Numerical modeling of tsunami inundation using upscaled surface roughness parameterization

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The importance of accurate numerical modeling of tsunami inundation in an urban area has clearly realized due to the devastating damage from the 2011 Tohoku Earthquake Tsunami and the expected high occurrence probability of Nankai Trough Earthquake. This study conducted two different upscaled surface topography parameterizations: 1) composite equivalent roughness model, and 2) drag force model, to consider the effect of structures as drag force based on detail of topographical data. Numerical results from the two surface roughness parameterizations are compared to the experimental results of a coastal city model focused on the maximum inundation depth, maximum inundation area, and its arrival time. Both the composite equivalent roughness model and the drag force model generally showed good agreement with the experimental results. The composite equivalent roughness model is superior to the drag force model in the area with low occupancy of structures. However, the drag force model shows better results of maximum inundation depth and arrival time to the experimental result at the near the edge of inundation area than the composite equivalent roughness model. The drag force model can reproduce flow direction dependency to some extent. There are several points to be improved (e.g. grid size dependency for calculating roughness parameters on the results, and of the determining the drag force coefficient).

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