AUTHORS COMMENTS

The authors thank the Reviewers and Editor for their constructive comments and corrections that have significantly increased the scientific quality of the manuscript and its clarity.
Here we present our answers to the reviewer's comments. In particular the manuscript has been significantly modified and presented more concisely (10% reduction in length), with additional analysis and expanding key points in the discussion section. In addition, we provide, according to the reviewers' suggestions, detailed comparisons of the data and their correlation along the examined transects, the classification of the glazed surface using topographic, NIR albedo and temperature brightness parameters and clarify the megadune migration processes and implications.
The revised version and a version with tracked changes are provided, but due the manuscript reshaping the tracked change is very difficult to follow.
We hope that the revised version of the manuscript has improved the quality of the text and of the scientific message.

Changes and answers in response to the Reviewer's comments/suggestions (in italic) are highlighted in bold A.

Reviewer Lhermitte (Remarks to the Author):

MAJOR COMMENTS

Although the paper tackles an interesting research topic (assessing spatial variations in megadunes) with novel results (upward migration and role on SMB), it may eventually warrant publication if some very major comments are addressed. The major comments are mostly related to a complete reorganization of the paper, which would require a significant effort. The major comments are outlined below and identified in detail in the specific comments are made in the uploaded pdf.

• The paper is currently written in a very lengthy and narrative setup following the research path with parts of the data, methods and results diluted throughout the paper. This makes it difficult to quickly read the paper and/or look for specific data set processing, analyses, etc. Reorganizing this into better aligned data, methods and results sections will allow to shorten and focus the paper better highlighting the main message.

A: As suggested by both Reviewers and Editor the manuscript has been completely rewritten and presented more concisely (10% reduction in length).

• The paper shows some direct overlap with a previous conference proceeding by the same authors (Traversa, G., Fugazza, D., and Frezzotti, M.: Analysis of Megadune Fields in Antarctica, in: 2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS, 5513–5516, https://doi.org/10.1109/IGARSS47720.2021.9554827, 2021a). I would consider removing the overlap (e.g. again showing the NIR profiles) and focusing on the novelty in this paper

A: The overlap with the previous paper has been removed and the manuscript now focuses more on the novelty of the present work; the analysis of broadband albedo is not discussed in the present paper, as it was in the Traversa 2021 paper. The present manuscript is focused on the analysis of SPWD, NIR Albedo and brightness temperature with the aim to create a method for the automatic detection of snow glazed surfaces of megadunes and on the detailed quantification of their migration.

• The migration problem remains complex as the Traversa et al show that the windward flanks migrate, while the leeward flanks don't. Consequently, it cannot be a (moving) steady state and after a long time the windward flanks would overlap with the leeward flanks, which would seem rather problematic on the long term. Therefore, the migration part of the study would benefit from some extension to address/document the importance of this discrepancy in more detail.

A: The quantification of megadune migration is one of the main results of the manuscript and is now significantly improved and discussed implication for morphologies overlap and their implication for ice core drilled in the megadune area. We have expanded the text in the results section 3.1 and added comments in the discussion and conclusion section. In the discussion section, at lines 430-433 we have written: "The results allowed us to calculate all the components of migration and to conclude that for a megadune with a wavelength of 3 km we could calculate an absolute migration of approximately 10 m a^{-1}. This burying process of snow on glazed surfaces takes about 300 years, with overlap of crest to through and glazed to sastrugi surface as observed by GPR internal layering (Fig. 5). ". In the conclusion section, at lines 480-483, we have written: "The results obtained using field measurements and remote observations allow to calculate all the components of megadune migration, absolute (11-14 m a^{-1}),

sedimentological migration (13-15 m a^{-1}) and the ice flow (1-2 m a^{-1}) and to conclude that for a megadunes with a wavelength of 3 km and migration of approximately 10 m a^{-1}, the burying process of snow on glazed surfaces takes about 300 years, with overlap of crest to through and glazed to sastrugi surface." We have also added additional GPS transects in Figure 5 and GPR layering to better show the process.

