

Preface

For the purpose of radiography, recent developments in muon and neutrino detectors make it possible to detect the muon and neutrino particles with high statistics and therefore in great detail. Because of their relevance for a variety of related fields of research, neutrino and muon physics will be a major focus in geophysical research. It is likely that several crucial questions concerning geodynamics and related fields such as volcanology and tectonics will be answered. The successful operation of such detectors, therefore, may very well represent the birth of a new technique for the study of fundamental issues in these fields.

The first workshop on “High Energy Earth Science: Muon and Neutrino Radiography” was held in Tokyo on June 26–27, 2008. The Tokyo Workshop has been a great success and clearly showed that Earth Science has now in hands a new, powerful technique for investigation. In particular, the applications of muon radiography are likely to expand in the near future because of its unique imaging capability and of the space resolution much higher than with conventional techniques. The workshop was devoted to addressing the main current issue in this research area to form a research network aimed at fostering scientific collaboration on muon physics, neutrino physics and geophysics. In the concluding session, it has thus been envisaged to meet again at a Workshop to be held in Naples.

At the Tokyo Workshop, the bases were also laid down for the MU-RAY (MUon RadiographY) project. This project foresees a collaborative effort for the development of an electronic detector of greater sensitivity for the study of volcanoes. The muon radiography of the summit cone of Mt. Vesuvius is envisaged as a first utilization, which is very challenging due to the strong absorption of the muon flux in the rock to be traversed. The radiography of other volcanoes, in particular Stromboli, will be performed in the framework of the project.

The MU-RAY Workshop was held in Naples on September 11–12, 2008. Driven by the enthusiasm for a further development of the new technique and for the extension of its applications, it took place only a few months after the Tokyo Workshop. It has been its natural follow with the purpose of extending the discussion on ongoing programmes and on future projects. In particular, the attention has been on the design of new detectors based on the experience gathered for Particle Physics and suitable for muon radiography of volcanoes. This special issue contains the contributions to these two workshops.

The Tokyo Workshop was hosted by the Earthquake Research Institute (ERI), the University of Tokyo. It was sponsored by the above institute, together with the MEXT (Ministry of Education, Culture, Sports, Science and Technology). The MU-RAY Workshop was hosted by the Dipartimento di Scienze Fisiche of the Napoli University “Federico II”, by the Napoli Section of the Istituto Nazionale di Fisica Nucleare (INFN) and by the Vesuvian Observatory of the Istituto Nazionale di Geofisica e Vulcanologia (INGV). It was sponsored by the above Institutions, together with the AMRA (Analisi e Monitoraggio dei Rischi Ambientali) Consortium.

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