MEETING REPORT

A mathematical treatment of geoscientifically relevant problems*

During the last two decades, technological progress has completely changed the observational methods in all fields of geosciences with a trend to achieve immediate results, thus reducing time and cost. Modern high-speed computers and satellite-based techniques are being used in disciplines like geophysics, geodesy, geology, physical geography, meteorology, navigation and many others. The increasing observational accuracy demands adequate mathematical tools; mathematics concerned with geoscientific problems, i.e. geomathematics, is becoming indispensable. In addition, a growing public concern about the future of our planet, its climate and environment, and about an expected shortage of natural resources connote the strong need for new mathematical structures, tools, and methods. For evolving efficient strategies for protection against threats of a changing Earth, the year 2013 was dedicated as the year of 'Mathematics of Planet Earth (MPE 2013)'. More than 100 scientific societies, universities, research institutions and organizations all over the world banded together to formulate the most urgent multidisciplinary and multifaceted planetary problems where mathematical sciences play a central role in the scientific efforts to understand and deal with these challenges[1].

In connection with MPE 2013 and with the mission of bridging the gap between mathematical theory and geotechnical applications, the Wadia Institute of Himalayan Geology (WIHG), Dehradun organized a winter school in geomathematics. The school was dedicated to the interdisciplinary research of mathematicians and geoscientists, which helped researchers from all over the country to gather and discuss their work. The main aim was to discuss the requirement of application of mathematics in geosciences in relation to various research problems. An overwhelming response was received with a total of 26 research scholars and faculty members attending the course from different reputed universities, academic and research institutions and government organizations across the country with geology, geophysics, geography, environmental science and mathematics background.

The winter school was inaugurated on 16 December 2013 by Anil K. Gupta (Director, WIHG), Mrinal K. Sen (Director, CSIR–National Geophysical Research Institute, Hyderabad), M. Mohanty (SERC Division, DST, New Delhi) and T. N. Jowhar (course co-ordinator, WIHG). In his welcome speech, featuring the history of geomathematics, Gupta welcomed the participants and mentioned that the winter school provides a platform for young researchers to discuss application of mathematics to geosciences and evolve novel solutions for open problems. Johwar briefed about the course content and its objectives. He also shared his experiences on application of mathematics in geology. Sen in his keynote speech highlighted the basic concepts of forward and inverse problems of geophysics.

Overall 40 lectures and 16 practical sessions spread over 14 days and a one-day field excursion were held during the programme. The lectures were mainly on specific mathematical techniques in geosciences. In the actual field of research, five lectures gave an overview of recent developments and current trends in quantitative geosciences. Other talks concentrated on model development, theoretical foundation, as well as numerical solutions for problems in mathematical geosciences. All talks demonstrated the diversity as well as the inter-relationships of the areas of research. Most of the days, the forenoon session was devoted to lectures and the afternoon session for practicals. Reputed faculty from different institutions and universities taught computation in geosciences. Informal discussions and interaction with participants and faculty members helped develop a motive to work in the interdisciplinary areas to solve specific problems on mathematical geosciences. The winter school was followed by a field excursion to Mussoorie on 25 December 2013, which included detailed description of the Main Boundary Thrust (MBT) by Rajesh Sharma (WIHG). The valedictory function was chaired by A. K. Awasthi, Pro-Vice Chancellor and Dean, Graphic Era University, Dehradun. In his valedictory speech, Awasthi said that mathematics is the backbone of basic sciences and needs to be taken seriously and with dedication. The participants in this function expressed their satisfaction on the course content, sequencing of the topics, delivery of the topics by mentors and the logistics provided at WIHG. The feedback from the trainees clearly indicated that the winter school was highly beneficial to all the participants, as it was useful, informative, and helped in skill-building and knowledge-sharing. The participants wanted more such programme in the future as well.

To sum up, mathematical approach is a must for quantifying results in the frontier areas of research in geosciences. So, this kind of course might be helpful to the participants for motivation in their own field of work. In addition, the aforementioned school not only helped popularize the use of mathematical and statistical approaches among geoprofessionals of India, but also provided an impulse to work in this new field. The organizers have been successful in achieving their mission of spreading knowledge and bringing the young generation of researchers together.

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