

## Significant issues posed by the 2016 Kumamoto earthquake with regard to active fault assessment and disaster mitigation

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After the Kumamoto earthquake, it was necessary to critically examine the efficiency of evaluation by the Headquarters for Earthquake Research Promotion of Japan for implementation of disaster mitigation countermeasures. Was the headquarters successful in predicting the earthquake? Was the information provided by the headquarters effective in mitigating damages? What should the headquarters and research institutes learn from this earthquake?

Many residents in Kumamoto said that they knew the existence of the Futagawa-Hinagu fault and were aware that the probability of an earthquake was “relatively higher,” prior to the earthquake. This can be regarded as a significant achievement for the headquarters after having devoted 22 years since 1995 to predict the occurrence of an earthquake. However, there is doubt whether these efforts actually led the residents to employ countermeasures.

The behavior of the fault during the Kumamoto earthquake was not consistent with the fault classification assumed in the evaluation. Another remarkable feature of the Kumamoto earthquake was that the "severely damaged zones" were generated along the active fault. A seismic intensity of 7 was recognized officially only in Mashiki town and Nishihara village. However, severe damages indicated that the seismic intensity in most areas along the earthquake fault was equivalent to 7. Although the Ministry of Land, Infrastructure and Transport issued a policy to not revise the Building Standards Law, the current standard is regarded only as a minimum requirement, and is not sufficient for a seismic intensity of 7. This leads to the conclusion that there should be a need to identify areas where the seismic intensity could reach 7.

In addition, various surface ruptures were generated during the Kumamoto earthquake. There were (1) narrowly defined earthquake faults, which were judged to be surface appearances of the seismic fault itself, (2) secondary faults induced with the seismic faulting, (3) gravitating landslides having no relation with the seismic fault. Are they clearly distinguishable at present? It is important to clarify the mechanism of ruptures and improve the hazard assessment of various ground displacements.

There were several unsolved problems such as determining a relationship between damages and faulting, even in the 1995 Hanshin Awaji earthquake. One of the reasons as to why these problems were unsolved is the lack of inter-disciplinary research. After the Kumamoto earthquake, it is necessary to develop a new inter-disciplinary research promotion system, considering all the risks posed by the earthquake.

Keywords: Kumamoto earthquake, active faults assessment, disaster mitigation