

# インフラサウンド観測の現状と HAYABUSA リエントリ時の観測報告

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## Overview of recent infrasound observation and a brief observation report of HAYABUSA reentry

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Since 2005, infrasound observation has been carried out in Japan and Antarctica by our group. Here, overview of infrasound observation activities for 5 years will be reported with a brief observation report of HAYABUSA reentry operated in Australia at 23:21 LT (13:51 UT) on June 13, 2010.

Infrasound is known as pressure waves in atmosphere with the frequency range from about 3.2 mHz to 20 Hz, between the atmospheric gravity waves and the audible sound. Because of its characteristics of distant propagation more than thousands kilometers in atmosphere, it could be important remote sensing method for explosive events such as volcanic eruptions, earthquakes, tsunamis, thunderstorms, artificial explosions, etc. We have set sensors up at Uchinoura Space Center (Kagoshima) and Syowa station (Antarctica) to monitor infrasound since 2007. Possible infrasound signals generated by Mt. Sakurazima eruptions, Microbaroms, Glacial events, rocket launches have been observed in these years.

After 7 years challenging cruise to a minor planet Itokawa (25143) with landing and surface exploration (e.g. Fujiwara et al., 2006), JAXA's spacecraft HAYABUSA came back to the Earth, possibly capturing surface particles on the S-type minor planet into its SRC (Sample Return Capsule). Following to the reentries of NASA's GENESIS (2004) and STARDUST (2006), the return of HAYABUSA SRC was the third reentry event directly from the interplanetary transfer orbit at a velocity of over 12 km/s, the first case by Japanese spacecraft. In order to obtain precise trajectory information to ensure the quick procedure for JAXA's SRC resumption team, we observed the reentry by optically in Australian night sky. High-resolution imaging and spectroscopy were carried out at 4 ground sites in WPA (Woomera Prohibited Area) to investigate thermal-protection process of TPA (Thermal Protection Ablator) as well as interaction process between SRC surface materials and upper atmospheric neutral and plasma components. Shock waves by HAYABUSA reentry were successfully observed at 3 arrayed stations and 3 single stations by infrasound and seismic sensor arrays on ground. It enables us to investigate precise parameters of pressure waves, propagation process of the supersonic waves in atmosphere, and air-to-ground coupling process at such extremely rare opportunity.

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### Reference

Fujiwara, A. et al., Science, 312, 1330, 2006.