Geophysical Research Abstracts
Vol. 19, EGU2017-5179-1, 2017
EGU General Assembly 2017

A Robust Scheme for the Global Earthquake Early Warning Based on Characteristic Frequency

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Earthquake hazards mitigation have always been an important issue. Prompt and rapid high precision magnitude estimation is essential to achieve the goal of effective early warning. However, the current state of the method including the maximum predominant period ($\tau_p^{\max}$), the vertical displacement of P-wave (Pd), and the $\tau_c \times Pd$method has reached a standstill for nearly a decade. The major shortcoming is that these methods are not quite applicable for large earthquakes (M>7). Therefore, a new magnitude estimation method for earthquake early warning is crucial and is needed for human preventing loss and casualties in the large earthquakes. Here we demonstrate a robust scheme based on the characteristic frequency. Our result shows a linear relation between the momentum magnitude and the characteristic frequency of P-wave which appears within the first few seconds. This method requires fewer calculations and doesn't need to apply any filter to obtain better results, so the data processing time needed for the real-time earthquake early warning system is greatly reduced. This method also indicates strong applicability for estimating earthquakes with magnitude larger than 7. We demonstrate a robust scheme of global earthquake early warning.