

DISCUSSION

Comment 1

(Comment on the paper "Seismic Stratigraphic Modelling of Sub-surface Godavari Limestone of Godavari Delta Region and its Importance in Oil Exploration", by P. K. Dewan, Journal Geological Society of India, Vol. 37, January 1991, pp. 13-23.

1. The paper by Shri Dewan deals neither with seismic stratigraphic modelling nor with oil exploration.

2. The study as presented in the paper only involves preparation of two isochron maps at the top and bottom of Godavari limestone in Godavari Basin and matching them with synthetic seismogram. The depocentres, channel areas, etc., shown in Figures 2 and 3 are imaginary in the sense that no such features can be recognised from isochron mapping alone. Further, continuous increase in isochron value as indicated in Figure 2 does not point to calm shallow marine environment of deposition. The identification of shelf age as indicated in Figure 4 is also ambiguous, as parallel to sub-parallel reflection are not characteristics of slope sedimentation.

3. The paper deals with a very fundamental aspect of seismic studies like isochron mapping of a particular horizon (Godavari limestone) and is in no way connected with seismic stratigraphic modelling or oil exploration. 80% of the content of the paper includes generalities which are well-known to the workers of Godavari area for many years.

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Reply

1. Godavari limestone's importance in oil exploration is indicated by its having a high acoustic impedance contrast with the surrounding clastics and its use as a marker horizon in seismic stratigraphic studies in the area for oil exploration. Also a shelf edge was mapped which can consist of good petroliferous deposits.

2. The depocentres, channel areas, etc., were not recognised by isochron mapping alone, isochronopach mapping was also done which was not useful enough to be represented in the paper. Seismic facies analysis is also included. One of the interpretations of continuous increase in isochron value as indicated in Figure 2, is calm shallow marine environment of deposition which is supported by biostratigraphic analysis and seismic facies analysis. Shelf edge is very well indicated in Figure 4. Parallel to subparallel reflections are indicative of calm environments of

deposition, which does not mean that there will not be an edge to the shelf if they represent the shelf environment. Oblique reflections in the parallel reflections indicate shelf edge environment.

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Comment 2

(Comments on the paper **Hydrogeology of the Jharia Coal Field, India**, by V. D. Choubey and I. Sankaranarayana, Published in Journal Geological Society of India, Vol. 36, No. 1, pp. 36-45.)

I wish to offer the following comments :

1. On page 37, 5th line under Mukunda Block subheading: Location of "Bore hole No. LJ/2 with maximum thickness of 600 m of Barakars" is not shown in Figure 2 to facilitate the reader to understand the basin orientation.
2. Section line AA' of Figure 3 is not indicated in the geological map of Mukunda Block (Fig. 2). Even Boreholes NGK 16, NGK 15 and NGK 11 have not been indicated. Hence, the direction of thickening of the water-bearing beds in the Mukunda Block cannot be made out.
3. The portion of Mukunda Block selected for the hydrogeological study in this paper (Figs. 4, 5 and 6) could have been indicated in Figure 2. If not atleast the Chatkari Jore be located on Figure 2. Otherwise the grid values in Figure 2 could have been marked on Figures 4, 5 and 6. This would have facilitated the readers to understand the exact position of the Mukunda Block.
4. From Figure 4 it is observed that Chotkari Jore is effluent (groundwater body feeding the surface streams) in nature and appears to be perennial. Authors state that the wells located on fracture zones are dry. In none of the maps the fracture zones have been demarcated, without which the above statement cannot be accepted.
5. The Unit of expression of specific conductance is μ mhos/cm at 25°C. In Figures 5 and 7, the authors have marked it as 100 μ Ohms-cms.
6. Spelling of Horizon tested in Table I on page 41 is wrong. Similarly Tm^2/d is given as $\frac{T^2}{M/d}$ in the same table.
7. Hydraulic conductivity as per Table I given in the paper is 1.56×10^{-3} to 4.6 m/d. But in the running matter on page 42, 2nd line from top it is 1.36×10^{-3} to 4.6 m/d.
8. On page 43, 2nd line of para below Figure 7 reads as "are given in Figures. 6-8." But Figure 8 doesn't find a place in this paper. Could the authors enlighten what Figure 8 is ? (in their manuscript without which the inferences drawn have no relevance).

