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# Hybrid Atom Electrostatic System for Satellite Geodesy

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The subject of this poster comes within the framework of new concepts identification and development for future satellite gravity missions, in continuation of previously launched space missions CHAMP, GRACE, GOCE and ongoing and prospective studies like NGGM, GRACE 2 or E-GRASP. We were here more focused on the inertial sensors that complete the payload of such satellites. The clearly identified instruments for space accelerometry are based on the electrostatic technology developed for many years by ONERA and that offer a high level of performance and a high degree of maturity for space applications. On the other hand, a new generation of sensors based on cold atom interferometry (AI) is emerging and seems very promising in this context. These atomic instruments have already demonstrated on ground impressive results, especially with the development of state-of-the-art gravimeters, and should reach their full potential only in space, where the microgravity environment allows long interaction times. Each of these two types of instruments presents their own advantages which are, for the electrostatic sensors (ES), their demonstrated short term sensitivity and their high TRL, and for AI, amongst others, the absolute nature of the measurement and therefore no need for calibration processes. These two technologies seem in some aspects very complementary and a hybrid sensor bringing together all their assets could be the opportunity to take a big step in this context of gravity space missions.
We present here the first experimental association on ground of an electrostatic accelerometer and an atomic accelerometer and underline the interest of calibrating the ES instrument with the AI. Some technical methods using the ES proof-mass as the Raman Mirror seem very promising to remove rotation effects of the satellite on the AI signal. We propose a roadmap to explore further in details and more rigorously this attractive hybridization scheme in order to assess its potential for a future geodesy space mission with theoretical and experimental work.