Co-seismic signatures observed by QuakeFinder systems during the 6 February 2016 M6.6 Meinong Earthquake in Taiwan

*Hsiao-Ching Chen[1], TsungYu Wu[1], Jann-Yenq Liu[1], Chieh-Hung Chen[2], Katsumi Hattori[3], Tom Bleier[4]

1. Institute of Space Science, National Central University, Taiwan, 2. Hubei Subsurface Multi-scale Imaging Key Laboratory, Institute of Geophysics and Geomatics, China University of Geosciences, Wuhan, Hubei, China, 3. Graduate School of Science, Chiba University, Chiba, Japan, 4. QuakeFinder, LLC, Palo Alto, California, USA

At 03:57 local time (19:57 UTC) on 6 February 2016, an earthquake with a moment magnitude of 6.6 struck in the Meinong District of Kaohsiung in Taiwan. The earthquake struck at a depth of around 23 km. This comparatively shallow depth caused more intense reverberations on the surface, and resulted in widespread damage and 117 deaths. The earthquake is the deadliest earthquake in Taiwan since the 921 earthquake in 1999. In this paper, seismograms of the free field strong earthquake observation network published by Center Weather Bureau are used as a reference. Concurrent/co-located measurements of seismometer and QuakeFinder systems together with infrasound systems are employed to study seismic waves and disturbances in the neutral atmosphere near the Earth’ s surface of the Meinong Earthquake. Each QuakeFinder system consists of a 3-axes induction magnetometer, an air conductivity sensor, a geophone, and temperature/relative humidity sensors. There are no obvious charges in the positive/negative ions, the temperature, and the humidity, while the magnetometer, the geophone, and infrasound data show clear co-seismic signatures, similar to seismic waves recorded by seismograms. The magnetometers register high-frequency pulsations, like seismic waves and superimpose with low-frequency variations, which could be caused by the magnetometer tilting and the underground water level change, respectively, during the arrival of seismic waves. The overall power spectrum of the geophones is similar to that of the seismometers, and however, the geophone (also magnetometer) power yields an exponential decay to the distance to the epicenter, while the seismic wave power is inversely proportional to the square of the distance. This suggests that the mechanisms detecting seismic waves of the QuakeFinder system and seismometers are different. In general, the geophone and magnetometer/infrasound system are useful to record high- and low-frequency seismic waves, respectively. Finally, some latest progresses in pre-earthquake signals probed by QuakeFinder systems in Taiwan are reported.

Keywords: co-seismic signature, earthquake

