# Towards Integrated Marmara Strong Motion Network

E. Durukal, M. Erdik, E. Safak, A. Ansal, O. Ozel, H. Alcik, A. Mert, N. Kafadar, A. Korkmaz, A. Kurtulus, and the Marmara Team

Bogazici University, Department of Earthquake Engineering, Istanbul, Turkey

Istanbul has a 65% chance of having a magnitude 7 or above earthquake within the next 30 years. As part of the preparations for the future earthquake, strong motion networks have been installed in and around Istanbul. The Marmara Strong Motion Network, operated by the Department of Earthquake Engineering of Kandilli Observatory and Earthquake Research Institute, encompasses permanent systems outlined below. It is envisaged that the networks will be run by a single entity responsible for technical management and maintenance, as well as for data management, archiving and dissemination through dedicated web-based interfaces.

• Istanbul Earthquake Rapid Response and Early Warning System - IERREWS (one hundred 18-bit accelerometers for rapid response; ten 24-bit accelerometers for early warning)

• IGDAŞ Gas Shutoff Network (100 accelerometers to be installed in 2010 and integrated with IERREWS)

• Structural Monitoring Arrays
- Fatih Sultan Mehmet Suspension Bridge (1200m-long suspension bridge across the Bosphorus, five 3-component accelerometers + GPS sensors)
- Hagia Sophia Array (1500-year-old historical edifice, 9 accelerometers)
- Süleymaniye Mosque Array (450-year-old historical edifice, 9 accelerometers)
- Fatih Mosque Array (237-year-old historical edifice, 9 accelerometers)
- Kanyon Building Array (high-rise office building, 5 accelerometers)
- Isbank Tower Array (high-rise office building, 5 accelerometers)
- ENRON Array (power generation facility, 4 acelerometers)
- Mihrimah Sultan Mosque Array (450-year-old historical edifice, 9 accelerometers + tiltmeters, to be installed in 2009)
- Sultanahmet Mosque Array, (390-year-old historical edifice, 9 accelerometers + tiltmeters, to be installed in 2009)

• Special Arrays
- Atakoy Vertical Array (four 3-component accelerometers at 25, 50, 75, and 150 m depths)
- Marmara Tube Tunnel (1400 m long submerged tunnel, 128 ch. accelerometric data, 24 ch. strain data, to be installed in 2010)
- Air-Force Academy Array (72 ch. dense accelerometric array to be installed in 2010)
- Gemlik Array (a dense basin array of 8 stations, to be installed in 2010)

The objectives of these systems and networks are: (1) to produce rapid earthquake intensity, damage and loss assessment information after an earthquake (in the case of IERREWS), (2) to monitor conditions of structural systems, (3) to develop real-time data processing, analysis, and damage detection and location tools (in the case of structural networks) after an extreme event, (4) to assess spatial properties of strong ground motion and ground strain, and to characterise basin response (in the case of special arrays), (5) to investigate site response and wave propagation (in the case of vertical array).

Ground motion data obtained from these strong motion networks have and are being used for investigations of attenuation, spatial variation (coherence), simulation benchmarking, source modeling, site response,

seismic microzonation, system identification and structural model verification and structural health control.

In addition to the systems and networks outlined above there are two temporary networks: KIMNET - a dense urban noise and microtremor network consisting of 50 broadband stations expected to be operational in mid 2009, and SOSEWIN - a 20-station, self-organizing structural integrated array at Ataköy in Istanbul.