

Infrasound observations: analyses of infrasonic waves generated by rocket launches and development of an optical sensing method

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Importance of infrasound, or low frequency pressure waves, has been gradually known in geo-science field. This frequency range is one of the new horizons of the remote sensing in the Earth's atmosphere, for example, a large earthquake in Sumatra region generated great Tsunami also produced such kinds of waves in atmosphere and shaking Earth itself by free vibration mode as well as affected even upon the upper atmosphere (Iyemori et al., 2005; Watada et al., 2006). As a purpose of awaking of nuclear bomb testing somewhere under the ground, a global sensor network of infrasound has been constructed in this decade by international CTBTO teams. The advantage of this frequency range, as an intermediate region between atmospheric gravity waves and audible sound waves, is its long-distance propagation without rapid attenuation in viscous fluid atmosphere.

Observation of infrasound in Japan began in 1980's by Tahira at Aichi University of Educational with using three arrayed sensors of Chaparral Physics' Model-2 (e.g. Tahira, 1995). They reported infrasound waves by volcanic eruptions, ocean waves, earthquakes, airplane passages, etc. Recently, infrasound waves possibly generated by thunders, sprites, fireballs, artificial reentry of vehicles, and auroral activities have been reported in several papers (Ishihara et al., 2004; Edwards et al., 2005).

In 2004, we began to study infrasound and discussed with prof. Tahira, then just after his retirement of his university, these three arrayed sensors tested again at Tohoku University in 2005. Network observation of infrasound is significant in studying these fields of science, however, the sensors are too expensive to buy for further several arrayed stations to distribute in Japan. In 2006, we began to develop new types of infrasound sensors by piezo films and firstly tested in field in 2007, comparing with the 3 Chaparral's sensors during the WIND sounding rocket campaign at JAXA's Uchinoura Space Center (Suzuki et al., 2007; Yamamoto and Ishihara, 2008). In 2008, a Chaparral sensor was firstly put on the field of Syowa base at Antarctica as a part of the JARE 49 expedition. Now we develop an optical type infrasound sensor with combinations of a diode laser and a PSD linear sensor.

In this paper, recent activities of infrasound measurements in Japan and Antarctica will be shown. According to the archived datasets of Uchinoura test site, infrasound observation in occasions of 4 rocket launches of JAXA from Uchinoura and Tanegashima Space Centers. Two sets of H-IIA launches as well as two sets of JAXA/ISAS's sounding rockets of S-520 and S-310 types are investigated in detail.

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