Interactive comment on "Vibration error compensation algorithm in the development of the laser interference absolute gravimeter" *by* Qiong Wu et al.

Anonymous Referee #1

Received and published: 14 January 2021

General Comments:

The authors are addressing the problem of the vibration interferences occurring in the laser interference absolute gravimeters. Such kind of gravimeters is using a falling body (FB) to determine the gravity value. The authors suggest to improvements through the use of a passive vibration isolation system (PVIS) combined to a vibration error compensation algorithm (VECA). Indeed, the PVIS has a double usage, reducing vibrations and record the residual vibrations. Then, this residual vibration signal subtracted from the displacement signal of the FB, thanks to the VECA. The authors compared their approach with a standard least squares approach, on 2 different study cases. 1. simu-

lation results by the injection of 2 different noise signals. 2. ability to capture the Earth tide.

The paper addresses a relevant scientific question with new ideas. The use of English is good, and the title reflects the content of the paper. The abstract provides an efficient summary. The approach presented is interesting. However the work and quality are contrasted. Indeed, stronger and more adapted comparisons, would better highlight the work presented. The overall quality of the article good even if the balance between the PVIS and VECA could be improved and some typing errors are present.

Remarks:

Since this work is theoretical, the Fig 1. would deserve to include, the laser, the FB, the cart, servomotor, PVIS, reference corner-cube etc, to give a better and faster idea of the suggested set up. The construction of the article is globally correct but could be improved. In section 2.1 the authors are detailing a classical spring-mass-damper, in order to say that some frequencies will be attenuated and a signal recorded. It can be shortened, in my opinion ; especially by comparison with the section 3.1 that would deserve more details. There is a lack of consistency in the mathematical symbols used (multiplication, for example) and citing style. Fig 4 & 5 are not clear, the double scale of the vertical axis makes the reading difficult. It would be clearer with a log scale or zoom box.

Questions: (specific comments)

The proposed method is a combination of 2 sub-techniques (PVIS and VECA). But the comparison is global, so it is hard to conclude about the correctness of the sub-technique themselves. What is the sensibility and precision of a PVIS ? Can it be compared alone with other techniques ? What if we add prior form of the noise from PVIS into the LSS ? Can the VECA be compared with other algorithms taking into account the vibrational signal from the PVIS ? l 136. Why add a white noise ? Why with this specific variance ? l 186. Why use the genetic algorithm among many others

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? Gradient ? Random walk ? Or Machine Learning ? l 192. Why no noise from the fringe signal is considered ? l 220. What are the input and output of the genetic algorithm ? What is the variable ? Individuals, etc. l 225. What is exactly the objective function chosen which "is based on the correlation coefficients" ? l 226. In figure 3, in "Is i greater than the maximum number of iterations" is the same i-th time iteration or the i-th iteration of the genetic algorithm ? It is confusing. l 236. The LSS used is Linear or Non-linear ?

Technical corrections/typing errors:

l 102. \Phi_1 the subscript missing.

l 104, unwanted space before the coma.

l 107. \Phi_2 the subscript missing.

l 119. idem

l 143. k - th

l 147 148. 10 the exponent missing.

l 161. parentheses for cos and sin functions and multiplication sign

l 162. it is equation 2.10 instead of 2.9

l 168. Problems with))

l 171. g_0 the subscript missing.

l 179. it should d+e instead of d-e?

l 203 204. [instead of (

l 210. power

l 214.) instead of]

l 218. citing style inconsistent

l 237. g_0 the subscript missing.

l 250. idem

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