Dear Editor,
We once again would like to sincerely thank the editor and the referees for their constructive comments and insights provided throughout all the revision rounds. We deeply appreciate the time everyone has taken to provide feedback. Based on the comments from the editor, we have further improved our manuscript.
In the following, we address the editor's comments point-by-point. We marked the comments given by the editor in red, provide our answers and comments in black, and indicate how we address the amendments in the manuscript in green.

Tiago Silva, on behalf of all co-authors.

The manuscript is much improved, and thank you for working on this, but there are still a few remaining points that could make the analysis stronger, including some assumptions which I feel need more justification or explanation. Please consider the following and I look forward to the revised manuscript.

The terrestrial ecosystem (ice-free area) in Greenland has -> Terrestrial ecosystems (ice-free areas) in Greenland have
We have updated according to the suggestion.

12: 'responded highly' -> responded strongly
We have updated according to the suggestion.

28: vegetation has expanded…is this vegetation cover or leaf area index?
Since our results are based on spatio-temporal changes in spectral greenness (NDVI≥0.15), the vegetation expansion is a result of newly emerging spectrally green areas. To clarify this point in the abstract, we now write: From spatio-temporal increases in spectral vegetation, we infer vegetation expansion northward and towards the interior of Greenland.

First paragraph of the introduction: I'm not asking for a change but just a general piece of writing advice. Almost never start a sentence with an author or a paper because it makes the subject of the sentence the author rather than the dynamic at hand (here Arctic greening).
Thank you very much for your very valuable writing advice. We will follow the recommended writing approach in future manuscripts.

65: 'striking'' is subjective. Best to just avoid adjectives whenever possible.
The subjective adjective has been removed. We carefully read the manuscript again and did not find any other instance with qualitative adjectives.

87: yes in general but snowpack thermal characteristics in addition to depth, like density, are also important for melt.
We completely agree. In the seasonal snowpacks, both depth and density are indeed important for generating and sustaining melt. However, while higher snow density increases the energy required to melt snow, it also increases thermal conductivity, with more efficient vertical heat transfer, accelerating melt. In order to complete the description of the thermal characteristics of the snowpack, we have added the following sentence to the Introduction:

“A relevant characteristic of the snowpack is that deep snow requires more energy than shallow snowpacks to equalise the cold content and liquid water holding capacity, an equalisation needed to subsequently initiate and sustain melt (Colbeck 1976; Musselman et al. 2017).”
However, if the snow is dense, its higher thermal conductivity can enhance internal heat transfer, partially offsetting this energy requirement. “As a result, deep snow often persists for extended periods, potentially delaying the start of the growing season and hindering plant growth (Schmidt et al., 2015).”

95: will also probably result in groundwater recharge. Honestly the snowpack section can be cut or shortened considerably. Nit necessary but the introduction is a bit long.
The detailed explanation regarding the thermal characteristics of snowpack and its relationship to soil water is based on valid feedback from the first revision round (e.g., Major Point 3, Minor Point 4, and Minor Point 33 from referee 1). Given the interdisciplinary nature of the manuscript, readers who are not familiar with snowpack characteristics may find it counterintuitive that more shallow snowpacks melt more slowly. Therefore, we previously followed the advice of Referee 1 and expanded the Introduction, and we suggest maintaining it as it is.

2.2: I’m left a bit confused about how the long NDVI records were harmonized.
We assume that 2.2 refers to the subsection 2.2 where we solely describe the remotely sensed products from the NOAA Climate Data Record for Normalized Difference Vegetation. The description on how we attempt to minimize differences due to sensor change during the study period is found in subsection 3.1 Spectral Greenness. We address this comment more in detail in the next point.

235: how does more observations lower NDVI? Is this because of snow/ice/cloud pixels? It’s still not entirely clear to me how data were harmonized to account for differences in instrument and processing.
We rewrote and expanded the paragraph that was previously unclear to:
To minimize the influence of temporal sampling artifacts at high latitudes, we began by calculating monthly integrated NDVI, as these estimates are less likely to be affected than metrics based on maximum NDVI (e.g., Myers-Smith et al. 2020). Our focus is on green vegetation, so we only considered daily NDVI pixel values greater than or equal to 0.15. We then divided the monthly integrated NDVI by the total number of observations available for that month (n) to obtain the monthly averaged greenness, analogous to the calculation of the arithmetic mean.
However, as shown in Figures S1 and S3, the AVHRR NDVI dataset, despite having more observations, exhibits less spatio-temporal variability compared to the VIIRS NDVI. This discrepancy is likely due to the less strict quality control regarding environmental conditions (i.e., snow cover, clouds, and shadows) in the AVHRR algorithm, which may have led to inaccuracies in NDVI calculations, as considered in subsection 2.2. As a result, calculating the arithmetic monthly mean for the AVHRR NDVI record would produce lower monthly greenness. To address the potential misrepresentation of the environmental conditions during the AVHRR period, we chose to use a reduced n based on the monthly minimum, average, and maximum number of observations from the VIIRS NDVI record to calculate monthly greenness. From 2014 to 2023, we identified these three statistics for each month. Then, we generated a consistent variability range from 1991 to 2013 to recalculate monthly greenness, ensuring a similar number of observations as those from 2014 to 2023. Figure 2 illustrates the resulting variability range of these three quantities in relation to the calculated monthly greenness extent. This approach

