

# Landforms and damage distributions on the worst hit colonies on the Niigata Ken Chuetsu Earthquake

# Masayuki Yoshimi[1]; Taku Komatsubara[2]; Yoshinori MIYACHI[3]; Katsumi Kimura[4]; Haruko Sekiguchi[1]; Masayuki Saeki[5]; Masanori Ozaki[6]; Tsutomu Nakazawa[6]; Rei Nakashima[7]; Sunao Kunimatsu[1]; Kunikazu Yoshida[1]; Hidetaka Saomoto[1]; Tomio Inazaki[6]; Masahiko Makino[8]

[1] Active Fault Research Center, GSJ/AIST; [2] Geol. Surv. Japan; [3] IGG, AIST; [4] GSJ/AIST; [5] Tokyo Univ. of Science; [6] GSJ, AIST; [7] Institute of Geoscience, AIST; [8] GSJ, AIST

The October 23, 2004, Niigata Ken Chuetsu earthquake ( $M_w = 6.6$ ), occurred on the active fold zone in the north central Japan, was the most suffering earthquake in Japan since the 1995 Kobe earthquake.

We conducted a quick field survey on the damage of buildings, mainly wooden houses or barns, in the focal area soon after the shock, from October 28th till November 3rd, 2004. We found that most of heavily damaged colonies were located on the area within 10 kilometers from the epicenter of the main shock, and that some slightly damaged colonies were also located in that area. Among those heavily damaged colonies, six colonies (Muikaichi-Nakagata, Budokubo, Kawaguchi, Tamugiyama, Wanazu and Shindojima), where no less than 20 percent of houses were totally collapsed by shaking, have been recognized as worst hit colonies. Though the area of each worst hit colony was not more than 1 square kilometers, clear contrast in the severity of damage was observed among subregions of each colony. These observed facts indicate that there could have been local amplification in those heavily damaged or worst hit colonies.

In order to figure out the relation between the damage degree and landform, we carried out landform classification and the classification of the damage of all the wooden houses or barns on those colonies.

The damage degree of a wooden house or barn has been classified with its outward appearance into three classes; total collapse, partial destruction and minor or minimal damage. Each structure has been mapped with damage class, type of the structure (with or without a fine basement) and roughly estimated age (new or old).

We also conducted landform classifications with the interpretation of aerial photograph and field survey. A set of aerial photographs taken by the US Air Force in 1947 was utilized so as to classify landforms less affected by the artificial alteration.

Five colonies of six (Muikaichi-Nakagata, Budokubo, Tamugiyama, Wanazu and Shindojima) are located on areas with similar landforms: the fan terrace, the terrace and dissected valley. The fan terraces of those areas are formed with the colluvial deposit supplied from the landslides on the hills nearby. Heavy damages by the shaking were concentrated on the fan terraces, especially in the subregions with steep slopes. On the contrary, shaking damages on the terraces or dissected valleys were not severe. These discrepancies in the degree of the damage among landforms imply that the ground motion on the fan terrace must have been greater than that on the terrace and the dissected valley. The other colony, Kawaguchi, is located on a flood plain surrounded by the hill with well-developed landslide configurations. Several old channels are recognized in the plain. Heavy damages were widely distributed on the plain, and no clear discrepancy in the damage degrees among landforms were observed there. Since the damage was significant in this colony compared with those of other colonies nearby, where are on the terraces, the flood plain might have amplify the ground motion.