Relocation of Offshore Earthquakes around the Korean Peninsula using Multiple Seismic Arrays: Case Examples for East Sea and Yellow Sea Regions

Shu-Chioung Chiu\textsuperscript{1,2}, Jer-Ming Chiu\textsuperscript{1,2}, Kwanghee Kim\textsuperscript{2}, and Suyoung Kang\textsuperscript{2}

\textsuperscript{1}CERI, University of Memphis, Memphis, TN 38152, USA
\textsuperscript{2}Institute of Geologic Hazard & Industrial Resources, Pusan National University, Busan, Korea

Yellow Sea and East Sea regions near Korea are two of the most seismically active marginal seas in the Far East. While offshore earthquakes in the Yellow Sea may be attributed to potential microplate boundaries, East Sea earthquakes may be associated to the seaward extension of many active faults on land or the deformation boundary between oceanic and continental crust. However, offshore earthquake locations using local seismic network are always subjecting to large uncertainties due to poor spatial coverage of seismic stations, discrepancies on velocity models, and limitations on traditional location technologies. For instance, it is not uncommon that the same earthquake within Yellow Sea may be reported independently more than tens to hundreds of km apart in Chinese and Korean catalogs while there is no mechanism for earthquake data exchange between the two countries. Multiple seismic array method can be applied to improve epicenter location of offshore earthquakes. Seismic stations in Korea can be integrated into three arrays based on their latitude. Apparent azimuths and apparent velocities of the incoming seismic waves (mainly Pn) from a regional earthquake to each array can be reliably determined. Epicenter of a regional earthquake can thus be located by tracing seismic rays following the back azimuths derived from multiple arrays. Offshore earthquakes in the East Sea and Yellow Sea regions are located at shallow depth within crust that Pn waves are expected to be the first arrival phase at many Korean stations. Thus, offshore earthquakes can be reasonably located using Pn arrivals. In the Yellow Sea case, the apparent velocity \(-8.0\) km/sec is observed for all arrays suggesting a typical continental Pn waves propagating across the continent-continent transition region into Korea. In the East Sea case, the apparent velocity of \(-6.8\) km/sec or lower is observed for all arrays suggesting a typical oceanic Pn wave propagating across the oceanic-continental margin into Korea. A better relocated earthquake location in the offshore region is essential for our understanding of regional tectonics and earthquake hazard assessment.