Earthquake Technologies

Earthquake Hazard Mitigation Technology

Active Fault Detection using Aerial Photographs

Simulation of Strong Ground Motion due to Large Earthquakes

Rapid Estimates of Damage due to Significant Earthquake

Geo-Technical Survey using Micro Tremors

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Earthquake Hazard Mitigation Technology

Collapse of highway piers

Uplift of a manhole due to liquefaction

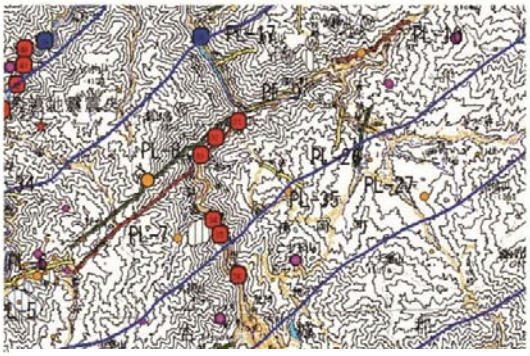
Slope failure

Source of photos : JSCE Earthquake Engineering Committee Report

Japan has suffered mega earthquake disasters including the 1995 Hyogoken-Nanbu Earthquake (M6.9) and the 2011 Great East-Japan Earthquake (M9.0).

We have responded by developing technologies to evaluate the seismic potential, seismic probability and strong ground motion due to large earthquakes. In addition, site surveying techniques such as geophysical explorations for a seismic simulation are researched.

Active Fault Detection using Aerial Photographs



Active fault map on GIS

To detect the location and scale of active faults to reveal seismic potentials, we developed the quantitative detection method of the active faults in collaboration with Public Works Research Institute. The analysis is based on aerial photographs.

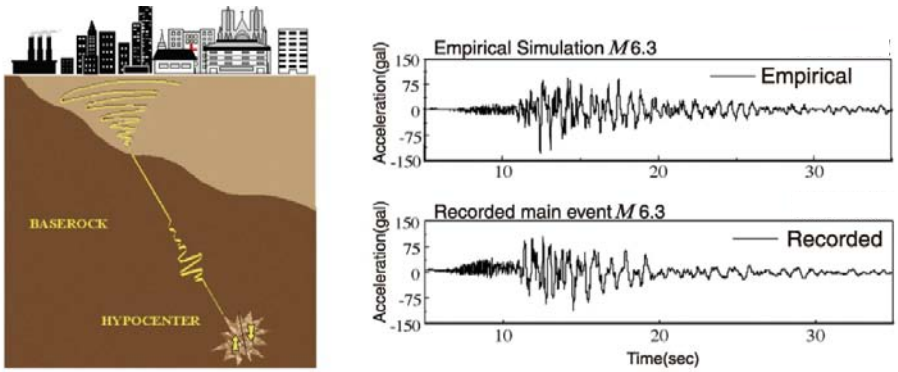
Country	Project
Japan	Active faults survey at large strike-slip fault zones
Japan	Research of the quantitative detection method of active faults based on geomorphology

Simulation of Strong Ground Motion due to Large Earthquakes

Earthquake ground motions are the result of propagating waves in the earth medium originating from a seismic source.

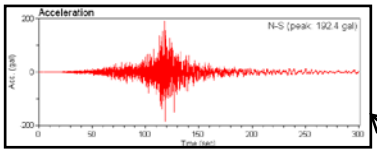
We have developed engineering synthesis and simulation methods for earthquake ground motions for seismic design of structures by improving Green's function method.

Country	Project
Indonesia	Seismic risk study of a hydro power plant
Vietnam	Review consultation of detail design of a gravity dam



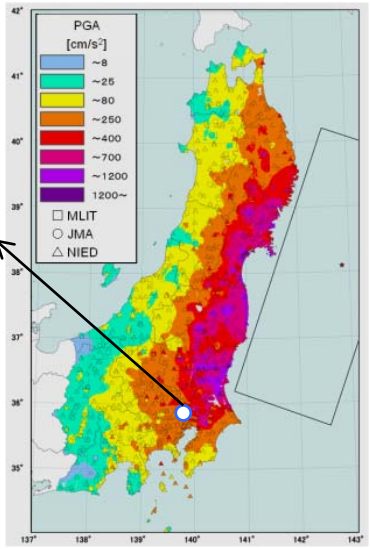
Schematic diagram of the simulation of strong ground motions

Rapid Estimates of Damage due to Significant Earthquake



Obs.
Shinjyuku,Tokyo

Acceleration waveform (NIED,Japan)

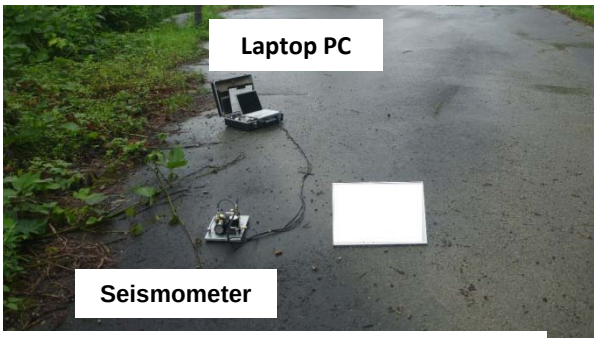


Map of the spatial distribution of peak ground accelerations (PGA) (NILIM,Japan)

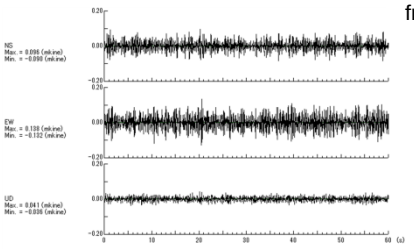
In order to evaluate damages of constructions and failures of soil ground, it is important detecting spatial distributions of seismic intensity indicators such as a peak ground acceleration due to Significant earthquakes. We developed a method of evaluating spatial distributions of seismic intensity indicators.

- Advantages of the method are as follows:
  - Simple kriging method is taken as a spatial interpolation of observed seismic intensity indicators.
  - Attenuation relationships from a seismic source to sites can be considered.
  - High spatial resolution, such as 250 meters.
  - Site amplification factors due to surface geology can be considered.

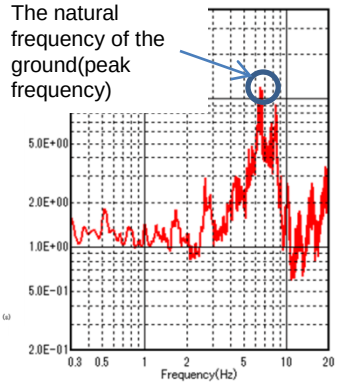
Geo-Technical Survey using Micro Tremors



Micro tremor-observation-system



Micro tremor-wave form



H/V spectrum

Micro tremors are ambient vibrations of ground They have useful information of subsurface structure.

- H/V spectrum, which is calculated using the Horizontal and vertical vibration spectrum of micro tremors, shows the natural frequency of the ground empirically.
- The natural frequency is correlated with ground stiffness. High frequency corresponds to high stiffness.

Country	Project
Japan	Seismic micro zoning survey at a port area
Japan	Site survey for seismometer installations