"Hydrological Sciences" section lecture was delivered by Dr V T V Nguyen from McGill University, Canada in which he discussed the impacts of climate change on the hydrological cycles on various temporal and spatial scales General Circulation Models (GCM) that predict climate change posses a coarse spatial resolution (generally 2° for both latitude and longitude) to be of any use to hydrological studies which deals with the regional/local and station level He discussed the theoretical and practical aspects of tools that have been developed to downscale the GCM prediction to local levels There were two lectures scheduled under the "Solid Earth" section The first one was delivered by Dr Kojiro Irikura from Aichi Institute of Technology, Japan entiteled "Earthquake Hazards Prediction" It was a very relevant lecture that highlighted the efforts made by Japanese government to understand and lessen the effects of earthquakes, especially drawing from the experience obtained during the 1995 Kobe earthquake He discussed the importance of evaluating strong ground motions from future earthquakes to mitigate earthquake damage in urbanized areas surrounded by active faults and located close to subduction-zone earthquakes He emphasized on recognising various fault parameters, zones, their rupture and propagation The second lecture belonging to the "Solid Earth" section was presented by Prof Bor-Ming Jahn from *Institute of Earth Science, Taiwan, entitled* "Formation and Evolution of the Continental Crust" Earth is unique among the planets of the solar system as it is the only one to posses a continental crust It covers 40% of the earth's surface, 40 km thick on an average, sialic in composition with a major seismic velocity jump, the Mohorovicic discontinuity, at its base Prof Jahn discussed current problems pertaining to the formation and evolution of the continental crust, processes of continental growth and and recycling with the help of a specific example of crustal growth from the Central Asian Orogenic Belt In addition, a series of public lectures were delivered by renowned experts, which were attended by more than a thousand Singaporean school children and their teachers

The section of special interest of the author was the "Ocean Science", in which a large number of Indian scientists participiated A session was convened by Dr P D Naidu, entitled "Link Between Abrupt Climate Variability and Asian Monsoon System over the last 140 ka" It was chaired by Dr Raja S Ganeshram from University of Edinburgh, UK in which the undersigned presented a paper entitled "Synchronous Variations in Polar Temperature and South Asian Monsoon Precipitation" The papers presented in this session tried to explore the connections between the tropics and high latitude climate change and to identify the regions in bringing such changes

Thus, this meeting was very informative and useful and concluded with great success The next meeting (AOGS – 2007) will be held in Bangkok, Thailand from 31st July to 4th August 2007

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SEMINAR ON PALEOSEISMOLOGY AND ACTIVE FAULTS IN GUJARAT

The above Seminar was organized on 16 September 2006 by the Institute of Seismological Research, Gandhinagar, Gujarat Over fifty delegates participated and fourteen papers were presented on recent work and results on the subject matter S K Biswas explained that Kachchh is a rift basin formed in Mesozoic time between Nagar Parkar Fault and the North Kathiawar Fault, the later being the master fault There were three uplifts that took place along primordial faults of Aravalli belt Island Belt, Wagad and Kachchh Mainland with intervening grabens and half grabens A sub-surface N-S basement ridge-Median High crosses the basin Acting as a hinge it divides the basin into a deeper western part and a shallower and more tectonised eastern part During late Cretaceous pre-collision stage of the Indian Plate, upthrusting occurred along these major faults Later on due to plate induced horizontal stress, strike-slip movement occurred along these faults The right-lateral slip shifted the uplifts eastward with respect to Kachchh mainland Igneous plutons have extensively intruded the Mesozoic sediments during rifting and post rift hotspot related Deccan volcanicity Studies on intrusive bodies and seismological data of NGRI suggest the presence of an ultramafic magmatic body in the 2001 epicentral zone During the present compressive stage, the Kachchh Mainland Fault (KMF) has become the active principal fault Towards the eastern end it left-steps and

forms south Wagad fault. The over-step zone Samkhiali-Lakadia graben – is the most strained part of the basin. The 1956 and 2001 earthquakes have occurred in this part. The 1819 earthquake occurred along western part of KMF. The Allah-bund uplift has occurred along the Nagar Parkar Fault (NPF) as a secondary effect. Rather, the 1819 earthquake might have added some uplift to already existing uplift. A lineament shown in Pakistan need not be called NPF.

