CORRESPONDENCE

THE JABALPUR EARTHQUAKE OF MAY 22, 1997

A.P. Agarwal, No.1, MIG, Shiv Nagar, Jabalpur - 482 002 and **V.K. Khanna,** Department of Geology, Govt. Science College, Jabalpur - 482 001, write:

Kindly refer to the paper 'The Jabalpur Earthquake of May 22, 1997' by Gupta et al. 1997, published in your esteemed journal, v.50(1), pp.85-91. The authors should be complimented for the first hand account of Jabalpur earthquake. We like to supplement the observations with additional information

1. Emission of peculiar faint reddish light was observed on the eastern horizon. Observations of light emission and other low frequency electrical phenomena are often associated with earthquakes originating out of ruptures and faults. Exoelectron excitation of ambient atmosphere is the mechanism responsible for light emission during rupture (Mohd. Haneef, 1997, personal communication).
2. The earth lore (sound) had two distinct breaks approximately at equal time intervals.
3. Three strong tremors were felt one after the other at 4.22 A.M on May 22, 1997. Earlier to these a mild tremor was felt by sensitive persons at about 2.40 A.M.
4. The atmosphere became heavy.
5. At a few places in isoseismal zone VIII vertical RCC columns got twisted.
6. There was emission of hot gases, vapours and sandy soil from ground cracks and several wells in meisoseismal zone VIII.
7. Change in groundwater level specially near the fault planes. An interesting feature is the opening of groundwater sources in tube wells of Tikamgarh district situated approximately 200 km NW of Jabalpur in Bundelkhand granite terrain.
8. The epicentre is present close to the intersection of ENE-WSW trending Gaur river faults and N-S trending Ranbenala fault.
9. Isoseismal map by Gupta et al. shows NE-SW trend. The findings of present authors is also the same. But the isoseismal map of a larger area shows the presence of N-S component also.
10. Bargi reservoir is located within 25 km from the epicentre and possibility of some reservoir induced seismicity cannot be completely ruled out. It is worth mentioning that the hot springs of Mandla and the area of conductive anomaly (Kalpi) due to the presence of fluids are submerged under the Bargi reservoir.
11. Actual damage irrespective of meisoseismal zones is controlled by rock types, nearness of faults, thickness of soil, reclaimed land, nature of foundation and quality of construction. Damage to construction over granite terrain is minimum. Maximum damage is in areas with thick soil cover as in Adhartal.
12. Only two earthquakes of magnitude >6.0 have been reported by Gupta et al. (1997), in Narmada-Son lineament. In addition to these there was one in 1846 of magnitude 6.5 with epicentre at 23°N latitude and 80°E longitude.
13. Even in the same locality similar constructions suffered differential damage. This is best seen in Shiv Nagar and Dhanwantari Nagar.

B. Ramachandran, Geol.Surv.India (Retd), No. 2, Brindavan Street, Mylapore, Chennai-600 004, writes:

The scientific community is indeed very thankful to you, for the very prompt write-up on the subject by Harsh Gupta and others. But following points need consideration in connection with the above event.

1. The regional structure in Jabalpur area, discussed in detail by W.D. West in an article in your journal in 1964.
2. Horst and Graben structure in the Narmada valley, normal to the Tapi-Narmada-Son lineament, with the attendant fault margins.
3 The effect of Bargi Reservoir founded on the traps and situated within 100 km of the epicentral tract, where the water head is in the order of more than 100m.
4. Hotspring in Mandla area, their temperature variations, and their radon content at the time of the shock and thereafter.
5. Collapse of thousand buildings in Jabalpur, most of which are cutcha masonry buildings, built of lime mortar, mud mortar and hutmets, without adequate foundation (Jabalpur is a cluster of villages on the main road side, except for the civil lines and the cantonment).

Relevant geophysical studies should be taken up in the region for prediction of future shocks, particularly in the western part, where two major reservoirs are under construction and more are planned for the future, besides geomagnetic studies. Adequate seismic factors should be provided for in all the buildings and structures, as per ISI code in future.

HIGH DAMS IN CENTRAL HIMALAYA

B. Ramachandran, Geol.Surv.India (Retd), Chennai-600 004, writes with reference to **'High Dams in Central Himalaya in Context of Active Faults, Seismicity and Societal Problems'** by K.S. Valdiya, Jour.Geol.Soc.India, v.49, pp.479-494.

"Regarding the safety of the Tehri Dam, the scenario presented is very pessimistic and forebodes a gloomy picture. It should be remembered that only shocks of Mag.7 have occurred in the area in the past. And with a reservoir at Tehri, shocks of more than 8 Mag. may occur. But this shock of M8 would produce a surface acceleration of 8500 mm/sec/sec, which would get reduced to 1/4 of that value in the fresh and sound rock underneath, on which the dam is founded. For withstanding this acceleration a seismic factor 0.25 g has been provided for the dam, with half of that value in the vertical direction. Of course the quality of construction is to be of a very high order.

Further, it should be remembered that dams of similar heights have been constructed at Bhakra, Mangala, Tarabela and Shillog under somewhat similar geological and seismotectonic setups and are functioning satisfactorily for nearly twenty to thirty years.

In Tadjikistan, the world's highest rockfill structure, the Nurek Dam, more than 300m high, has been functioning for the last twenty years, where the seismic situation is much worse than anywhere in the world, with the Pamir Plateau in the vicinity, replete with earthquakes. Another very high rockfill dam has also been constructed here in the last twenty years. In fact, in this region, seismic activity has been in decline, in the light of isostatic balance created by the water reservoirs. It may be added in this connection that statistics reveal a very low percentage of failures of dams because of seismicity (>1%)."