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高圧下における Fe-S 融体の音速速体：地球および月核への応用
Sound velocity measurements of liquid Fe-S at high pressure: Implications for the Earth's and lunar cores

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The sound velocity of liquid Fe-S is an important physical property to understand the Earth's and lunar outer cores. We measured P-wave velocity (V_P) of liquid $Fe_{84}S_{16}$, $Fe_{60}S_{40}$, and $Fe_{50}S_{50}$ up to 5.4 GPa and 1550 ^{o}C using ultrasonic method combined with synchrotron X-ray technique. The derived VP of liquid Fe-S shows very little change with temperature. The V_P of liquid Fe-S decreases linearly with increasing S content at 2.5 GPa and 1300 ^{o}C. The V_P of liquid $Fe_{60}S_{40}$ increases almost linearly. The expected V_P of the lunar outer core range 3840-4250 m/s assuming the lunar core consists of liquid Fe-FeS outer core and solid Fe inner core. Although the V_P of liquid $Fe_{60}S_{40}$ is slower than that of pure liquid Fe up to 5.4 GPa, the V_P of liquid $Fe_{60}S_{40}$ should be exceed that of liquid Fe over 7 GPa because the pressure derivative of V_P of liquid $Fe_{60}S_{40}$ is larger than that of liquid Fe. This result suggests S is effective in increasing the V_P of liquid Fe over 7 GPa. Therefore, S is considered to be a possible light element of the Earth's outer core.

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