Response to comments from Reviewer 2

We thank the reviewer for their careful review of our manuscript and we are grateful for their constructive suggestions. Our responses to the comments are provided below and are organized using the following color code:

- the original text by the reviewer (black)
- response to the reviewer comments (blue)

This manuscript by Shaju et al. examines the optimal positioning of temperature sensors in ice boreholes. This field of research is quite far from my own field, but it was a pleasure to read a very well written paper that I could easily follow despite my lack of prior knowledge. The introduction is well crafted, and the results and discussions are easy to follow.

Reviewer 1 has already presented a very detailed, in-depth expert review and I agree in the comments presented there. In particular, sections 2.2.1 and 2.2.2 are difficult material to comprehend without background knowledge.

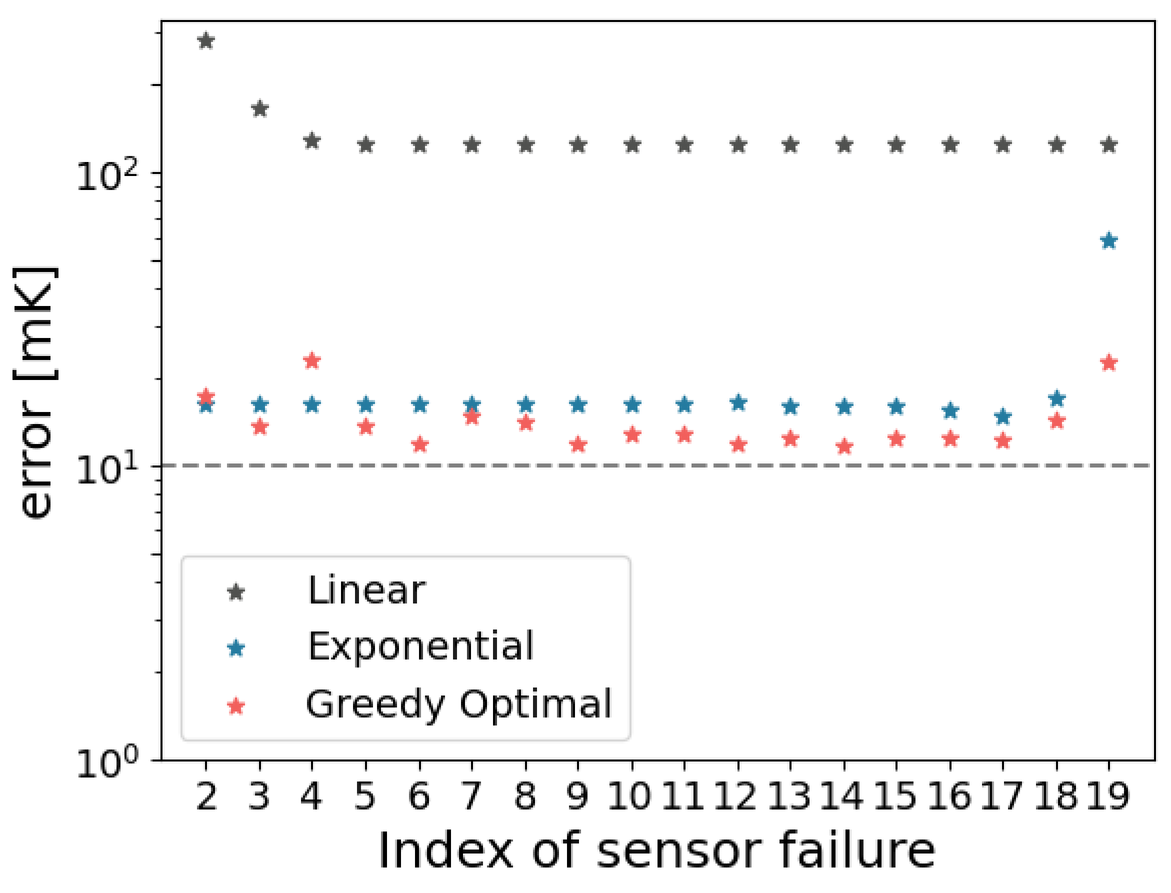
We thank the reviewer for their positive feedback. We agree that it is important to simplify the sections 2.2.1 and 2.2.2 for enhancing the readability and make our manuscript much more helpful to other researchers in this field. In the revised version, we will reduce the complexity of the algorithm by providing step descriptions and using simplified notations that are easier to grasp.

One little thing that the authors probably already have considered and might want to add to the discussion section is the question of sensor failure. With the greedy algorithm, the sensor positions are optimized, and fewer sensors are needed. However, this must come at the cost of a large penalty if one sensor fails? Or phrased differently, could/should some sort of redundancy be built in?

