INTRODUCTION: CURRENT DEVELOPMENTS IN SEISMOLOGY AND EARTHQUKE ENGINEERING IN NIED

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This Session intends to introduce some of the recent activities in seismology and earthquake engineering studies being carried out in NIED (National Research Institute for Earth Science and Disaster Prevention, Tsukuba, Japan). NIED is an Independent Administrative Institution in the field of science and technology for the mitigation of disasters caused by torrential rains, snowstorms, earthquakes, volcanic eruptions, landslides and other natural phenomena. Researches in earth science, earthquakes in particular, and mitigation of earthquake disasters are major fields of research in NIED.

Following the Kobe earthquake that killed more than 6,000 people in 1995, Japanese Government started to pay greater attention for the advancement of the science and engineering in earthquakes and earthquake disaster mitigation, for which NIED is being asked to take leading roles.

In the field of seismology, NIED has been responsible to set up and to operate seismometer networks which uniformly cover the whole area of the country. At present, NIED is operating more than 3,000 seismographs at about 1,800 locations. There are K-NET with 1,000 strong-motion seismographs, Hi-net with 700 high-precision seismographs at the bottom of about 100m deep boreholes, Kik-net with 1,400 strong-motion seismographs, one each at the ground surface and at the bottom of borehole of the Hi-net locations, and F-net with about 70 broad-band seismographs. All of the earthquake records from these networks are collected at the NIED in Tsukuba. We analyze and distribute these data to researchers and practicing engineers all over the world through our Home Page. K. Kasahara, Y. Okada, S. Hori, and K. Obara will elucidate the establishment and operation of these dense networks widely used for scientific and technical researches.

NIED earthquake data is utilized by NIED researchers for various purposes. In this Session, two examples will be shown. S. Matsumura is going to illustrate how to utilize such data for basic studies of earthquake prediction. NIED data is also used for real-time determination of the size and location of an earthquake. Such information may be sent to a possible end user several tens of seconds before the arrival of strong shakings. S.

Horiuchi created a new method in which earthquake size and location could be precisely determined within several seconds after earthquake occurrence.

In the engineering field, NIED is building the world's largest shake table in Miki city near Kobe. In spite of the heavy damage inflicted to many kinds of structures in Kobe during the 1995 earthquake, nobody was able to critically observe how these structures failed during the earthquake. The ground motion in the epicentral area of the Kobe earthquake was much stronger than the level we used to apply for the earthquake resistant design. We also realized that, for such strong ground motion, it is difficult to follow traditional earthquake resistant design method. We have to change design philosophy so that to permit certain amount of damage when subjected to very strong ground shaking. It has, therefore, become more important to know in detail why, how, and to what extent damage takes place in real-sized structures. The 3-dimensional large-sized shake table to be completed in 2005 will be the largest and the most technologically advanced test facility in the world. It will be possible to test real-sized structures to collapse and thus will facilitate to calibrate and validate our earthquake resistant design capabilities.

K. Ohtani will summarize the specification, design and construction of the shake table which is now nicknamed as "E-Defense". With two years before completion, we are seriously considering how to use E-Defense most effectively. How to perform the first series of tests, as well as what kinds of tests to choose, is being planned by task groups in NIED. M. Sato will explain the activities of these task groups.

Presentations in this special session deal only with earthquake-related activities in one research organization in Japan. These activities all started after the 1995 Kobe earthquake, because it took a huge human and property loss which we could not estimate before the earthquake. We wish to share the know-how we have cultivated and the facilities we are building among all the people who want to mitigate future earthquake disasters.