1. To meet criticism by Navarro about 'perspective' we have inserted at line 35 (+ references in the reference list):

Svalbard has a wide spectrum of surging glaciers, with surge periods ranging from a couple of decades to (presumably) a few hundred years (Lefauconnier and Hagen, 1991). Many of the larger tidewater glaciers on Svalbard do surge regularly (a precise percentage is not known). Glaciers with well-documented surge behaviour in a similar size-class as Tunabreen are for instance Kongsvegen (length ≈ 25 km, slope ≈ 0.028), Comfortlessbreen (length ≈ 16 km, slope 0.042) and Monacobreen (length ≈ 40 km, slope ≈ 0.027). The characteristic slope of Tunabreen (≈ 0.032) is within the usual range of larger tidewater glaciers. The observed long-term (multi-annual) calving rate is relatively high (≈ 270 m a^{-1}), but it should be noted that calving rates vary enormously across the Archipelago (Blaszczyk et al., 2009). The surges of Tunabreen appear to be initiated on the lowest part of the glacier and propagate upward, which is not uncommon for surging tidewater glaciers in Svalbard (Sevestre et al., 2018). Altogether, Tunabreen appears to be a fairly representative glacier, albeit with a relatively high and increasing surge frequency.

Błaszczyk, M., Jania, J., Hagen, J.O.: Tidewater Glaciers of Svalbard: Recent changes and estimates of calving fluxes, Polish Polar Res., 30(2), 85-142, 2009.

Lefauconnier, B., and Hagen, J.O.: 1991. Surging and calving glaciers in eastern Svalbard. Nor. Polarinst. Medd. 116, 1991.

Sevestre, H., Benn D.I., Luckman, A., Nuth, C., Kohler, J. Lindbäck, K. and Pettersson, R.: Tidewater glacier surges initiated at the terminus, JGR Earth Surface, 1035-1051, doi: 10.1029/2017JF004358, 2018.

2. Bed undulations (point by Navarro)

This remains a difficult issue. We acknowledge that bed undulations may facilitate stable positions of the front. However, in our view it remains questionable if considering small undulations in only one-dimension makes much sense. The reviewer refers to the study by Vieli et al. (2001), where a numerical calculation is done along a flowline. But, when lateral undulations are important, the choice of flowline becomes critical as well, and perhaps a 2-D approach is necessary to fully capture the effect of undulations..

We believe that in our case bed undulations are less dominant for the dynamic evolution because we consider longer time scales and because Tunabreen is subject to vigorous surges during which the front overrides undulations anyway (and which may actually ***change*** the bed).

3. Significance of the work (Anon. Reviewer, AR)

We regret that AR classifies the impact of this article as "fair".

There is a great need to quantify how the larger glaciers of Svalbard will behave in the future. Model studies undertaken so far are of a very global nature (in effect only looking at mass balance, e.g. Hock et al., 2019), not dealing with the pecularities of calving and surging processes at all. By no means do we claim to have the perfect model, but we deal with the interaction between dynamics and mass balance, which is a step forward. In the discussion we write: "*Therefore, in the end one would like to repeat the simulations presented here with a comprehensive glacier flow model with full spatial resolution. However, it will not be an easy task to prepare the necessary input fields, formulate boundary conditions in a straightforward way, and get the calving and surging to occur at the right place and time*".

Hock et al.: Glacier MIP: A model intercomparison of global-scale glacier mass-balance models and projections. Journal of Glaciology , Volume 65 , Issue 251 , June 2019 , pp. 453 – 467, DOI: https://doi.org/10.1017/jog.2019.22

4. Geodetic mass balance (AR)

Meanwhile to DEMS have been published for Svalbard, en this has allowed us to make a comparison between our model simulation calibrated on glacier length and the geodetic evidence.

We thus have inserted at original line 311:

Two Digital Elevation Models (DEMs) for Svalbard have recently been published, referring to the years 1936 and 2010 (Geyman et al., 2022). The DEMs allow an independent check on the model performance. The mean change in surface elevation for Tunabreen over the period 1936 – 2010, based on gridded DEM data, amounts to -0.30 m w.e. a^{-1}. The mean net balance calculated for this period from the model output (run of Fig. 7) is -0.25 m w.e. a^{-1}. We thus conclude that the calibrated model result is in broad agreement with the geodetic evidence.

Geyman, E.C., Van Pelt, W. J. J., Maloof, A. C., Faste Aas, H. and Kohler, J.: Historical glacier change on Svalbard predicts doubling of mass loss by 2100, Nature, 601, 374–379 (2022). https://doi.org/10.1038/s41586-021-04314-4

5. Calculated ELA trend (AR)

We have access to all ouput data from the study of Van Pelt et al. (2019), so we assume that our calculated value of the ELA trend, derived directly from the model output, is more accurate than the back-of-the-envelope estimate by AR.