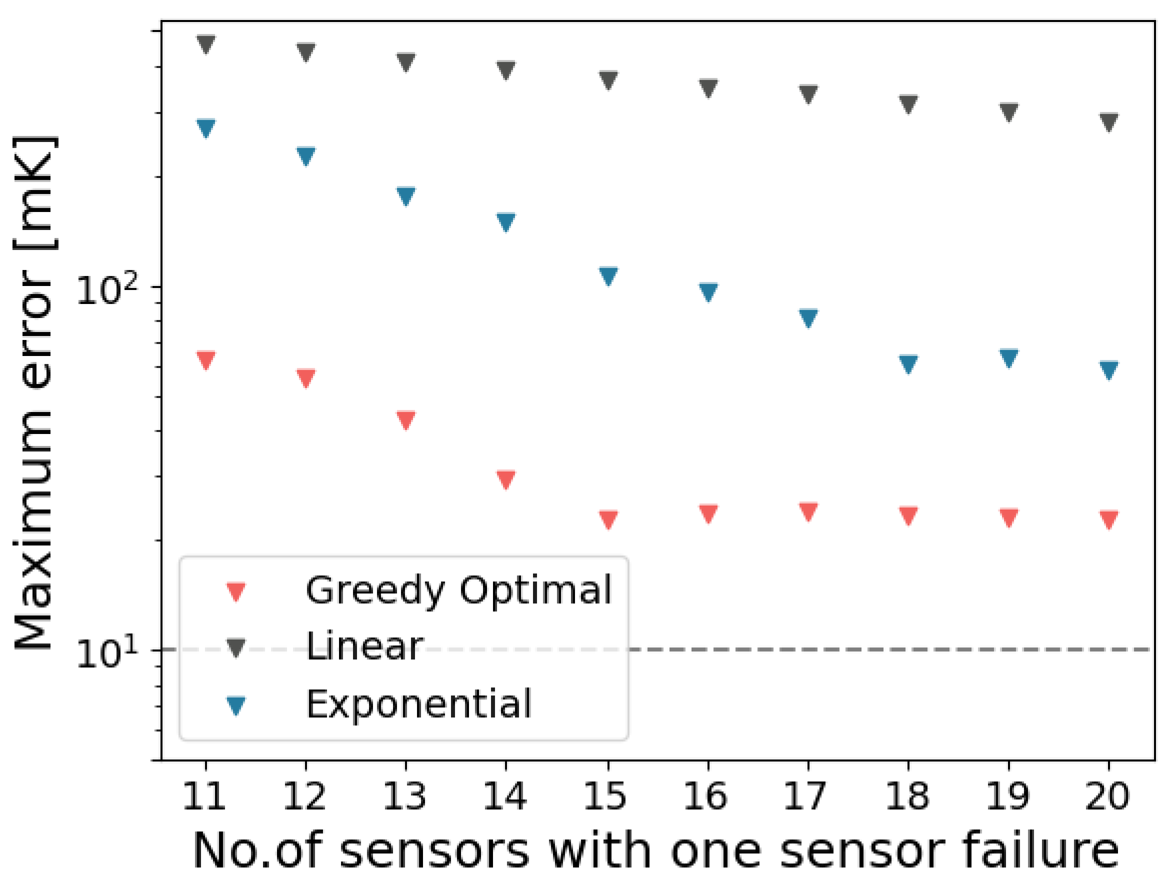
Thank you for your advice, it's an important consideration, especially when relying on fewer sensors. To address this, we first tested sensor failures across all three placement strategies using 20 sensors, each with a device error standard deviation of sigma_d = 10 mK. As shown in Review Figure R2, the greedy optimal placement resulted in the lowest error across most cases. The maximum sampling error due to sensor failure was highest for linear placements (>250 mK), followed by exponential placements (~60 mK), while the greedy optimal placement remained below 30 mK.

To assess the reliability of greedy optimal sensor placement with fewer sensors, we tested one-by-one sensor failures for sets ranging from 11 to 20 sensors. For each set, we recorded the highest sampling error resulting from the failure of any single sensor, and plotted this maximum error to evaluate performance. As shown in Review Figure R3, the sampling errors remain within 30 mK when 15 or more sensors (with a sensor failure) are used.

We will add a short discussion of the sensitivity to sensor failure under Section 3.2 and add a version of Review Figure 3 under Appendix in the revised version.



Review Figure R2: This figure compares the maximal sampling error for linear, exponential, and greedy optimal placements of 20 sensors, each with a device error standard deviation of sigma_d = 10 mK, under one-at-a-time sensor failures. The horizontal axis indicates the index of the failed sensor. Failures at indices 1 and 20 are excluded, as the method relies on interpolation.



Review Figure R3: This figure shows the maximal sampling error observed due to single sensor failure for all the three sensor placement startegies of 11 to 20 sensors, each with a device error standard deviation of sigma_d = 10 mK. The horizontal axis shows the no. of sensors including the failed sensor.