Recent progress of the infrasound studies and sensor development

Masa-yuki Yamamoto[1]
[1] Kochi Univ. of Tech.

Infrasound is one of the most important open fields to study the missing link from troposphre to upper atomosphere. In this decade, observation of the infrasound has been gradually improved with the progress of constructing the CTBTO sensor network in all over the world for watching the nuclear explosions. On the other hand, many kinds of remote-sensing observing methods have been developed by many scientists for ionspheric plasma observation like the GPS-TEC mapping method to clarify the wide field disturbances like TID (Travelling Ionospheric Disturbance), indicating the importance of vertically propagating large wavelength waves to be projected and seen on the mapping results.

Hence, not only the electromagnetic coupling processes but also neutral atmospheric pressure waves like the audible sound and infrasound should be studied, however, the observation of infrasound is currently insufficient. As for the event studies, it has been reported that, for example, huge earthquake like Smatra (2004) or Tohoku-oki (2011) as well as its induced tsunami became a clear wave source of these kinds of waves, suggesting the infrasound whose propagating velocity is faster than that of tsunami waves on the sea is important for the disaster prevention. Even the relatively small scale geophysical phenomena like volcanic eruptions, meteorite entries, or thunders also creates clear N type infrasound signal at a time of arrival of the shock waves generated at the source.

Propagation is rather difficutl issue to soive in the atmosphere because of its vertical temperature (sound speed) profile. A sounding experiment was carried out using a JAXA sounding rocket in 2012 with emitting several frequency sound and receiving the artificial sonnar signal in the stratosphere up to the thermosphere, experimentally showed the clear natural damping structures with increasing the altitude, however, even the audible sound frequency range, the sonic waves can propagate into the thermospher up to 150 km.

In order to measure such kind of pressure waves in a few to several 100 km scale, arrayed sensors network is required, thus the cost of each pressure sensor is important to built. We recently developed a new infrasound sensor that include some weather monitoring sensors and seismometers, enables us to integrate such information to create an independent emergency alert system by one sensor complex for any geophysical events just after the arrival of the sonic waves. In this paper, we will show the most recent progress of the infrasound observation as well as the development of infrasound sensors, to open the new era of the infrasound study and its usuful applications into the society.