Method for measuring of gravitational acceleration using electromagnetic induction in space

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When a magnet drops through a metal pipe, eddy currents are induced in the pipe. The magnet receives a vertical upward-force from the magnetic field that eddy currents produce and the magnet falls at a slow and constant speed. The falling velocity can be determined from a theoretical formula including the mass of the magnet, the magnetic dipole moment of the magnet, gravitational acceleration on the earth, the metal resistivity, the pipe’s internal radius, and the pipe’s thickness. We built a theoretical formula representing the velocity, considering pipe’s thickness. The magnetic dipole moment of the magnet can be determined from the magnetic force-distance relationship between the two magnets. From measurements conducted by varying the mass, the metal resistivity, and the pipe’s thickness, we confirmed the validity of our formula. When we measure the falling velocity at a specific location, we will know the magnitude of gravitational acceleration at the location from our formula. In this way, we can determine the gravitational acceleration in space or on other planets if we have a magnet and a metal pipe.

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