DISCUSSION

CURRENT SEISMICITY IN NORTHERN MAHARASHTRA AND SOUTHERN GUJARAT: IMPLICATIONS OF PLUME TECTONICS by Manoj Mukhopadhyay.

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After going through the paper it is felt that, there are some points to be clarified by the authors.

1. The author has explained the seismicity of the Northern Maharashtra and south Gujarat with the help of the three concentric circles of 80, 200 and 300 km radii, which seems incorrect. Figure 3 indicates that the seismicity of the Ahmedabad, Cambay and western Gujarat lies in the 300 km radius circle and gives wrong perception about the real cause of the seismicity along active Cambay rift. Surprisingly, how Vadichanda can be a centre of all the 300 km encircling seismic activity. The figure is drawn for the seismicity of western Indian shield only after studying 16 instrumental and 19 non-instrumental data of historic period, which gives a totally wrong impression about the seismo-tectonics of the region. Presently, two views are prevalent amongst the seismologists to explain the seismo-tectonics of the western Indian shield: (a) the Kutch region has suffered a bolide impact at Anjar/western Gujarat around 66 m.y. close to KT boundary which initiated the breakup of Seychelles and induced further tectonic ramifications (Negi et al. 1992; Raval, 2001). (b) The reunion plume movement, which explains seismo-tectonism of the western Indian shield and Arabian sea. The present day seismicity is confined along the plume outburst region i.e. around Cambay and along the plume trace region i.e. Cambay-Broach-Surat-Mumbai-Laccadive (Raval, 2001; Pandey and Agrawal, 2001; Singh, 2002). The Vadichanda is neither a bolide impact nor the plume outburst region, but situated on plume trace region.
2. Figure 4 of the paper clearly indicates that the epicentres of most of the earthquakes are aligned along a line passing through Surat-Vadichanda-Nasik. Looking at this, it is clear that this weak zone may be an active fault passing through Surat-Nasik. This constitutes part of the West Coast Fault region, which begins from Cambay to further south.
3. In Fig.6 the author suggests high precision repeat microgravity and GPS surveys along the major roads. Figure.4 shows minimum number of seismic centres along Surat-Bardoli-Lamati road and Bulsar-Nasik road. It is better to identify local lineament fabric of the whole region prior to any such exercise.
4. Figure 1 indicates a large circle, which approximates the hot mantle plume at the time of rifting, which comprises Aravalli, Singhbhum, Dharwar and Eastern Ghat Precambrian belts. This fact must be supplemented with the available references.

Manoj Mukhopadhyay, Indian School of Mines, Dhanbad - 526 004, Jharkhand, replies:

We thank Sharma and Purohit for expressing interest in our paper. Following is our reply to the points raised by the authors.

1. Sharma and Purohit cite the two views prevailing among seismologists to explain the seismotectonics of the western Indian shield: (a) one for the Kutch region, and (b) the other pertaining to the Reunion plume movement. The Kutch region is not included in the present study; hence we shall not deliberate on that. In support of the seismo-tectonics resulting from the Reunion plume movement, they quote the papers by Raval (2001), Pandey and Agrawal (2001) and Singh (2002). As it may be seen that all the three papers post-date the submission of our paper to the Journal. Consequently, we did not have the advantage of consulting these while preparing our paper. Anyway, the work by Raval (2001) again deals with the 'Earthquakes over Kutch', and there is only a passing reference to seismic activity at the intersection between the Delhi-Aravalli mobile belt with the Cambay-Kutch rifts. We have no disagreement with this view. Burke and Dewey (1973) proposed four-arm junction for the Khambat plume generally in this region – recall the first paragraph in our paper (sentences 4, 5 and 6 under Introduction). The paper by Pandey and Agrawal (2001) also does not give any detailed account on seismo-tectonics of the region covered in our study save

the reproduction of an epicentral map (Fig 7) While Fig 3 in our paper incorporates both non-instrumental and instrumental data for the period 1594-1971, Fig 4 provides a revised seismicity map for this part of the western Indian shield based on the data from the Gauribidanur Seismic Array The latter figure demonstrates that most of the seismic activity is in the Surat-Daman-Nasik region around Vadichanda The third paper quoted by Sharma and Purohit in support of the seismotectonics due to the Reunion plume is that by Singh (2002) This paper deals with gravity interpretation and does not discuss the seismotectonics of the west coast

2 Sharma and Purohit conclude that Fig 4 in our paper 'clearly indicated that the epicentres of most of the earthquakes are aligned along a line ' We think it is rather premature to assign the observed seismicity to the West Coast Fault only This is due to mainly three difficulties (i) the West Coast Fault has a more NW-orientation, (ii) seismically the most active region is trap-covered and (iii) more data coverage is essential to investigate the fault-related seimicity

3 There is nothing wrong in our suggestion that both high-precision repeat microgravity surveying supplemented by repeat GPS data should be undertaken both within the active zone as well as some distance outside it Refer (among others) Yun-Tai et al 1979 and Buchbinder et al (1988) (cited in our paper) There cannot be any dispute about the usefulness of identifying the local lineament fabric in such studies

4 The large circle approximating the hot mantle plume at the time of India's rifting (depicted in Fig 1 in our paper) is after White and McKenzie (1989) The reference is cited both in text and in figure caption Other additional references are Kent (1991) and White (1992) – both refer the original source paper by White and McKenzie (1989)

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