Oral | Symbol M (Multidisciplinary and Interdisciplinary) | M-TT Technology & Techniques

[M-TT43_1PM2]Brand-new scope of coupling geophysics being established by infrasound and associated waves

Convener:*Masa-yuki Yamamoto(Department of systems engineering, Kochi University of Technology), Nobuo Arai(Japan Weather Association), Chair:Masa-yuki Yamamoto(Department of systems engineering, Kochi University of Technology)

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Infrasound and associated wave studies are recently focused on coupling waves with long-distance and vertical propagation characteristics. Such kinds of waves, having with coupling process between the atmosphere and the surface of ground and ocean, are linked with elastic waves in lithosphere and oceanic sphere, as well as to atmospheric regions up to the upper atmosphere, playing a role of generating many kinds of wavelike turbulences in thermosphere. Moreover, whole on the globe, these waves excited depending on the latitude regions, as well as on the environmental regions, such as snow ice, desert, rainforest, mountain, ocean, etc., have their own characteristics. These waves can be excited by large-scale geophysical events like volcanic eruptions, tsunami, thunderstorms, etc. as well as artificial explosions, propagating with long distance. In this session, we would like to discuss such "coupling geophysics" by using many new or well-known investigated data and simulations of infrasound and associated low frequency waves. It can combine multiple spheres in geophysics and bring a brand-new scope of geophysics. Your contributions from many regions are welcome!

5:45 PM - 6:00 PM

[MTT43-P02_PG]Improvement and evaluation of optical-type infrasound sensor for multi-site observation

3-min talk in an oral session

*Kousuke IKEHARA[1], Masa-yuki YAMAMOTO[1], Yoshihiro KAKINAMI[1], Yoshiaki ISHIHARA[2] (1.Kochi University of Technology, 2.JAXA Space Exploration Center, Japan Aerospace Exploration Agency)

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Infrasound is applicable for remote-sensing methods for detecting geophysical phenomena in the atmosphere. There have been developed and used many types of infrasound sensors, however, typically used infrasound sensors are almost developed by foreign countries, resulting high cost situation in Japan. If we can develop low cost infrasound sensors, multi-site arrayed observation will be realized in near future.Recently, infrasound signal generated by tsunami was clearly detected by many CTBTO infrasound stations (Arai et al., 2011), suggesting a new era for establishing a dense infrasound sensor network in every prefecture of Japan for preventing or reducing catastrophic disasters. Because the nature of pressure waves with large wavelength, amplitude of infrasound generated by tsunami might be proportional to the size of the disasters. Combination with sensor networks of seismometers on ground and ocean floor, GPS-buoy type wave recorders, and water manometers on ocean floor, establishing a dense network of infrasound sensors with arrayed configuration is desired.Since 2006, we have been developing new sensing method of infrasound by using piezo film and PSD (Position Sensitive Detectors), achieving frequency range between 0.001 Hz and 10 Hz as well as minimum pressure level of 0.01 Pa (Yamamoto and Ishihara, 2009). In 2013, we tried downsizing the PSD type infrasound sensor developed in 2008 into a size of 0.15 m x 0.15 m x 0.25 m height with calibrating it by using space chamber (0.8 m length x 0.58 m diameter) as an accurate volume pressure reservoir (Manabe et al., 2013). Here, we improved the PSD optical-type infrasound sensor by using 3D printer technology to make many tiny parts

designed with 3D CAD software.By pushing and pulling a small amount of air by a small syringe, calibrating pressure waves with extremely weak amplitude (10 Pa to 0.01 Pa) can be generated in the space chamber, precise measurement of artificially generated infrasonic signals could be realized. The waves were measured by both of the developed PSD sensor and Chaparral Model-2.5 infrasound sensor at the same time. Comparison with output signals by two types of sensors, the downsized PSD type infrasound sensor was carefully studied. In this paper, we will introduce the new design and obtained calibrating datasets.