

Wine, beer, and cola

Tohru Watanabe[1]; Taiki Kakizaki[2]

[1] Dept. Earth Sciences, Univ. Toyama; [2] Earth Sci. Univ. Toyama

Low frequency earthquakes are often interpreted as free oscillations of fluid bodies in the depths. The fundamental frequency is estimated from the characteristic length of an oscillating body and the sound velocity. We would like to show examples of oscillating phenomena that are familiar to us but difficult to understand.

(1) Sound of wine glass

When you rub the edge of a wine glass, you can hear a clear sound. When you put water into the glass, you hear the sound change. The dominant frequency decreases as the amount of water increased. This cannot be explained by the normal mode of a stopped pipe.

(2) Sound of bottle

When you blow the mouth of bottle, you can hear a low tone. Its dominant frequency is significantly lower than the fundamental mode of a stopped pipe. This is called Helmholtz oscillator. When we blow, the air in the neck is pushed down and the air in the body is compressed. It is then pushed up by the compressed air, and it passes the equilibrium position. It is pulled down by the decompressed air in the body. The system acts like a spring pendulum.

(3) Sound of can

When you blow the mouth of can, you can hear a relatively loud sound. Its dominant frequency is also significantly lower than the fundamental mode of a stopped pipe. In this case, you cannot see a neck. What generates this sound ?

We will play these instruments and discuss mechanisms of sounds based on Fourier analysis.