Tsunami evacuation using an agent-based model in Chile

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Tsunami evacuation planning can be crucial to mitigate the impact on lives. During evacuation procedures, vertical evacuation can be an effective way to provide protection to people if horizontal evacuation is not feasible. However, this can imply an associated risk if the different scenarios related not only to the uncertainties of the tsunami phenomena, but also to the behavior of people during an evacuation phase are not considered. For this reason, in recent years, tsunami risk management in Chile has incorporated the propagation of uncertainties in each phase of the study of tsunami impacts and the design of evacuation routes. Agent-based models allow coupling inundation tsunami scenarios and the people's interactions and decision-making. In this research, thousands of tsunami scenarios are considered to establish tsunami hazard mapping based on flow depths and tsunami time arrivals. We chose a worst-case scenario from this database and coupled it with an agent-based model to assess tsunami evacuation in Viña del Mar, Chile. Moreover, we examined an improved situation with the same characteristics, but including 11 tsunami vertical-evacuation (TVE) facilities. Our findings show that the tsunami flood might lead to significant human casualties in the case of a worst-case scenario (above 50% of the agents). Nevertheless, including the TVE structures could reduce this number by roughly 10%. Future work will include propagation of uncertainties also in all the phases of the evacuation where HPC will aid on the simulations of agent-based models that require intense computational resources.