



## **Demonstration of earthquake fracturing process in kitchen**

Kei Kurita

University of Tokyo, Earthq. Res. Inst., Tokyo, Japan (kurikuri@eri.u-tokyo.ac.jp)

Realization of earthquake phenomena in class rooms at freshman course of universities and high schools in a simple experiment such as using kitchen environment is the purpose of our presentation. The target is the understanding essential part of earthquake fracturing process by not only demonstration but hands-on experiment by students themselves. Fracturing process is essentially characterized by stochastic process so that implementation of this in the classroom experiments contains strong uncertainty which makes class design difficult. Here we introduce quite simple suits of experiment which works in highly reproducible way.

The experimental set-up and the protocol is simple: the material is starch syrup and metallic containers. We heat up the syrup to 130C to remove water, then pour into a metallic container. The selection of the container is essential. In the successful case we used a Japanese Sukiyaki-nabe (a thick-walled shallow pan commonly used in Sukiyaki. For those who can not imagine please visit a Japanese restaurant to taste Sukiyaki and examine it!) at about 5mm thickness. Keep the nabe in ice-water bath to cool. When the temperature goes down heated syrup transforms into elastic transparent sugar candy. Keep in silence for minutes a small cracking sound becomes audible, then small circular cracks with dimension of 5-10mm become visible with large cracking sounds. Use our eyes and ears but recent students may want to take pictures and record sounds by smartphone, which makes scientific analysis possible. The cracking is essentially driven by the mismatch of thermal expansion of metal and sugar candy. In the Sukiyaki nabe rough bottom surface plays a critical role. If we increase the thickness of the syrup resultant crack dimension increases and the time scale increases.

In the presentation by the video we show how the location of cracks migrates with actual sounds. This is a process of space-filling. When the surface is covered by cracks new cracking no more occurs. The crack pattern indicates the region of stress-released part and stress-accumulated part. This will be a good lesson to understand how great earthquakes sequentially occur along the subduction zone. If we use another type of pan such as thin walled paella pan completely different crack morphologies appear. We would like to emphasize this experiment has many extensions according the ability of students and can excite the brain for deeper understanding.