• The introduction now contains two separate parts with a general introduction with short summary, focus, aim and is then followed by a second more in-depth introduction about the processes, uncertainties related to megadunes. I would advice to go for general introduction -> in-depth introduction (including scientific problem statement) -> aim -> short summary. This will increase the readability and flow of the introduction.

A: As suggested by the Reviewer, the Introduction was completely rewritten as proposed.

• The subtle differences in use of different data sets (Landsat, Sentinel-1) and preprocessing (e.g. FCC on different bands for different data sets) makes it complex to follow the flow and setup of the paper as it therefore reads as a patchwork of different things. Consider switching to a more homogeneous or grouped approach that would allow the reader to better understand (Study Area / Data including processing (Landsat, Sentinel, Wind, GPR, Velocity)) / Methods (reflectance + albedo, thermal brightness temperature, SPWD, classification, migration (including comparison with existing velocity) / Results per method subsection / Discussion without new results / Conclusion).

A: Following the Reviewer's comments, the manuscript has been reorganized with the following sections: 1.0) introduction, 1.1 Study area, 2 Data and Methods, 2.1 Data, 2.1.1 Satellite datasets, 2.1.2 Atmospheric reanalysis dataset, 2.1.3 Topographic dataset (DEM), 2.2 Methods, 2.2.1 Automatic detection of glazed snow surfaces, 2.2.2 Megadune movement estimation, 3 Results, 3.1 Megadune characterization and automatic detection, 3.2 Megadune migration, 4 Discussion, 4.1 Application of the automatic detection of glazed snow on megadune fields , 4.2 Megadune upwind migration, 5 Conclusions

• The paper mentions seven transects for the analysis, but from my understanding many of analysis seem limited to one transect (C in figures 4-6). Consider making the analysis more general and extensive so the results can also be generalised for the other transects.
A: On the basis of the comments from Reviewer 1, we present in figure 2 of the revised manuscript only transect C; in figure 3 we show instead scatterplots considering all transects. The analysis and description from the results section 3.1 and discussion section 4.1 take in consideration all the transects analyzed.

• Based on the equation of SPWD (Eq.4) the SPWD is only calculated for eight potential neighboring cell (i.e. in steps of 45 degrees). This implies that wind uncertainties of 22.5 degrees (and corresponding height differences in different directions) would not affect the affect the SPWD as the wind can only flow N,NE,E,SE,S,SW,W,NE and nowhere in between. This could have large impact on the SPWD as the 8 directions do not necessarily align with the maximal slope alogn the terrain. I would therefore recommend to recalculate the SPWD along the real wind direction but for interpolated DEM data.
A: The SPWD has now been recalculated based on the method proposed by Scambos et al. (2012). While differences between the previous method and the new one are small, i.e. 0.1 m

km^{-1}. We chose to use the method by Scambos et al. (2012) as it was applied before for the same purpose. At lines 197-201 in the revised manuscript, we have written:
"To further estimate the SPWD based on the wind direction from ERA5 and Landsat-derived sastrugi, we used the approach of Scambos et al. (2012), i.e., we calculated the dot product between the slope derived from the REMA DEM and the wind direction. The algorithm was applied to ERA5 and sastrugi-based wind directions resampled at 120 m spatial resolution, and the REMA DEM was resampled to match ERA5 and sastrugi-based wind directions using bilinear interpolation. The resulting SPWD has units of m km^{-1}."
The values of SPWD elsewhere in the manuscript reflect these changes in the method.

• *Given the difference in satellite response for images with SZA < 70 and >70 I would consider only using images with SZA<70. The other seem erroneous and by limiting it to SZA<70 (in the data section) based on know artefacts (e.g. Picard 2016) it would allow the story to focus on the main points.*
A: We have now removed scenes with SZA > 75°