B.K. Rastogi of ISR inferred that Kachchh has large compressive stress due to upward thrusting/buckling of the region that started after the major continent collision had stopped along Himalaya 10 Mybp. The major faults indicate overthrusting of the southern blocks as happened for 1819, 1956 and 2001 large earthquakes. The major faults (Allah Bund, Island Belt, Kutch Mainland and Katrol) and minor faults (Wagad, Banni and Gedi) are capable of producing great/major earthquakes. There is great hazard from the hidden faults also as was experienced for 2001 earthquake. From precise locations of aftershocks, the hidden fault (named North Wagad Fault) is determined to be south-dipping, hanging block of which moved northward during the 2001 mainshock. The Gedi Fault, situated 50 km NE of 2001 epicenter, has become active after 2001. So far the maximum magnitude has been 5.6 i.e. for an earthquake on March 7, 2006. However, with a length of 50 km it is capable of producing a damaging earthquake of magnitude 6-7. Tomographic inversion of aftershock data indicates presence of a high velocity mafic pluton/rift pillow beneath the 2001 earthquake rupture (60 km x 40 km). This crustal pluton must be contributing additional significant stresses. Within this pluton a small low velocity zone is detected at the focal depth of the mainshock (18-25 km), which is inferred to be a fluid-filled (trapped aqueous fluid resulting from metamorphism) fractured rock mass, that might have acted as an asperity to nucleate the earthquake. Recent geophysical surveys by NGRI (seismic and gravity) with limited coverage have provided some idea of basement depth (3-6 km) and crustal depth (37-45 km) in southern Kachchh. Receiver transfer functions from earthquake data determined by NGRI have yielded crustal depth of 38-49 km. Thus the crust in Kachchh is found to be thicker than the average Precambrian crust. A WNW-ESE trending large Moho upwarp (by 2-5 km) beneath the aftershock zone (in the zone of pluton) is detected, that might have played an important role in generation of 2001 earthquake. From Sp–S times the sedimentary thickness is obtained to be 2-3.2 km from Ramvav to Jawharnagar.

Javed Malik of IITK showed the map of active faults which he prepared from satellite imagery in collaboration with Prof. Nakata prior to 2001 earthquake. Banni area was noticed as an active zone. Several faults mapped in the area are not triggered due to 2001 activity and remain as potential candidates for future earthquakes. He emphasized that identification and precise location of active faults and understanding of their geometry is very much important for proper seismic hazard estimation.

Based on geomorphic analysis and field observations in Katrol Hill Range area, L.S. Chamyal of Baroda University suggested that the neotectonic movements along KHF and Transverse Faults shaped the landscape of these areas that also provide examples of Quaternary sedimentation in fault controlled basins. The GPR has been used for precise mapping of the KHF and to infer its shallow subsurface geometry. On GPR profile KHF is traced as a vertical fault. Three major phases of Quaternary tectonic uplift in response to differential uplift along the KHF under compression are inferred.

R.V. Karanth proposed a new tectonic model for the western India. He suggested that the practice of extending Aravalli lineament in the regions of Saurashtra and Kachchh needs to be reviewed. With the help of field and petrographic studies and published seismic as well as sedimentological data, he opined that the region of Sind, Kachchh and Saurashtra appear to have evolved independently as micro plates and fused with the Aravalli proto-continent sometime during Precambrian. Independently evolved Saurashtra-Kachchh together with Sind block got attached to the main Aravalli proto-continent along Cambay lineament. Raising doubt on the very existence of Kachchh Rift he emphasized that structures recognized in Kachchh at surface are related to thin-skin tectonics, which has given rise to fault-propagation and fault-bent folding in the region. Revising the accepted theory that Indian subcontinent is formed on account of the fusion of three proto-continents, viz. Dharwar, Singhbhum and Aravalli proto-continents he proposed a fourth proto-continent, namely Sind-Kachchh proto-continent.

