1. Line 59. I would erase "the overwhelming programming effort and", because in many cases, the adjoint equation has the same form as the equations to be solved for the forward problem, so that the same code can be used for both the forward problem and the adjoint equation.
Response:
    Suggestion followed.

2. Lines 172 & 173. Sentence "Details… in Chen et al. (2021).." can be erased.
Response:
    This sentence has been erased.

3. Line 271. Correct "note" as "noted".
Response:
    Done.

4. Line 286. Correct "trail-and-error".
Response:
    Thank you for pointing this out. The phrase has been corrected to "*trial-and-error*".

5. Lines 408 & 409. Expression "Here we applied the multiplicative noise is intended" should be corrected.
Response:
    Thank you for this comment. This sentence has been corrected as "*Here, we applied the multiplicative noise to……*"

6. Lines 413 to 418. The effect of a possible instrumental drift is not strictly related to the proportionality of the error on the measured value.
Response:
    Thank you for this comment. To prevent potential misunderstanding, we have modified the expression "*tending to experience more significant drift and thus being more prone to*" to "*tending to experience more significant drift, which in some cases may result in elevated observation noise*", in order to clarify that this is a potential rather than a strictly deterministic relationship.

7. Line 610. "range between 9.05×10-5~1.32×10-4 (corresponding to logarithmic values of -4.04~-3.88" should be substituted with "range between 9.05×10-5 and 1.32×10-4 (corresponding to logarithmic values between -4.04 and -3.88".
Response:
    Done.