NOTES

MICRO-TREMOR ACTIVITY IN JUBILEE HILLS AREA OF HYDERABAD, ANDHRA PRADESH

The twin city of Hyderabad and Secunderabad had experienced seismic activity in the past. For the earthquake of 1876, few felt reports were available in the catalogues for pre-instrumental period (Ramakrishna Rao, 1989). Seismic activity had also been experienced at Gundipet area (25 km from NGRI) during the months of January and February 1982 and at Medchal (30 km from NGRI) on June 30, 1983 (Rastogi and Chadha, 1985). The largest event at Gundipet was of 3.5 magnitude and Medchal event was of 4.0 magnitude. On August 25, 1984 a tremor of magnitude 1.6 was felt in Kushaiguda (6 km from NGRI). On November 29, 1984 three tremors were felt in Saroor Nagar (8 km from NGRI), the largest being 2.2 in magnitude. Jubilee Hills area (16 km from NGRI) experienced micro-tremor activity during 1994 and 1995. On October 10, 1994 the largest magnitude of the tremor that occurred in Jubilee Hills area was 2.0, whereas during the year 1995, the largest magnitude of the tremor was only 1.2 (Ramakrishna Rao and Solomon Raju, 1996).

On October 15, 1998, National Geophysical Research Institute (NGRI) Seismological Observatory recorded four tremors from Jubilee Hills area of Hyderabad at 17:37, 17:54, 21:35 and 23:08,hrs (IST). The tremor that occurred at 17:54 was of magnitude 1.7 and the others were of 0.9 magnitude. NGRI has set up a temporary state-of-the-art, three-component digital seismographic network of four seismic stations to monitor the micro-tremor activity from October 16, 1998 to November 5, 1998. A total of 500 tremors were recorded during the period of investigation. Only 41 tremors, recorded on all stations of the network, could be located accurately. The list of

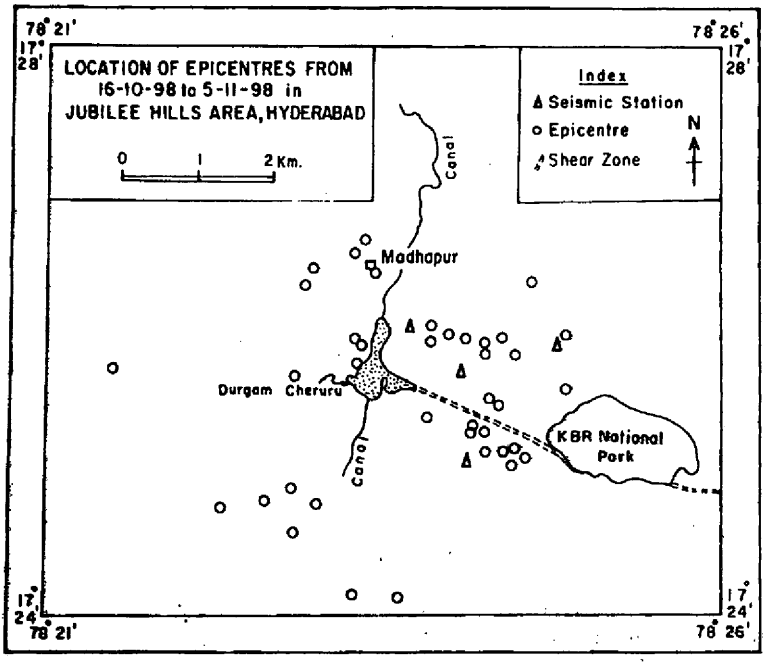

Fig.1. Location of seismic stations and epicentral locations.

