Interior structure of Mars estimated from elastic properties of liquid Fe-Ni-S

*Hidenori Terasaki[1], Yuta Shimoyama[1], Mayumi Maki[1], Fuyuka Kurokawa[1], Satoru Urakawa[2], Keisuke Nishida[3], Ryunosuke Saito[1], Yusaku Takubo[1], Yuki Shibazaki[4], Tatsuya Sakamaki[4], Akihiko Machida[5], Yuji Higo[6], Tadashi Kondo[1]

1. Graduate School of Science, Osaka University, 2. Graduate School of Natural Science and technology, Okayama University, 3. Graduate School of Science, The University of Tokyo, 4. Graduate School of Science, Tohoku University, 5. Natural Institutes for Quantum and Radiological Science and Technology, 6. Japan Synchrotron Radiation Research Institute

To give a constraint core composition and interior structures of terrestrial planets, elastic properties, such as sound velocity and density, of liquid Fe-light element alloys at high pressure are required together with geodesy observations. In this study, we have measured sound velocity and density of liquid Fe-Ni-S (S=17-30 at%) using ultrasonic pulse-echo and X-ray absorption methods combined with multianvil apparatus up to 14 GPa and studied the effects of pressure and sulfur content on the elastic properties. Measured sound velocity (V_P) of liquid Fe-Ni-S increased non-linearly with pressure and its pressure dependence is well fitted by the Birch-Murnaghan equation of state. Obtained bulk modulus of liquid Fe-Ni-S decreases with increasing sulfur content. Based on these obtained properties, we will discuss estimated radius and sulfur content of Martian core by comparison with observed moment of inertia data of Mars.

Keywords: Mars, Core, liquid, sound velocity, density

