Geophysical Research Abstracts, Vol. 9, 04588, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04588

Prediction model for refining flood hazard assessment: Application to risk reduction planning in Squamish, BC, Canada

Chang-Jo Chung, Murray Journeay

Geological Survey of Canada, Ottawa, Canada (chung@nrcan.gc.ca / Fax: +1-613-996-3726 / Phone: +1-613-996-3413)

As a mountain community nestled at the confluence of five major river systems, Squamish has experienced a long history of disaster loss from natural hazards. The community is located along the Sea-to-Sky corridor connecting Vancouver and Whistler, site of the 2010 Winter Olympic Games, and is expected to double in size within the next 30 years. The probabilities of future natural disasters triggered by major earthquakes and/or landslides are estimated to be relatively "small" compared to those for major flood events. For the past 40 years, more than 10 major floods have impacted the community, causing considerable economic loss, injuries and hardship. As the community continues to grow, so too do the vulnerabilities and risks associated with development in hazard prone areas. As part of an ongoing Smart Growth community planning process, Squamish is one of a growing number of communities in Canada actively involved in mainstreaming proactive risk reduction and comprehensive land use planning to increase overall disaster resilience. The use of a probabilistic flood hazard assessment model provides additional capacities to evaluate magnitude-frequency relationships and spatial extents of future flood events based on historic climate records. Outputs of the model will be used to refine vulnerability and risk assessments for both river and storm-water flood events that are of concern to the community, and in developing risk reduction strategies to mitigate the impacts of future flood events.

Daily rain gauge data and historical records of flood events (magnitude-extent) that have impacted the community of Squamish are available since 1959. Based on these data, we have developed a methodology for evaluating the frequency, magnitude and

extent of future flood events. Evaluation involved the following steps:

STEP 1. We compared rain gauge data to historic records of major flood events. From this, we were able to establish a quantitative correlation between storm events and associated floods. The correlation allows us to predict the occurrences of future floods based on the frequency-magnitude relationships established with available rain gauge data.

STEP 2. We derived an exponential distribution function to describe frequency-magnitude relationships of observed flood event. The estimation was statistically tested. Model uncertainties were empirically tested by dividing the rain-data into two time periods, 1959-1979 and 1980-present.

STEP 3. Based on correlations between the areas damaged by past flood events and available digital elevation data for Squamish, we were able to estimate the likely spatial extent of floods associated with future storm events of variable magnitudes.

STEP 4. By combining steps 2 and 3, we were able to then predict the frequencies, sizes and spatial extents of potential damaged areas for any given time horizon, thereby making the outputs more useful for both emergency planning and longer-term strategic land-use planning.