

exail



INDUSTRIAL QUANTUM GRAVITY SENSORS FOR FIELD APPLICATIONS

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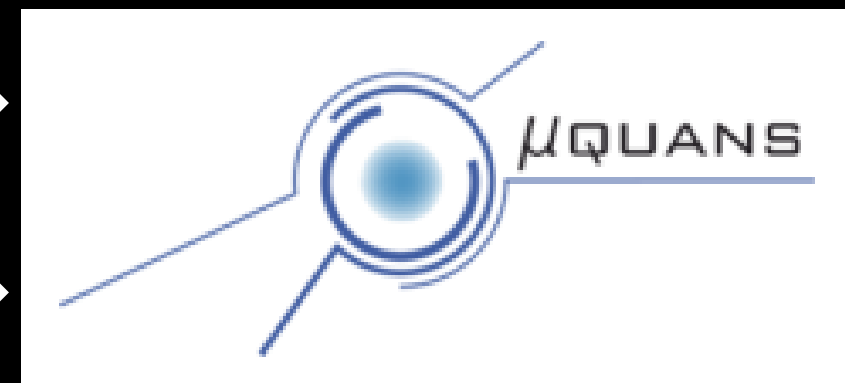
EPIC Online Technology Meeting on
Quantum Metrology and Quantum Sensors

2011

2021

2022

ixblue → **exail**



1500
EMPLOYEES

Quantum systems since 2011: new name, same team

Exail Quantum Sensors (formerly Muquans)

- Industrial quantum sensors since 2011
- Specialized in high-precision measurements, quantum sensing and metrology
- Systems in operation all around the world



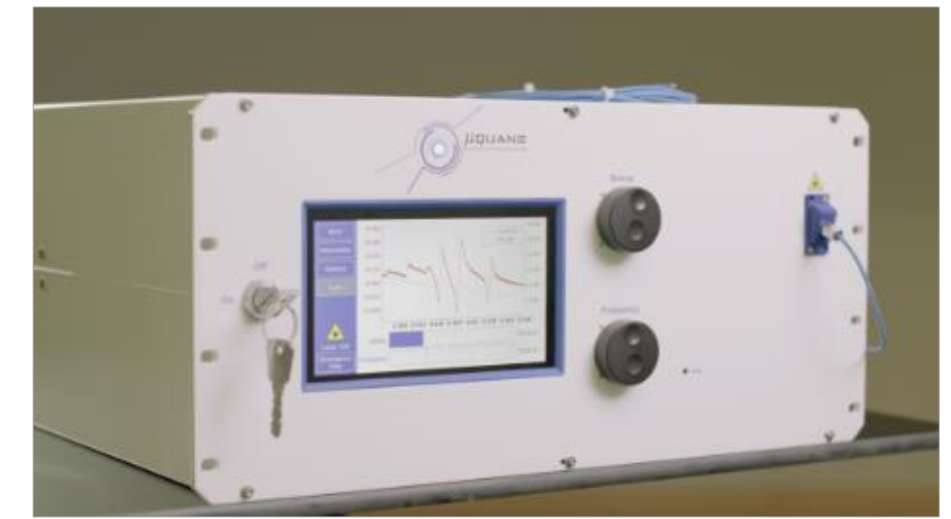
➤ Cold atom gravity meters
($\Delta g/g \approx 10^{-9}$)



➤ Cold atom atomic clock
($\Delta f/f \approx 10^{-15}$)



➤ Optical frequency transfer
($\Delta f/f \approx 10^{-20}$)



➤ Laser and subsystem solutions
($\Delta \lambda/\lambda \approx 10^{-10}$)