Table 1. List of tremors and epicentral parameters

Date	Origin	Lat°N	Long° E	Depth	No.	GAP	DMIN	RMS	ERH	ERZ	Q
981017	1033 46.75	17-25.42	78-24.16	0.13	6	140	0.8	0.03	0.0	0.3	B1
981017	1058 27.75	17-25.35	78-24.18	0.64	6	138	0.6	0.08	0.2	0.7	B1
981017	1146 44.70	17-25.91	78-24.25	3.72	6	247	0.6	0.06	1.3	0.5	C1
981017	1326 57.73	17-25.85	78-24.81	1.82	6	322	0.1	0.09	0.2	0.1	C1
981017	2158 39.64	17-25.11	78-24.51	1.00	6	234	0.7	0.04	0.2	0.3	C1
981017	2227 31.59	17-25.92	78-24.88	1.00	6	326	0.3	0.20	0.0	0.0	C1
981017	2339 2.36	17-25.78	78-24.25	1.38	6	213	0.4	0.01	0.1	0.1	C1
981018	002 32.19	17-26.27	78-24.63	2.00	6	301	0.9	0.13	2.2	1.4	C1
981018	043 54.76	17-25.08	78-24.44	0.71	6	231	0.5	0.04	0.3	0.6	C1
981018	134 16.56	17-25.11	78-24.25	1.00	6	188	0.3	0.05	0.5	0.5	C1
981018	244 6.72	17-25.01	78-24.43	0.48	6	246	0.5	0.01	0.1	0.1	C1
981019	040 29.12	17-25.58	78-24.88	0.49	6	253	0.5	0.03	0.4	0.2	C1
981019	618 55.79	17-25.88	78-24.33	1.00	6	182	0.8	0.04	0.0	0.0	C1
981019	854 44.52	17-25.13	78-24.45	0.95	6	222	0.6	0.06	0.2	0.2	C1
981022	722 28.06	17-26.36	78-23.41	2.29	5	320	0.9	0.00	0.0	0.0	C1
981022	731 19.06	17-26.61	78-23.26	2.20	6	327	1.5	0.01	0.2	0.2	C1
981022	1253 3.33	17-24.86	78-22.82	1.97	6	315	2.4	0.01	0.1	0.1	C1
981022	2155 23.21	17-25.50	78-25.93	3.00	6	328	2.1	0.00	0.0	0.0	C1
981023	231 34.96	17-25.44	78-24.26	0.09	6	140	0.8	0.04	0.0	0.9	B1
981023	1338 45.28	17-25.23	78-24.25	0.77	6	163	0.4	0.02	0.2	0.3	B1
981023	1458 20.15	17-25.88	78-24.13	0.33	6	177	0.7	0.05	0.1	0.3	B1
981026	2348 57.05	17-25.50	78-23.29	2.28	6	324	1.3	0.01	0.2	0.1	C1
981027	838 15.04	17-25.84	78-23.36	1.04	6	296	0.7	0.02	0.2	0.2	C1
981027	852 29.54	17-25.67	78-21.52	1.57	6	338	3.9	0.02	0.4	1.3	C1
981028	844 5.58	17-25.67	78-23.29	0.89	6	288	0.9	0.02	0.2	0.1	C1
981028	1238 10.56	17-24.77	78-23.01	1.27	6	313	2.1	0.04	0.6	1.4	C1
981029	20 9 45.64	17-25.94	78-23.99	0.58	6	190	0.5	0.01	0.1	0.3	C1
981030	125 30.80	17-26.04	78-23.82	0.80	6	240	0.3	0.20	0.4	0.4	C1
981030	739 31.30	17-24.06	78-23.61	1.17	6	331	2.0	0.01	0.1	0.3	C1
981031	1811 12.95	17-25.87	78-23.82	0.72	6	149	0.2	0.02	0.2	0.2	B1
981101	1 9 17.23	17-26.25	78-22.76	2.49	6	330	1.8	0.02	0.4	0.3	C1
981101	816 13.67	17-24.58	78-22.80	2.17	6	322	2.5	0.02	0.4	0.5	C1
981102	9 2 2.09	17-25.83	78-23.31	1.21	6	299	0.8	0.01	0.2	0.1	C1
981102	1528 10.94	17-25.77	78.24.50	0.77	6	157	0.5	0.02	0.2	0.4	B1
981103	2 1 10.07	17-24.80	78-22.74	1.95	6	318	2.5	0.03	0.6	0.8	C1
981103	840 27.79	17-26.26	78-22.93	2.33	6	327	1.5	0.01	0.2	0.2	C1
981103	847 49.43	17-26.39	78-22.99	2.22	6	327	1.5	0.01	0.2	0.1	C1
981103	9 9 21.22	17-25.37	78-23.78	0.43	6	219	0.9	0.01	0.1	0.0	C1
981104	1653 50.50	17-25.23	78-24.21	0.35	6	152	0.4	0.03	0.1	0.3	B1
981105	1037 25.36	17-24.12	78-23.28	2.90	6	330	2.3	0.12	0.8	0.7	C1
981105	1253 32.48	17-24.70	78-22.28	0.50	6	328	3.4	0.06	0.8	0.6	C1