9. On page 43, 5th and 6th lines of para below Figure 7 read as "The specific conductance of the water reflects the sulphate concentration." How is EC related to SO_4 ? (sympathetic or antipathic is not clear from Figures 5 and 6).
10. On page 43, 7th line of para below Figure 7 reads as "In Bhagaband Block also the same trend in water quality is evident. With only Figure 7 on hand none can reach the conclusions of the authors. It is well-known that $1 \text{ ppm TDS} = 1.56 \text{ EC} \times 10^6$ (Richards, 1954); $\text{TDS} = \text{AC}$ where C is the conductance in $\mu \text{ mhos/cm}$ at 25 C and A for most groundwaters is between 0.55 and 0.75 depending on the ionic composition and concentration of the solution and not EC directly reflecting SO_4 concentration.

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Reply

The authors are thankful to Dr. J. C. V. Sastri for pointing out certain errors which have inadvertently occurred.

1. It is not always possible to show the location of all bore-holes on a small scale map.
2. Unfortunately section line AA' has not been marked on Figure 2. No doubt it would have been much easier to understand Figure 3 of the section line AA' was marked on Figure 2. The omission is regretted.
3. The Mukunda block is the principal area of our investigation. The location of Mukunda has been prominently indicated on Figure 1.
4. In Figure 4, Chotkari Jore has been shown as an effluent stream. However, there are some wells in this area which are dry. It is a well established fact that the response of the groundwater system is controlled by the interaction of natural hydrogeological controls, the free-draining boundary of the mine, the dynamic changes in the hydraulic properties caused by mine-related deformation and various operating parameters. The hydraulic property of coal-measure rocks are strongly controlled by the frequency, continuity and apertures of the fractures.
5. The unit expression of the specific conductance is $\mu \text{ mhos/cm}$ at 25°C and in Figures 5, 6 and 7, this is an error and has to be corrected.
6. In Table No. 1, there is again a typographical mistake in the spelling of "Horizon tested" and in the expression Tm^2/d .
7. Hydraulic conductivity as per Table I should be 1.56×10^{-3} to 4.6 m/d and on page No. 42, this should be read as 1.56×10^{-3} to 4.6 m/d. The correct expression is mentioned in Table I.
8. While revising the manuscript, the last figure (No. 8) was deleted and therefore, on page 43, it should be read as Figures 6 and 7.

- 9-10. Regarding the 5th and 6th line on page 43, in connection with specific conductance of water reflects sulphate concentration. This inference has been drawn mainly on the basis of the sulphate ion being more stable in an oxidising environment where the pH ranges from 6 to 8. Thus, the sulphate ions remain in solution and are reflected in the specific conductance readings. In fact, this is the sulphate salt concentration that is reflected in EC values.

We are thankful to Dr. Sastri for drawing our attention to the facts under point No. 9 and 10 under discussion. The typographical mistakes have been corrected in the reprint copies widely distributed.

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‘EARTH SYSTEM SCIENCE’

It is clearly time to develop ‘Earth System Science’ for the earth’s crust and interior, following the examples of those mainly concerned with atmosphere and oceans. The solid earth is a system comparable in complexity to those but operating on a much longer time scale. This system embodies link between the core-mantle interactions, mantle dynamics and the generation and evolution of lithosphere and so to the biosphere that forms a thin layer between the solid earth and its fluid envelopes. The stages of origin, migration and subduction of the lithosphere are all associated with lithosphere/hydrosphere interaction, and continent formation is tied to interaction between the mobile mantle and the lithosphere. The continents evolved between the mantle and fluid envelopes, and the biosphere and human beings depend on all of these.

We have probably gained more fundamental knowledge about the earth’s interior during the 1980s than in all the previous scientific history. During the same period, however, the cumulative and damaging effect of human society has become dramatically obvious. We do not know if we have the time to complete our understanding of the earth before our aggressive attack on the planet irreversibly depletes the resources such as soil and petroleum, that are not economically replaceable by future generation.

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