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Paper:

Tsunami Fragility — A New Measure to Identify Tsunami Damage —

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Abstract

Tsunami fragility (fragility curve, or fragility function) is a new measure, we propose, for estimating structural damage and fatalities due to tsunami attack, by integrating satellite remote sensing, field survey, numerical modeling, and historical data analysis with geographic information system (GIS). Tsunami fragility is expressed as the structural damage probability or fatality ratio related to hydrodynamic features of tsunami inundation flow, such as inundation depth, current velocity and hydrodynamic force. It expands the capability of estimating potential tsunami damage in a quantitative manner.

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25 Table 1: Fragility curves for Tsunami damage developed by different researchers Author Tsunami Area Methodology Main Building typology Fragility function Peiris (2006) 2004 Indian Ocean Sri Lanka Field Survey data Single story masonry | | . | | H H In 1 | |. Dias et al (2009) 2004 Indian Ocean Sri Lanka Field Survey data, Probabilistic modeling. Koshimura, S., Namegaya, Y. & Yanagisawa, H. (2009a): Tsunami Fragility – A New Measure to Identify Tsunami Damage. Journal of Disaster Research, 4(6), pp.479-488. Koshimura, S., Oie, T., Yanagisawa, H. & Imamura, F. (2009b): Developing fragility functions for tsunami damage estimation using numerical model and post-tsunami data from Banda Ache, Indonesia. Shuto’s tsunami intensity scale and damage possibility have been widely used as a measure of tsunami damage. However, as he concluded, degree of damage may change according to the uncertainties suggested above. The primary objective of this study is to identify a regional vulnerability against tsunami disaster, by developing fragility functions expressed as the relationship between damage probability on structures of human lives and hydrodynamic features of tsunami inundation. To develop the fragility functions, we focus on Banda Aceh city of northern Sumatra, Indonesia, which was caused more than 70,000 casualties and 12,000 of house damages during the 2004 event, e.g. [JICA, 2005].

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