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The development of atom-interferometry-based instruments for space missions THIERRY BOTTER, JASON WILLIAMS, SHENG-WEY CHIOW, JAMES KELLOGG, NAN YU, Jet Propulsion Laboratory — The development of quantum sensors based on atom interferometry is being pursued both in academic research settings and applied research laboratories. Applications of interest range from fundamental problems, such as the precise determination of the gravitational constant, G, the direct detection of gravitational waves and the experimental verification of Einstein's equivalence principle in the quantum regime, to applied solutions, including the quantum-sensitive accelerometers, rotation sensors and gravity gradiometers. Atom interferometers of all flavors rely on the interrogation of atoms under free fall to realize their measurement. On earth, therefore, measurement sensitivity, which scales with the square of the interrogation time, must be balanced with the system size needed for the free fall trajectory of atoms. In space, however, the microgravity environment allows for quantum-sensitive measurements with compact designs, making atom interferometry an attractive technology. In this talk, we report on the development of two atom-interferometry-based instruments at the Jet Propulsion Laboratory aimed at improving gravity measurements of planetary bodies. The development and performances of these instruments will be discussed, as well as current scientific results and remaining technical challenges.

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