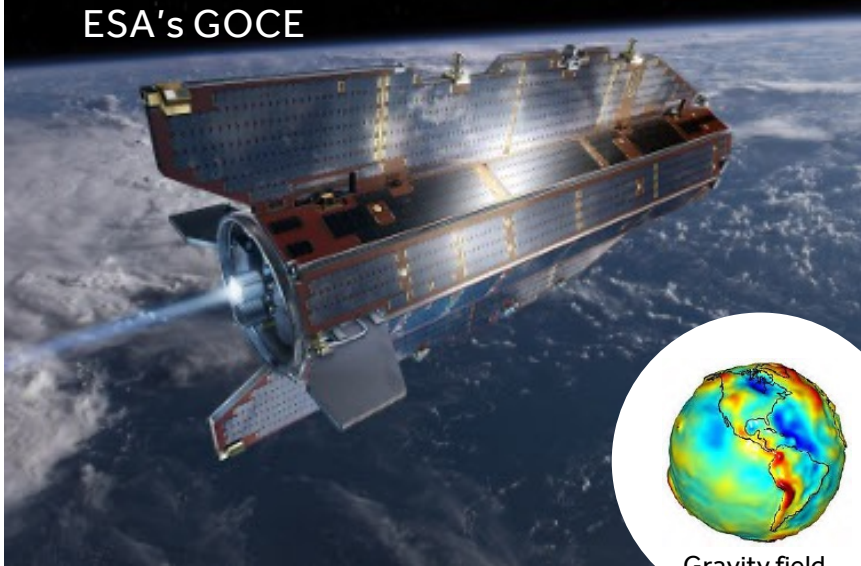# Gravity Missions & Climate

TOGETHER FOR OUR PLANET

ESA's GOCE

Gravity field

- Space missions such as ESA's GOCE (Gravity field and steady-state Ocean Circulation Explorer) use sensitive instruments to measure the small changes in the Earth's gravitational field. The satellite must fly as low as possible to capture the finest detail in the gravity.

- This means that the spacecraft will encounter the thin outer layers of the atmosphere, which causes drag. To prevent the satellite from falling from orbit, the drag is measured and compensated by firing electric thrusters, and thus the orbit is maintained.

- The measured drag can be used to calculate the density of these outer layers of the atmosphere. The density data is used to improve atmospheric climate models.

UK SPACE AGENCY

Centre for EO Instrumentation

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Measuring Gravity & Drag with Cold Atoms

- We measure gravity in space using instruments called accelerometers, which measure the tiny forces on the spacecraft.

- GOCE used a delicate mechanical device. The latest concepts use a tiny cloud of supercooled atoms instead of a mechanism. These atomic systems offer far more sensitivity and accuracy, but the technology is very challenging.

- UKSA and CEOI are supporting Teledyne e2V and partners in designing a cold atom instrument which will be able to measure atmospheric drag as well as the gravity field in due course. This will be the basis of two mission concepts, one with ESA and one a national mission candidate.
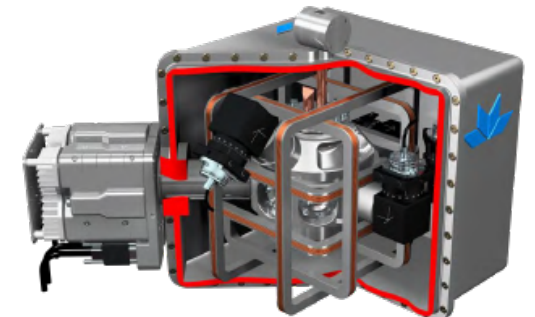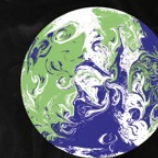
Credit: Teledyne e2V

Credit: RAL Space

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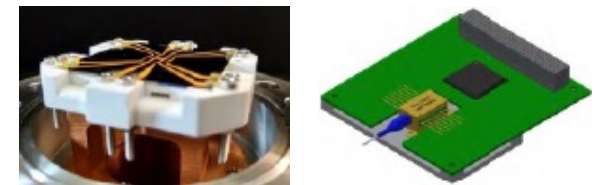
CASPA ADM & Q-ACE

SPACE 4 CLIMATE

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CASPA-ADM

CASPA-ADM (ESA preliminary study)

This will be a small spacecraft which will:

- Demonstrate the cold atom technology in space
- Allow measurements of changes in atmospheric density

Q-ACE (UKSA preliminary study)

This study will use the SkimSat concept from TAS UK.

- A skimsat is a satellite designed to graze the Earth's atmosphere.
- It will carry a more sophisticated cold atom instrument, offering longer lifetime and higher performance.

More information

UK SPACE AGENCY

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TUDelft   ThalesAlenia Space   esa

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