

**Improvement of Earthquake Early Warning System for Railways  
Considering Locality of P-wave Propagation**

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Epicentral distance is estimated from the growing form of the curve of the initial P-waves in the Earthquake Early Warning system, especially for railways. This estimation is based on the empirical knowledge that the initial P-waves grow gradually when the epicenters locate further, which is due to geometrical spreading, scattering and intrinsic attenuation of the P-waves. However, in practice, the growing curves of the initial P-waves are not simply a function of the epicentral distances. Therefore, the epicentral distances estimated from the initial P-waves include an error, which sometimes lowers accuracy of the warnings. In this study, we revealed that the growing curves of the initial P-waves are fluctuated by regionally different heterogeneous conditions of subsurface causing the errors in estimation of the epicentral distances. We propose a robust relationship between the initial P-waves and the epicentral distances considering the regional heterogeneous conditions.