Answers to Reviewer 1:

First of all we want to thank the reviewer for the general positive feed back and constructive comments on our manuscript. All comments have been taken into account and a list of answers and undertaken actions is given below. Answers are marked in "blue".

Comments by Reviewer 1:

The introduction looks good. It provides a comprehensive overview of the current state of the Antarctic Peninsula (AP) ice sheet, including the effects of climate change on temperature, ice shelf loss, and ice mass loss. The introduction also highlights the limitations of current methods used to estimate ice mass loss on the AP and identifies the need for further research, such as geodetic mass balance estimation. Overall, the introduction provides a clear and concise background to the study area and sets the stage for the research that follows.

The data used for the study appears to be scientifically sound and coherent. The authors used bistatic Synthetic Aperture Radar (SAR). They used two coverages of the AP with TDX data acquisitions from austral-winter 2013 and 2017 for their analysis, and a reference DEM (refDEM) based on the global TanDEM-X DEM at 12 m spatial resolution.

To obtain information on the CMB, the authors used output from the regional climate model MAR.

The authors computed the average CMB for the period July 2013 until June 2017 and the absolute and relative difference (dCMB) in respect to whole temporal coverage of the MAR data (2008-2022) is computed to obtain information CMB anomalies during the study period. They also defined the mass balance ratio (MBR) by dividing the CMB anomalies (dCMB) by the total mass change ($\Delta M/\Delta t$) to indicate the contribution of CMB changes on the mass change.

Overall, the data used in the study appears to be based on established and widely accepted scientific methods and models, and the authors have taken care to provide appropriate references and explanations for their methods.

The method seems comprehensive and well thought out. The differential interferometric SAR processing approach used to derive DEMs from TDX data is well explained, along with the advantages of this approach. The iterative coregistration procedure used to generate smooth DEM mosaics for each time step is also explained in detail. The text describes how the coregistration procedure had to be adapted for the study area due to the limited availability of ice-free areas and complex topography. The methods used to compute ice mass change rates are also described, including how different basin definitions and sub-region definitions were used, and how voids in the elevation change field were filled. The text explains how the results were converted to ice mass changes using a volume-to-mass conversion factor. The method seems well developed and comprehensive.

The article discusses the variation in ice surface elevation in the northern part of Antarctica and its possible causes. The paper presents an analysis of changes in the surface elevation of glaciers and ice basins over an area of 770,000 km², covering 96.4% of the glaciated area of northern Antarctica. The results indicate a significant loss of ice mass, with loss rates of up to -8 m/yr on some glaciers and a total mass loss of -24.3 ± 5.8 Gt/yr in the study region. Possible causes for this ice mass loss are discussed based on previous studies, including warming ocean waters and changes in snow accumulation. However, the study highlights that additional analyses of ice dynamics are needed to confirm the conclusions drawn from variations in ice surface elevation. A limitation of the study is that it focuses only on the selected study region and does not consider the long-term temporal variation in Antarctic ice changes.

We understand the reviewer's concern. However, the data handling and the processing resources needed for carrying out such an analysis on Antarctic wide scales would be too difficult, at least using our computing infrastructure. Moreover, for most regions in Antarctica the amount of ice free areas for coregistration is very low, which would further strongly hamper the analysis. However, there exists estimates based on other approaches, like altimetry or gravimetry, for the remaining regions in Antarctica. These approaches have certain limitations on the AP, but work very well at the less complex topography of e.g. the East or West Antarctic Ice Sheet (see e.g. the IMBIE reports).

One potential critique is that the study relies solely on bi-static SAR data, which may have limitations in terms of accuracy and resolution compared to other measurement methods.

As also requested by Reviewer 2, we evaluated the quality and suitability of the TanDEM-X data for assessing the volume changes using independent data sources. For more details see the (new) supplement and the answers to Reviewer 2.

The authors acknowledge that there is a need for improved ice thickness data towards the grounding line, which is a dominant error source in ice discharge estimates on the AP.

Additionally, while the study provides a detailed assessment of glacier mass balances at unprecedented spatially detailed scales and with high precision, there may be other factors that are not accounted for in the analysis. For example, the study identifies that most of the mass losses are caused by ice dynamic changes, but it may be difficult to distinguish between changes in ice dynamics caused by climate variability versus other factors such as ocean currents or internal ice sheet processes.

We agree with the reviewer, and that is why we also pointed out in the manuscript that additional research on the glacier ice flow evolution (seasonal and long-term) is needed to better assess the driving factors.

The study provides important new insights into glacier mass balance in the northern AP and is significant for cryosphere science, I advise that it be accepted for publication.