Geophysical Research Abstracts
Vol. 21, EGU2019-4187-3, 2019
EGU General Assembly 2019


# The Potential of Characterizing Global Earthquakes by Dominant Frequency of Initial Complete P-wave

Cheng-Ju Wu (1) and Cheng-Yin Wu (2)

(1) National Tsing Hua University, Department of Physics, Hsinchu, Taiwan (s105000034@m105.nthu.edu.tw), (2) National Dong Hwa University, Department of Materials Science and Engineering, Taipei, Taiwan (timwu20000127@gmail.com )

**The earthquake hazards mitigation has always been an important issue. To make progress on the earthquake hazards mitigation, prompt and accurate magnitude estimation is essential for effective early warning. The current methods invoke the maximum predominant period ($\tau_p^{\max}$) of the first 4s P-wave data, the vertical displacement of P-wave (Pd), and the $\tau_c \times Pd$ estimation which are not quite applicable for devastatingly large earthquakes (M>7). In this study, the dominant frequency is calculated by Fourier Transform, but the data length is chosen in a rather different manner than the ordinary one. We compute the dominant frequency of each complete P-wave waveform along the time axis, which can be considered as a reformed way of Short-Term Fourier Transform based on critical physics characteristics of waveform data. Here we demonstrate a new magnitude estimation scheme based on this dominant frequency idea. In this study, we use data of the vertical component (BHZ) of the broadband seismograph all around the globe from the Global Seismographic Network (GSN). A total of 7199 recorded waveform data for 75 earthquakes ranging from Mw5 to Mw9.1, of which 44 events are of $Mw \geq 7.0$, are used. The result shows a robust correlation between the dominant frequency of the initial complete P-wave velocity and the moment magnitude even for devastating events (Mw>7). Our result is consistent with Olson and Allen's result that the frequency component of the early P-wave scales with the magnitude. Most importantly, a new time-frequency analysis algorithms based on dominant frequency method could provide a more detailed scheme of the probability distribution of energy as well as the improvement of the precision and accuracy of earthquake early warning in the foreseeable future.**