Sanjay Das of GSI showed evidences that Jamnagar coast is rising. He detected neotectonic evidences near Ranjitnagar-Balamba in Aji delta as well as Und river delta along North Kathiawar Fault. V. K. Gahalaut of NGRI and K.C. Tiwari of Baroda Univ.presented GPS observations and suggested that the post seismic relaxation could be slow and may last for nearly two decades. This could be an extra source of strain. S.K. Gupta of PRL raised the possibility of detecting helium precursory anomaly in artesian wells. A. K. Singhvi of PRL emphasized

the use of luminescence dating for geomorphological investigations through which evolutionary history of Kachchh basin has been reconstructed for the past 20 ka Mukesh Gupta of SAC indicated application of InSAR technology in investigation of subsidence/uplift due to earthquake deformation R N Pande of GSPC, Gandhinagar dwelt on the tectonic models of Indian plate motion

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INTERNATIONAL SYMPOSIUM ON APPLIED GEOCHEMISTRY IN THE EVALUATION AND MANAGEMENT OF ONSHORE AND OFFSHORE GEO-RESOURCES

The Indian Society of Applied Geochemists (ISAG) conducted an International Symposium on "Applied Geochemistry in the Evaluation and Management of Onshore and Offshore Geo-resources" during 28-30 September 2005 at Atomic Minerals Directorate for Exploration and Research (AMD), Begumpet, Hyderabad A special issue of the Journal of Applied Geochemistry (JAG), Vol 8, No 2A, July 2006 has been exclusively devoted to the proceedings of the Symposium, the gist of which is presented below

The editors Prof K Surya Prakash Rao and Dr V Divakara Rao are to be complimented for their effort in getting the volume within a short period The volume contains thirty eight papers — nine papers on evaluation of petroleum source rocks and sedimentary basins with greater emphasis on geochemical studies, five papers on Coal Bed Methane (CBM), thirteen on ferrous- non-ferrous, three on geochemical studies on onshore areas, seven on groundwater and pollution and one on air pollution

D K Pande in his keynote paper discusses the importance of geochemical studies for getting clues on the generation, migration and evaluation of oil and gas He opines that great thrust has to be given for exploration and exploitation of Coal Bed Methane (CBM), as it is going to be an alternate source of energy In this regard, the role of ISAG is great in designing programmes for training the professional geochemists in the search for CBM (pp 233) S Pahari and others evaluate the petroleum source rocks of Mesozoic and Tertiary deposits of Cauvery Basin, Sattapadi, Kudavasal and Karaikal (pp 234-250) G C Datta and others present the results of geochemical investigation of several aromatic biomakers in the Bombay 'high' and Bassein of Western offshore to evaluate the lithology, palaeo-environment and thermal activity of source rocks (pp 251-265) Minati Das gives an account of the influence of clay minerals on hydrocarbon potential in the Jorajan, Assam basin (pp 266-276) A case study of absorbed gas concentration survey in the Kutch-Saurashtra offshore is presented by D K Singh and others Two prospects for hydrocarbon have been identified based on positive indication of threshold values (pp 277-287) D Vyas and others give an account of geochemical and geological studies to predict the nature of sub-surface hydro-carbons for exploration in Cauvery and Krishna-Godavari Basins (pp 288-298) S R Mangotra and others discuss the results of geochemical studies on hydrocarbons in Ramnad-Palk Bay sub-basin, Cauvery basin which are aimed to understand the genesis, exploration and migration of gaseous hydrocarbons (pp 299-319) •Rakesh Sharma and others in their paper discuss results of twelve major and trace elements Higher concentrations of Cu, Ni, Zn, Fe, Li and K are reported for the areas of Bokabil and Middle Bhuban of Agartala dome structure and a good correlation is found between lithostratigraphic and chemostratigraphic units (pp 320-331) A K Bhatnagar and others give an account of geochemical characters vis-a-vis oil source in south of Cambay Basin (pp 332-358)

The Coal Bed Methane (CBM) generated during coalification process and gets entrapped within the pore spaces has been recognized as an alternate source of energy in the coal bearing countries of the world India, with vast resources of coal, initiated exploration for CBM and the commercial production of gas is yet to come S C Das Gupta's paper deals with the exploration and resource evaluation of coal bed methane in India Methane in coal bed is dependent on thickness, degree of coalification, depth of occurrence and permeability The direct measurement of methane in the GSI bore hole has indicated gas content of 0 14 to 12 7 cubic metre/tone (pp 359-365) Shankar N Chaudhuri and others in their paper describe the depositional environment of coal of Ramkola-Tattapani coalfield vis-a-vis coal bed methane Although the rank character of coal is not very encouraging from the CBM point of view, better rank is expected at deeper part of the basin as favourable petrographic compositions of coal