Core composition of Mercury estimated from elastic properties of liquid Fe-Ni-alloy

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Knowledge about density and elastic properties, such as bulk modulus, of liquid Fe-Ni-alloys at high pressure are important to constrain the interior structure and composition of planetary cores. Mercury's core is relatively large compared to other terrestrial planets and is at least in a partially molten state (Margot et al. 2007). Recent X-ray spectroscopy data suggests that S of 1-4 wt% exists on the surface, indicating possible existence of some amounts of S in the core (e.g., Chabot et al. 2014). In this study, we have measured sound velocity and density of liquid Fe-Ni-S using ultrasonic pulse-echo and X-ray absorption methods combined with multianvil apparatus up to 14 GPa. The obtained sound velocity and bulk modulus significantly decreased with increasing S concentration especially at lower pressures. We asses the effect of the newly obtained elastic properties on the compositions of Mercury's core.

Keywords: Mercury, Elastic property, Core

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