



Improvements of the offshore earthquake locations in the Earthquake Early Warning System

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Since 2014 the Earthworm Based Earthquake Alarm Reporting (eBEAR) system has been operated and been used to issue warnings to schools. In 2015 the system started to provide warnings to the public in Taiwan via television and the cell phone. Online performance of the eBEAR system indicated that the average reporting times afforded by the system are approximately 15 and 28 s for inland and offshore earthquakes, respectively. The eBEAR system in average can provide more warning time than the current EEW system (3.2 s and 5.5 s for inland and offshore earthquakes, respectively). However, offshore earthquakes were usually located poorly because only P-wave arrivals were used in the eBEAR system. Additionally, in the early stage of the earthquake early warning system, only fewer stations are available. The poor station coverage may be a reason to answer why offshore earthquakes are difficult to locate accurately. In the Geiger's inversion procedure of earthquake location, we need to put an initial hypocenter and origin time into the location program. For the initial hypocenter, we defined some test locations on the offshore area instead of using the average of locations from triggered stations. We performed 20 programs concurrently running the Geiger's method with different pre-defined initial position to locate earthquakes. We assume that if the program with the pre-defined initial position is close to the true earthquake location, during the iteration procedure of the Geiger's method the processing time of this program should be less than others. The results show that using pre-defined locations for trial-hypocenter in the inversion procedure is able to improve the accurate of offshore earthquakes. Especially for EEW system, in the initial stage of the EEW system, only use 3 or 5 stations to locate earthquakes may lead to bad results because of poor station coverage. In this study, the pre-defined trial-locations provide a feasible way to improve the estimations of earthquake locations in EEW system.