High-grade photonics inside

➤ Vertical integration model



Quantum Sensing

Quantum Communication

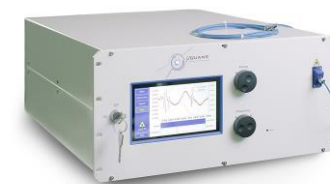
Quantum Simulation

Quantum Computing

Systems



➤ ILS laser series
Intelligent Laser Systems



➤ USML laser series
Ultra-stable Master Lasers

Sub-systems



➤ iMOB series and fiber lasers
Micro-Optic Benches

Components



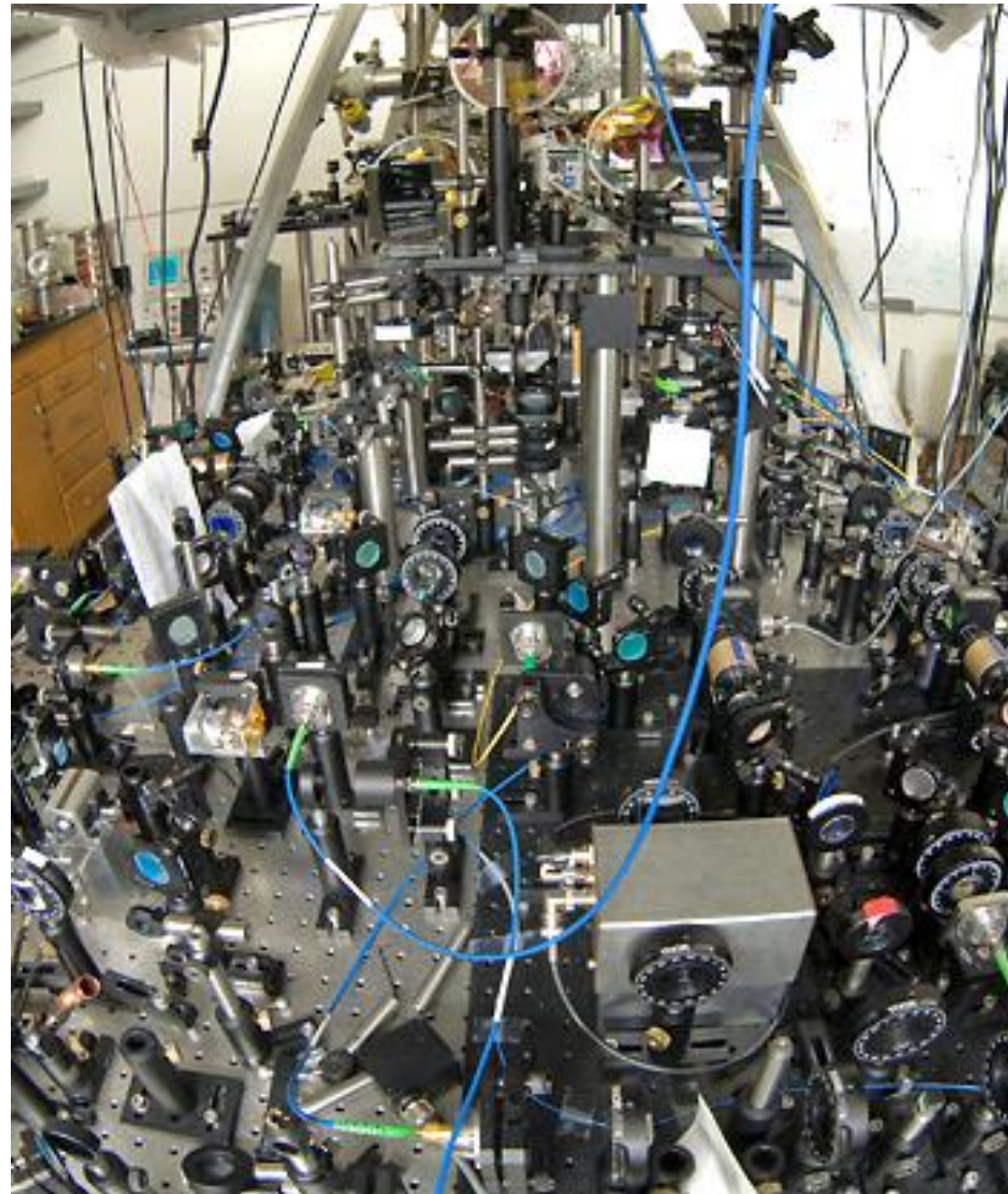
➤ fibers, modulators, custom solutions

Absolute Quantum Gravimeter

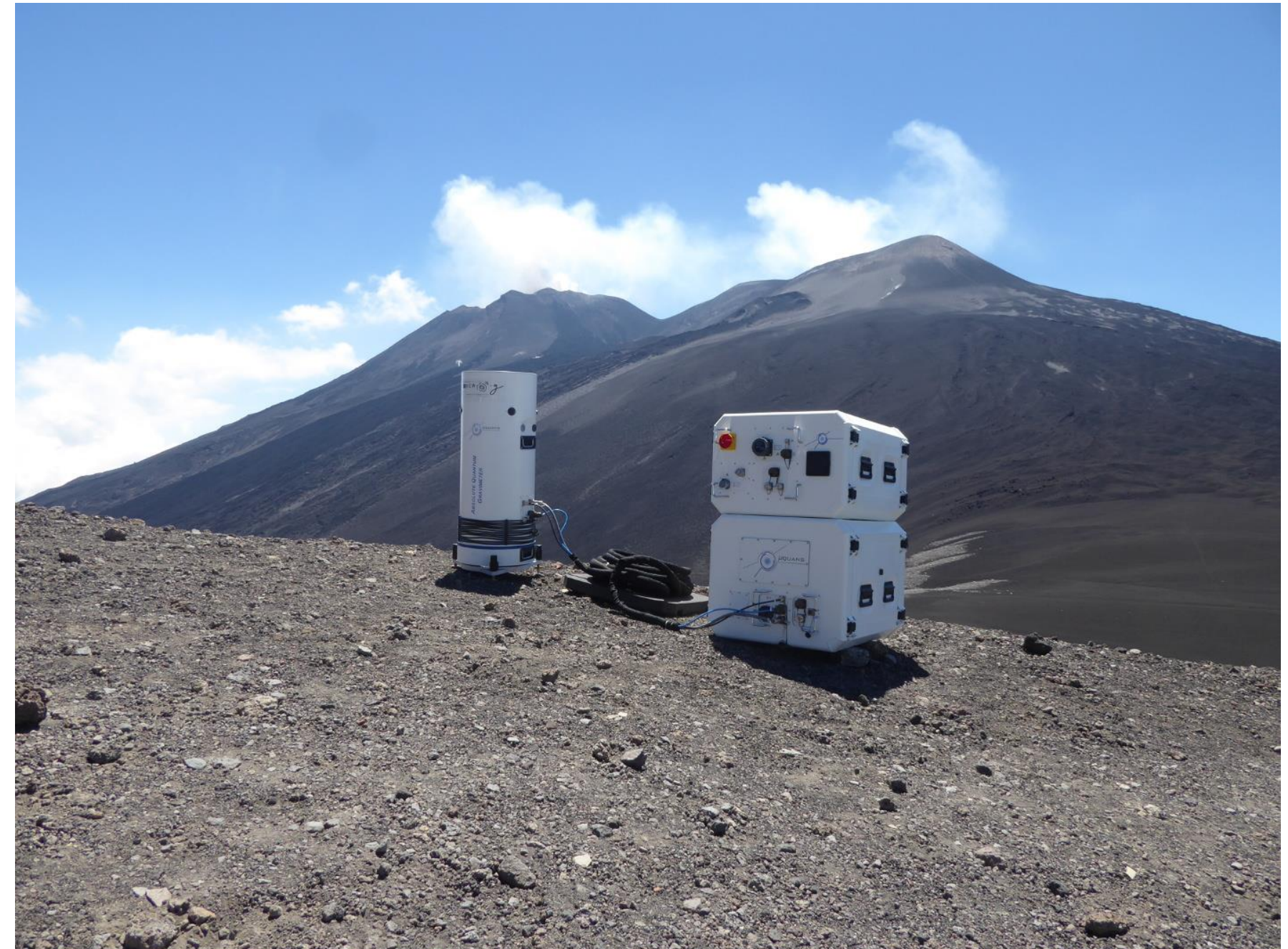
