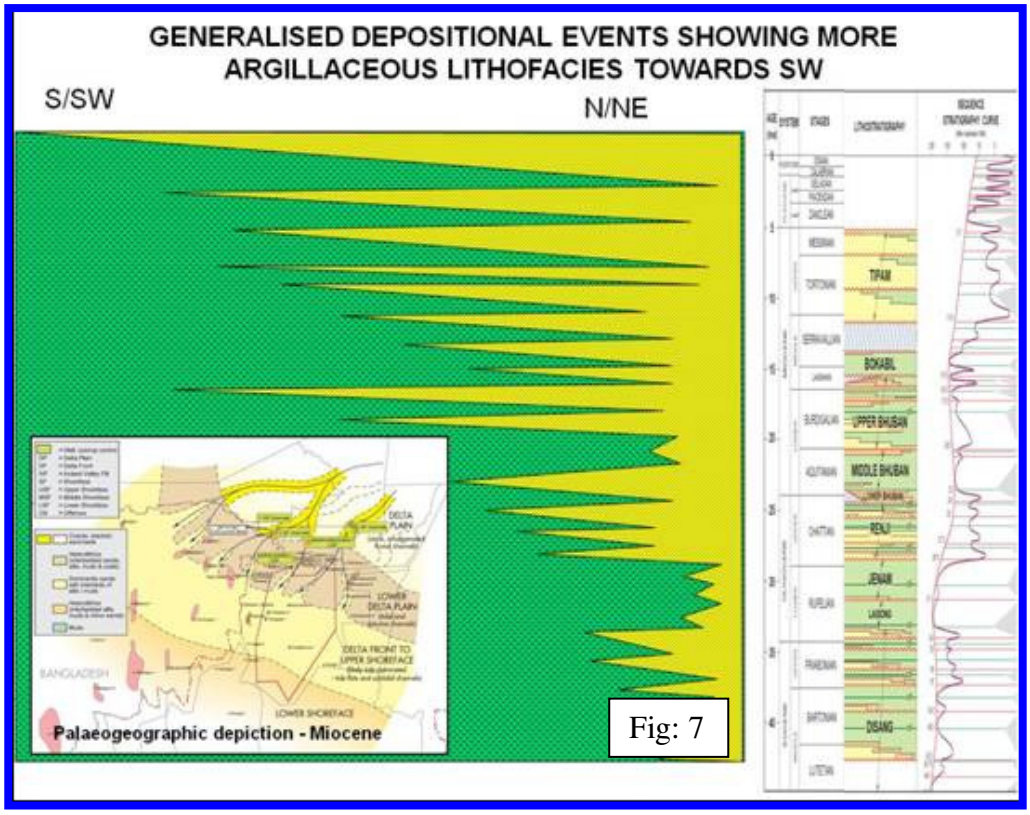


Fig: 7

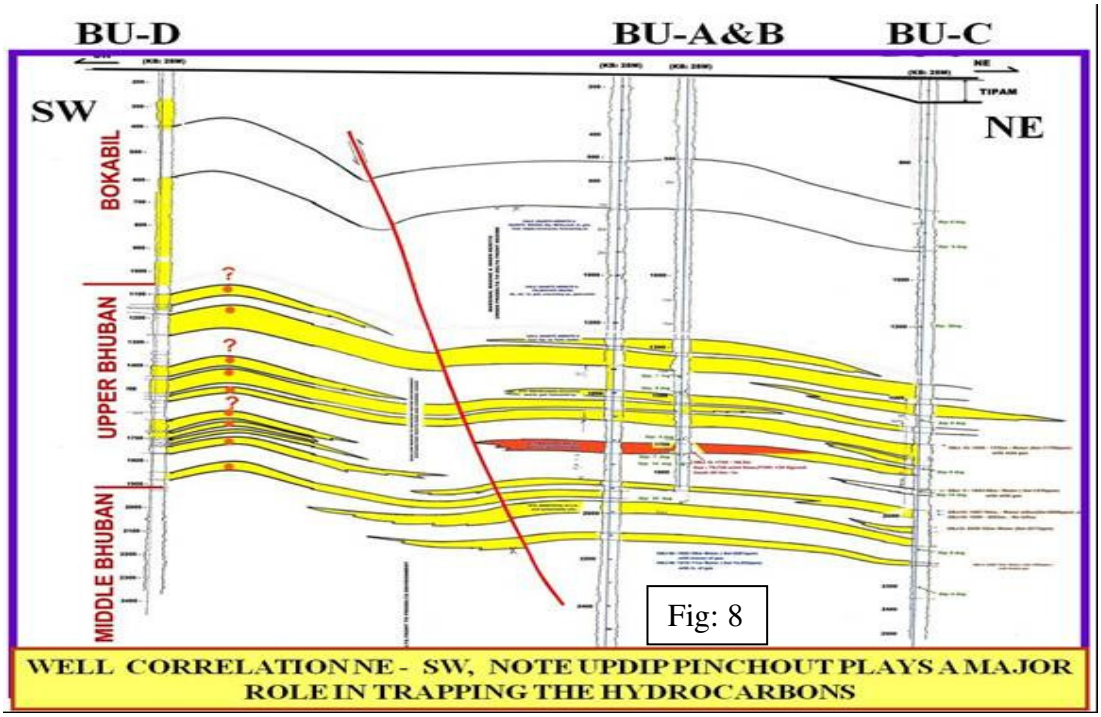


Fig: 8

WELL CORRELATION NE - SW, NOTE UPDIP PINCHOUT PLAYS A MAJOR ROLE IN TRAPPING THE HYDROCARBONS

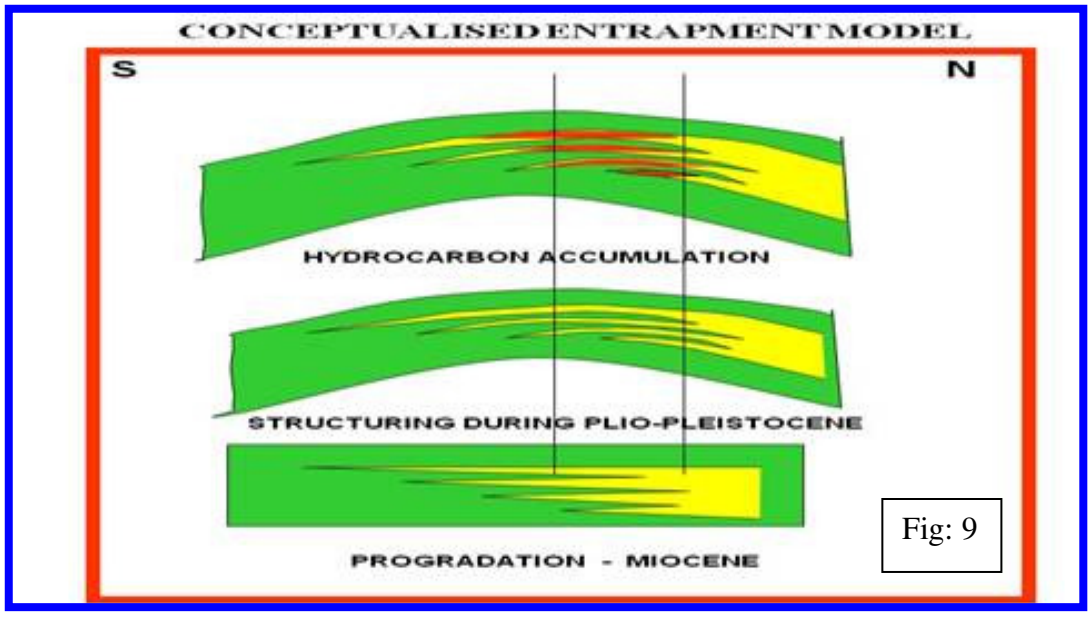


Fig: 9

Conclusions:

Bhubandar is a concealed structure. The gas accumulations are known within Upper Bhuban. An integrated approach of land sat, Geologic, seismic and well data suggests that stratistructural entrapment plays a major role in trapping hydrocarbons. A regional understanding of the area reveals major paleo clastic input from from NE to SW. The structures came into existence during Plio-Pleistocene times. This facilitated updip pinch outs. Land sat imageries helped to a greated extent in mapping the geomorphologic anomalies using elevation contours.

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