Origin - Origin time in GMT; Depth - Depth in km; GAP - Azimuthal gap; DMIN - Distance minimum from epicentre to station; RMS - Root mean square; ERH - Errors estimated in location in km; ERZ - Errors estimated in depth in km; Q - Solution quality of the located epicentre.

Q	Epicentre	Focal depth
A1	Excellent	Good
B1	Good	Fair
C1	Fair	Poor
D1	Poor	Poor

tremors along with the epicentral parameters is shown in Table 1. Location of the seismic stations and the epicentral locations are shown in Fig.1. The epicentres are aligned in NW-SE direction and the estimated depths for 78% of the tremors are confined to 2 km from the earth's surface.

Jubilee Hills area is mainly composed of Archaean granites and gneisses occurring as prominent hillocks. A WNW-ESE trending shear zone extending from Banjara Lake near Hotel Taj Residency, passes through Kasu Bramhananda Reddy (KBR) National Park and terminates near Durgam (Cheruvu) reservoir. The micro-tremors recorded from this area are probably causally related to this shear zone.

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SECOND CONVENTION OF THE MINERALOGICAL SOCIETY OF INDIA AND NATIONAL SEMINAR ON EARTH RESOURCES

A two-day Convention of the Mineralogical Society of India (MSI) and National Seminar on Earth Resources was held on 10-11 January, 2000 at Mangalore University. Fifty three abstracts were received which dealt with, (i) Application of remote sensing in the exploration of earth's resources, (ii) Marine mineral resources, (iii) Atomic and other strategic minerals and ornamental stones, (iv) Environmental aspects, (v) Coastal aquifers and (vi) Magmatism, metamorphism and mineralisation in the continental crust.

The Convention and the Seminar was inaugurated by Prof. S. Gopal, Vice-Chancellor, Magnalore University. Prof. C. Naganna, President of MSI presided over the function. Prof. K.R. Subrahmanya was the Convenor of the Seminar.

Dr. S. Adiga who released the abstract volume, highlighted in his keynote address the new developments and achievements of the country in the field of remote sensing. The deliberations of first session covered the application of remote sensing techniques and utilisation of satellite data for demarcation and mapping of different mineralized zones including lesser minerals, hydrogeophysical assessment of shallow depth lineaments, groundwater development of environmental resources, land evaluation and development of environmental database. It also emerged from the discussions that satellite data can be used as an effective tool in solving surface and groundwater problems and in their effective management.

The keynote address of the second technical session by V.K. Banakar was focussed mainly on two aspects (i) the chemistry, mineralogy, morphology and allied features of the oceanic ferromanganese deposits in relation to their genesis and growth and (ii) the importance of seamount ferromanganese crusts both as resources and as records of the palaeoceanographic events. His presentation also threw light on the discovery of ferromanganese nodules on the deep-ocean floor, their economic potential and pioneer countries involved in exploration and investment. The first paper of this session discussed the results obtained from the studies on western continental