Olivier Carraz, RHEA for ESA

- Institut d'Optique Graduate School (Paris, France)
- PhD in Astronomy and Astrophysics (Instrumentation) at ONERA (Paris, France)
    - Cold Atom Gravimeter for onboard applications

Laser, Atom interferometry, Quantum physics, Gravimetry

Mission And System Studies Section, Future Missions & Instrument Division, Future System Department, Directorate of Earth Observation Programmes, ESA

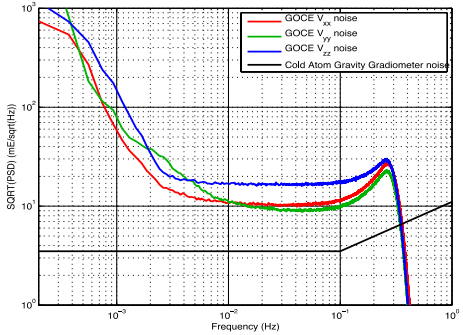
- Support to EOP for preparatory activities on quantum sensors for space gravity mission.
- Support to technology development and qualification of quantum sensors (Earth Sciences, Navigation, Space exploration, Fundamental physics,…).

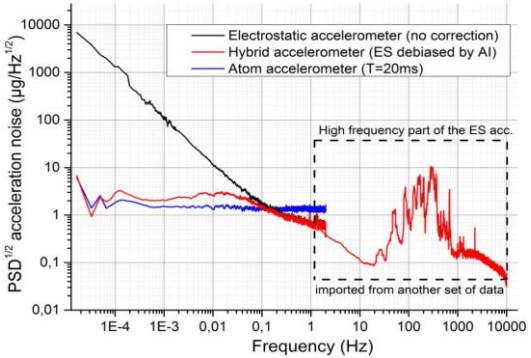
Quantum demonstrator before 2030: Other science aspects than EO geodesy (Atmosphere, planet exploration, ADCS,…)

Towards a full mission by 2035: Driven by user need, continuity (GRACE, GRACE-FO, NGGM) and improvement (GOCE).

Benefits and added value of quantum vis-à-vis conventional technologies for the applications.

- Absolute measurement, no drift
- No showstopper so far to increase sensitivity
- No mechanical part
- High common rejection of vibration noise in Gravity Gradiometer Concept





Status of quantum gravimetry. What can and cannot be done now or soon?

Gravity Gradiometer concept:

- State of the art GOCE or further: Challenging wrt platform development but already existing technology

- Time variable: Most important applications are derived from time variable gravity field, from daily to weekly/monthly basis. Needs 2-3 orders of magnitude better, technology not there yet.

GRACE/Next Generation Gravity Mission concept:

Bottleneck: electrostatic accelerometers

- Improvement of classical accelerometer (drift, calibration), improvement of reliability, relaxing draft free control.

Overall concept for future mission

☐ Action plan for increasing TRL

Develop Electronics

Reduce Power consumption

Feasibility of an In-Orbit Demonstrator

☐ Action plan for simulation environment

0-g platforms

Airborne

ISS, Cubesat ?