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## Towards a two-axis cold-atom gyroscope for rotational seismology

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Cold-atom inertial sensors target several applications in navigation, prospection, geoscience and tests of fundamental physics. The operation of these sensors is based on atomic interferometry taking advantage of superpositions between quantum states of different momentum of an atom. These superposition states are obtained by means of optical transitions with two (or more) photons communicating momentum to the atom and acting as beam splitters and mirrors for the matter waves. The SYRTE cold-atom gyroscope currently represent the state of the art of atomic gyroscopes with a short-term sensitivity of  $40 \text{ nrad/s}/\sqrt{\text{Hz}}$  limited by vibration noise (using a 4 Hz sampling rate), a long term stability of  $3\text{e-}10 \text{ rad/s}$  and an accuracy of  $10 \text{ nrad/s}$ . The detection noise limit of the sensor (quantum projection noise) is currently  $5 \text{ nrad/s}/\sqrt{\text{Hz}}$  in the band DC-1 Hz, which already represents an interest to sense ground rotations in a typical frequency range between 1 mHz and 1 Hz. A second horizontal axis of measurement is currently being implemented. Moreover, we are designing a new experiment which aims a reaching a (quantum projection noise limited) sensitivity of  $1 \text{ nrad/s}/\sqrt{\text{Hz}}$  in this frequency band along two axes of measurement, which represents an interesting perspective for the field of rotational seismology. This contribution will present the results recently achieved with the SYRTE gyroscope experiment to reach state-of-the-art performances and present the route to applications of this sensor in geosciences.