assumes that the environmental conditions from 1991 to 2013 are comparable to those from 2014 to 2023. Figures S2 to S5 present the average number of monthly observations and the associated standard deviation for both the AVHRR and VIIRS periods, both before and after adjusting n.

In the Results and in Table S1, we statistically compared the calculated monthly greenness with an independent variable, such as the Greenland Blocking Index. There, we describe how the prevailing weather patterns relate to changes in spectral greenness for three periods: AVHRR (1991-2013), VIIRS (2014-2023), and the full period (1991-2023). Positive and significant correlation coefficients ranging from 0.5 to 0.8 were found between ecoregions 1 and 4, generally with higher correlations for the VIIRS period than for the AVHRR period.
Ultimately, we stated in subsection 5.3, Study Limitations and Future Research Directions, that "The NDVI datasets used in this study come from two NOAA satellite products, each employing a different sensor type. The absence of overlapping temporal datasets limited our uncertainty assessment, and the potential for mismatches between the datasets cannot be disregarded. This lack of a common calibration period raises concerns about the reliability of long-term time-integrated NDVI analysis."

243: a bit confused by the 0.15 NDVI threshold, especially in the artic where soil reflectances or intermittent standing water (depending on ecosystem) can result in situations where vegetation is present but measured NDVI is quite low. Is there a reference for the 0.15 value?
The NDVI threshold selected for analysing spectral greenness is based on the literature referenced in the first sentence of subsection 3.1 Spectral Greenness. We have now rewritten and expanded that first sentence as: Arctic regions are characterized by sparse vegetation, which often results in notably low NDVI values, sometimes as low as 0.15, as observed by Liu et al. (2024) at the start of the growing season on Disko Island and by Gandhi et al. (2015) in scrublands. In contrast, areas with dense shrubs in tundra regions typically exhibit NDVI values above 0.5 (e.g., Walker et al. 2005), with signal saturation occurring around 0.7 (e.g., Myers-Smith et al. 2020).
In subsection 2.2, we provide a brief overview of the typical interpretation of the NDVI range. To highlight the NDVI mentioned by the editor, we now include the sentence: "Negative NDVI values are typically associated with water, clouds, or snow, indicating the absence of spectrally visible vegetation." As a result, areas with intermittent standing water and scattered vegetation, such as wet tundra or regions near water bodies, are often inadequately represented in the NDVI analysis.
Later, in subsection 5.3 Study Limitations and Future Research Directions, we further elaborate on the limitations of the NDVI analysis.

'focuses' is more common but 'focusses' isn't wrong
We have rewritten the verb to its more common form.

Fig. 1; the ecoregions make sense but it wasn't fully clear how they were deliniated. Also, is spectral greeneness reflectance in the green or NDVI or a different metric? I just checked the table and it means mean monthly NDVI....it will help the reader to quickly explain what this means in figure legends because greenness can mean different things and can get confusing.
We described in subsection 3.3 that physio-geographic features such as adjacent seas, ocean currents, and ice caps, with direct and indirect control on heat and moisture transport were

considered on the delineation of the ecoregions. In this way, ecoregions were not susceptible to climate-sensitive metrics (e.g., summer averaged air temperature).
We agree with the editor and acknowledge that the brief description of spectral greenness in Table 1 is indeed incomplete. We have updated the text that now reads seasonally averaged monthly NDVI≥0.15, as described in subsection 3.1

‘shrinkage’ -> decline
Instead of "shrinkage," we have updated the definition in subsection 3.1, where "decline" represents a reduction in the spatio-temporal changes of greenness distribution instead of “shrinkange”. In contrast, positive spatio-temporal changes in greenness distribution are defined as "expansion."