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Finding the Source Location of 2018 Sulawesi earthquake and tsunami by IIA and TATA methods

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The tsunami in the event of 2018 Sulawesi earthquake and tsunami (SET) occurred after an earthquake of magnitude 7.5. However, it is very difficult for such an earthquake to trigger a tsunami with 10-m flood depth. The causes of this tsunami event remain unknown. A submarine landslide, an additional seabed vertical displacement, and seiche effect may play roles. To gain a deeper understanding of this tsunami event, finding the location of the tsunami source is especially important. We developed two new tsunami analysis methods, impact intensity analysis method (IIA) and tsunami arrival time analysis (TATA) method, to analyze the tsunami source in the SET event. The IIA method can quickly filter out the areas with low impacts of the tsunami sources and effectively reduce the number of tsunami scenarios. However, for a tsunami with a strong direction, it is less easy to grasp. The newly developed TATA method can overcome this weakness. In this study, we perform different scenarios by simulating the tsunamis generated by the earthquake, in-the-bay landslides, and seiche. The earthquake scenario results show that the wave height contributed by the earthquake is less than 0.3 m, which is far away from the field survey. The results from in-the-bay landslide and seiche are away from the waveform and arrival time at Pantoloan. The IIA is then used to reduce the number of the scenarios. From both of the IIA results of Palu and Pantoloan, the possible tsunami sources are located either inside the Palu Bay or around the bay mouth. Based on the tidal gauge data at Pantoloan and the tsunami arrival time from BMKG, the precise location of the tsunami source is spotted. We further created several scenarios which satisfied most of the data we collected, such as the Pantoloan gauge record, Palu inundation area, and flooding depth from the field survey along the Palu Bay. The detailed results will be presented in the full paper.