Temporal Changes of Shallow Material During Kumamoto Earthquake by Autocorrelation Function and Interferometry Method

Reza D. D. Esfahani, and Fabrice Cotton

The goal behind this study

- ✓ How large are the changes of shallow material according to shear-wave velocities during strong shaking ?
- ✓ Do these changes remain ?
- ✓ Can we use observed velocity (strain) changes to develop in situ relationships between strain and shear modulus reduction ?

Data

- ✓ We use Kumomoto earthquake sequence, start with foreshock M6.5 and the mainshock M7.3

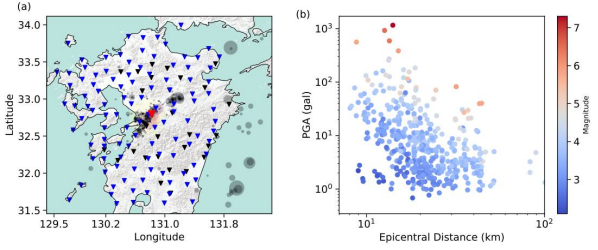

Figure 1. a) The location of Kik-Net and Knet stations. c) The cataloge of data used in this study.

Velocity changes evolution

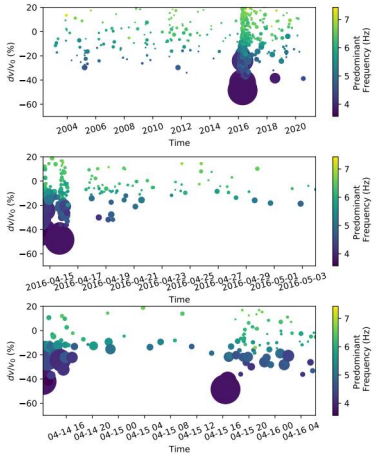

Figure 2. Velocity changes estimated by using autocorrelation function for different time span.

Predominant frequency evolution

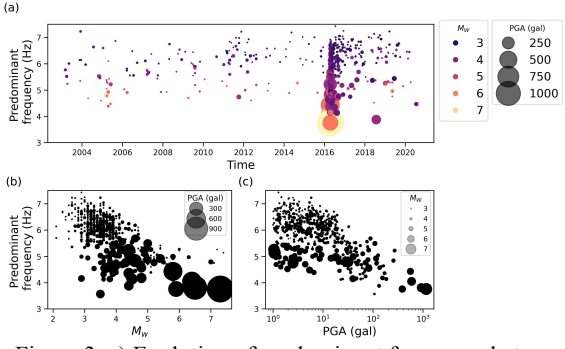

Figure 3. a) Evolution of predominant frequency between 2003 to 2020. b) Relation between predominant frequency and Mw, c) and PGA.

Relationships between strain and shear modulus reduction

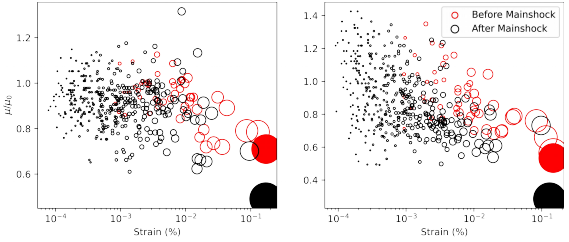

Figure 4. Strain-shear modulus reduction for interferometry and autocorrelation method. The used shear eave velocity is corrected by using velocity changes

Take to home messages

- ✓ These variations are larger when measured from autocorrelation (which means that the variations are close to the surface)
- ✓ We observe an healing process of material properties
- ✓ In situ relationships between strain and shear modulus reduction can be derived from seismograms analysis