An absolute vector magnetometer dedicated to ground observatories

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Abstract

Derived from the Absolute Scalar Magnetometer designed for the Swarm mission, an instrument with additional vector capabilities specifically optimized for ground magnetic observatories has been developed by CEA-Leti with the support from CNES and IPGP. This paper presents the operation principles and main features of this instrument.

A first test campaign, carried out at the Chambon la Fort magnetic observatory operated by IPGP, has demonstrated that the instrument's resolution is in accordance with our performance predictions. However the vector measurements long term stability was affected by mechanical effects due to the sensor's support which did not allow to guarantee the sensor's attitude with sufficient accuracy. A new sensor holder has therefore been designed and the upgraded magnetometer will be evaluated over a six month period at Chambon la Fort. Its data will be compared to the ones delivered by the classical combination of an NMR scalar reference magnetometer and a three-axis vector fluxgate calibrated on a regular basis, representative of the standard procedure adopted in most ground observatories. Preliminary results will be discussed and the potential of this device for fully autonomous magnetic observatories will be assessed.