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Atom Interferometer Technologies in Space for Gravity Mapping and Gravity Science JASON WILLIAMS, SHENG-WEY CHIOW, JAMES KELLOGG, JAMES KOHEL, NAN YU, Jet Propulsion Laboratory, California Institute of Technology — Atom interferometers utilize the wave-nature of atomic gases for precision measurements of inertial forces, with potential applications ranging from gravity mapping for planetary science to unprecedented tests of fundamental physics with quantum gases. The high stability and sensitivity intrinsic to these devices already place them among the best terrestrial sensors available for measurements of gravitational accelerations, rotations, and gravity gradients, with the promise of several orders of magnitude improvement in their detection sensitivity in microgravity. Consequently, multiple precision atom-interferometer-based projects are under development at the Jet Propulsion Laboratory, including a dual-atomic-species interferometer that is to be integrated into the Cold Atom Laboratory onboard the International Space Station and a highly stable gravity gradiometer in a transportable design relevant for earth science measurements. We will present JPL's activities in the use of precision atom interferometry for gravity mapping and gravitational wave detection in space. Our recent progresses bringing the transportable JPL atom interferometer instrument to be competitive with the state of the art and simulations of the expected capabilities of a proposed flight project will also be discussed. This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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