# Development of a high-frequency earthquake rupture imaging method at the regional scale; application to the 2016 Kumamoto earthquakes

*Tristan Deleplanque[1], Jean-Pierre Vilotte[1], Pascal Bernard[1], Claudio Satriano[1], Hiroe Miyake[2]

1. Institut de Physique du Globe de Paris, 2. The University of Tokyo

Rupture physics control spatial and temporal distribution of energy radiation of earthquakes and is responsible of strong groung motion. Originally used at teleseismic distances [e.g., Xu et al. 2009; Satriano et al. 2014], we apply back projection method at regional scale to image the rupture process. Our concern is to obtain high quality images of high frequencies (4-8 Hz) generation areas by dealing with network aperture and site effects. To develop our methodology, we take as example the April 2016 Kumamoto, Japan, earthquakes (Mw 6.1 event on 14, 21:26, Mw 6.0 event on 15 00:03 and Mw 7.1 event on 16, 01:25, JST) and several moderate-size earthquakes (Mw 4-5) within the source area. We select, from K-Net and KiK-net networks, surface records within 100 km from hypocenter and convert them into energy records (square of horizontal components of velocity).

We investigate a volume containing the rupture area and localize in space and time extended zones with relatively large energy release in the studied frequency band. Those extended zones are the high frequency generation areas and they are compared to the location in space and time of asperities derived from strong-motion waveforms inversion [Asano et al. 2016; Kubo et al. 2016; Kobayashi et al. 2017]. We establish a first link between the size of the generation areas and the amount of released energy by studying, as simple cases, point source-like earthquakes. Furthermore, an iterative back projection method [Yao et al. 2012] is applied to remove step by step from the records the pulses associated with the main strong groung motion area in order to be able to identify secondary generation areas.

Keywords: earthquake rupture, crustal earthquake, regional back projection

 