➤ Squeezing a lab into a suitcase



I. Newton, ~1665



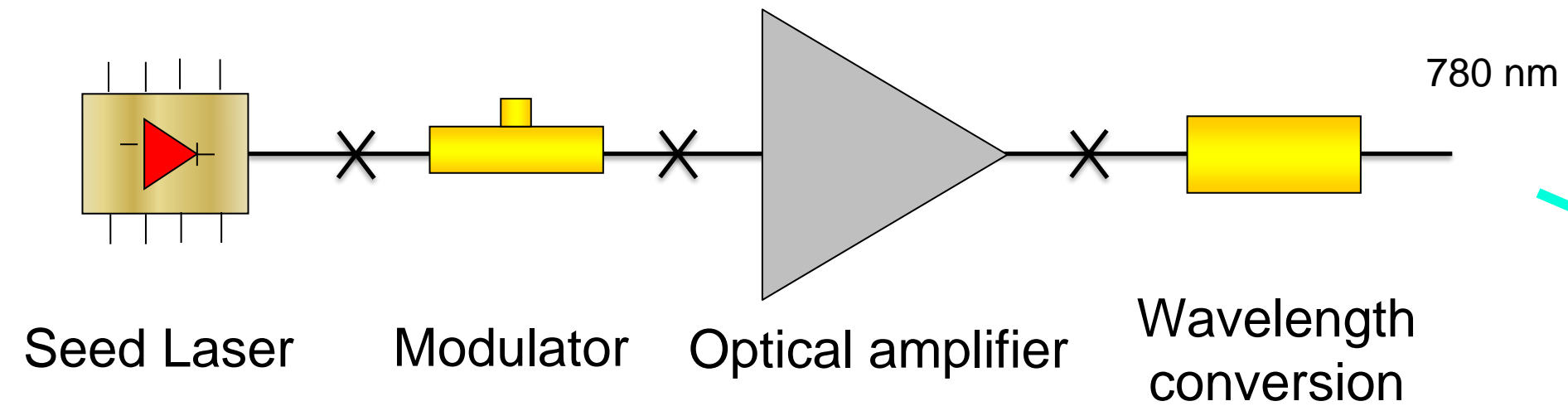
Berkeley, 2010



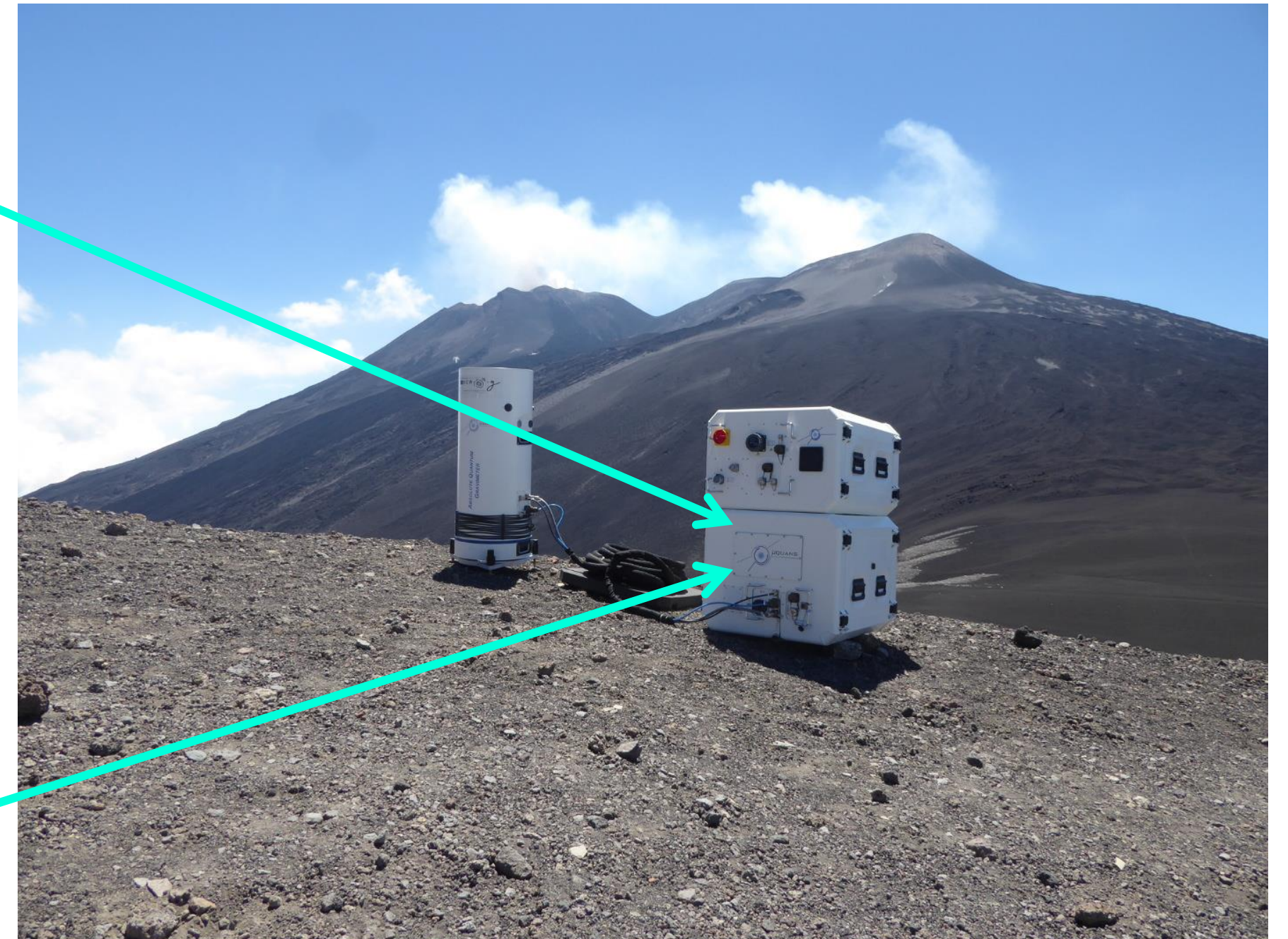
Muquans / Exail, 2020

Absolute Quantum Gravimeter – How does it work?

➤ Telecom laser technology



➤ Free-space micro-integrated optics



Working in harsh conditions



➤ Hard conditions for quantum sensors...

- But even more so for classical devices!

➤ Demonstration of useful signals for geophysics

- State of the art performance
- Validates all technical choices (optics, electronics...)
- Shows industrial maturity of all our solutions
- Quantum sensors have a role to play!

Geophysical Research Letters*

Research Letter | [Open Access](#) |

Detecting Volcano-Related Underground Mass Changes With a Quantum Gravimeter

Laura Antoni-Micollier, Daniele Carbone , Vincent Ménéret, Jean Lautier-Gaud, Thomas King, Filippo Greco, Alfio Messina, Danilo Contrafatto, Bruno Desruelle ... [See fewer authors](#) ^

First published: 25 June 2022 | <https://doi.org/10.1029/2022GL097814>

Conclusion

- **Exail has brought cold atom quantum sensors from the lab to the field**
- **10+ years of experience in photonics and industrial quantum sensors**
- **We provide photonics solutions all along the value chain, from components to full systems**
- **Many innovations yet to come**
 - Space qualified quantum laser systems
 - Onboard quantum sensors
 - Autonomous gravity mapping
 - New optical components and architectures for quantum technologies
- **We are open to partnerships and collaborations!**



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