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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Evaluation of the capacities of a field absolute quantum gravimeter (AQGB01)" *by* Anne-Karin Cooke et al.

Anonymous Referee #2

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The paper presents the first results of analysis of performance of AQG#B01 quantum gravimeter that is proposed as a novel field instrument for high-frequency absolute gravity monitoring experiments. The performance of the instrument was characterized by three criteria: stability (absence of instrumental drift), sensitivity in relation to other gravimeters, and ability to react to hydrogeological mass changes. The accuracy of the gravity measurements by the instrument was compared to that of state-of the art absolute gravimeter (Micro-g-LaCoste, FG5#228). The study included a number of test measurements performed in the observatory conditions (Larzac Observatory in southern France). The results of the tests are carefully described and analysed in the paper. Generally, the study demonstrates that quantum gravimeter has the performance comparable to that of state-of-the art instrument, if installed in the ideal observatory

conditions. However, the purpose of the study was to demonstrate that the AQG#B01 quantum gravimeter can be used in demanding field conditions in geophysical and hydrological studies. This has not been demonstrated by the authors, and several open questions remain after reading the paper. There is reference to the earlier paper by Ménoret et al. (2018) describing the previous version of the instrument, but the authors were using the upgraded version and they did not provide many technical parameters of this upgraded instrument. Below is the list of some general questions that need to be addressed. 1) The instrument proposed for operation in the field conditions need to be compact and robust. It would be useful to present some general scheme of the instrument (or photo with general view of installation), from which it is possible to see its size. The authors provided only information that "improvement in ease of use and transportability has been achieved with each element weighing 40 kg or less". So the reader may be puzzled: how many elements weighting 40 kg is necessary to move from one site to another during field measurements? 2) One important property of any geophysical field instrument is autonomous power supply and its time of operation without recharging or changing the batteries. There is no information about this in the paper. The tests were done in observatory conditions, and there is no information about the instrument power supply system in the paper. What batteries are used to ensure the autonomous operation? Is the instrument using internal or external batteries? How long time the instrument can be operated autonomously without recharging or changing batteries? Is the instrument performance degrading with decreasing the battery capacity? 3) It was written in the Abstract that the proposed instrument can be used in high-frequency absolute gravity monitoring, but there is no information about signal bandwidth and dynamic range. It is not clear what the authors mean by high-frequency because the paper presents the data integrated over time intervals of 24 hours. 4) Each field instrument needs to have a system for data registration, either to high-capacity internal storage media or to remote storage using some data transmission protocols. There is no any information about this in the paper. 5) How the data quality control during measurements is realised? How much efforts from the operator

are necessary for this? 6) The thermal stability of the instrument was tested in a very narrow range from +20C to +30C. So the question arises: how the instrument performs in real conditions, in which it is possible to have daily temperature variations up to 20 C in some cases? Moreover, is it possible to use this instrument for monitoring mass changes in glaciated areas with temperatures lower than 0 C? 7) In their observatory tests the authors were using thermal insulation of the instrument, but realisation of the insulation is not discussed. It is important to discuss how the insulation was done, in order to demonstrate that the instrument can be insulated also in real field conditions. Is it possible to reach similar temperature stability as in the observatory? 8) The authors did not provide any reference to the manufacturer. Only name Muquans is mentioned, but it is not clear from the text whether it is a company name or the name of an individual.

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