• *The classification of Figure 7 is completely unclear as all methodological details are missing. Additionally I am missing analyses that show that albedo and brightness temperature cannot be used and/or that the method works and is reliable. Just using a method and saying that it works is not how it should be done.*
A: The sentences suggesting that albedo and temperatures cannot be used have been removed. The methodological details on the classification have now been added at lines 209-219 of the revised manuscript, where we have written: "After having visually identified the thresholds of SPWD, NIR albedo and thermal brightness temperature on the image from 17/Dec/2015, which was one of the best available images in terms of cloud cover (~0%) and presenting no blowing snow/fog and the lowest SZA (67°) for the EAIIST site, we applied a conditional calculation to automatically map glazed snow. In order to better define the detection method and evaluate the use of each parameter, we first applied the automatic detection on the entire tile of Landsat (path 69, row 119; ~36,000 km^2) and then on a narrower area (~2,400 km^2), which showed higher homogeneity in NIR and TIRS 1 bands. Different thresholds of NIR albedo and thermal brightness temperature were used, which allowed the detection of the highest amount of glazed snow surface in the entire analysed area. The thresholds were defined as follows: NIR albedo < 0.82 and thermal brightness temperature > 246.5 K on the entire tile and NIR albedo < 0.805 and thermal brightness temperature > 247.6 K on the narrower area. Additionally, to determine the role of the SPWD in the automatic detection, we performed the classification by first excluding and then including this parameter (SPWD > 1 m km^{-1})."

• *I would advice to deposit the data corresponding to the paper in a open access repository (with doi) and not rely on requests to the corresponding author.*
A: We have added details on the repositories where data used in this paper are available.

Comments/Remarks from pdf annotated manuscript

L15-17 - Can be removed. Distracts from the story in the abstract
A:We have removed the sentence as suggested.

L17-18 - The authors often start sentences with subordinate clauses like "Focusing in" or "Considering" "As regards/Regarding" and I think it removes the flow from the sentence by putting

accent on the side ideas. We analysed the dynamic parameters of megadunes, their albedo and morphology for two sample areas ...
A: We have restructured and shortened the manuscript as suggested by you and the other reviewer and avoid using subordinate clauses at the start of sentences whenever possible.

L20 - I am not sure the meaning of sedimentological would be 100% clear for the reader in this context. Perhaps clarify
A: We have added: "i.e. given by the deposition of snow" to clarify

L21-22 - If the windward flanks migrate, while the leeward flanks don't, it cannot be a moving steady state and after a long time the windward flanks would overlap with the leeward flanks, which would seem rather unlogical.
A: We have added comments in the discussion and conclusion sections, at lines 430-433 and 480-483 of the revised manuscript, to better explain the megadune migration process. See major comment for the full text.

L25-26 - Why would you need to do a detailed mapping? Is mapping what is really interesting here?
A: The aims of our work are to identify parameters for the automatic detection of glazed surfaces of megadunes and to quantify their migration. We now make this clearer in the introduction section at lines 72-79 of the revised manuscript, where we have written: "The aim of the study is to provide a detailed survey of the spatial and temporal variability of two megadune areas using remote sensing data (Landsat 8 and Sentinel-2), elevation models (Reference Elevation Model of Antarctica REMA, Howat et al., 2019) and climatic conditions using atmospheric reanalysis data (ERA5) in addition to past in-situ measurement data (firn core, GPR and GPS), to explore spectral, thermal, and windward slope relationships with a view towards generating an algorithm for their automatic detection. Moreover, we provide for the first time the first calculation of the absolute megadune movement, and its different components: ice-flow and sedimentological progradation. The analysis of absolute megadune movement has important implications on the remote sensing ice dynamic measurements, in particular on ice flow measurements and elevation changes.".

L26 - Evolution and trends of what? albedo, thermal properties, migration, SMB,...
A: The sentence has been removed owing to the restructuring of the abstract. We now clarify the aims in the introduction section, see previous comment for details.

L50-57 - Consider moving the goal and focus to the end of the introduction
A: We have moved the aims of the manuscript at the end of the introduction section as suggested, see comment at lines 25-26 for details.

L46 - There is 1:1 overlap with this conference proceeding in this paper. Consider removing this overlap to make the story more focused on the novelty.
A: The conference proceedings only presented a very preliminary assessment of megadune mapping, which is greatly expanded on in this study. We have improved the text throughout to focus on the novelty of the manuscript

L56 - What is meant by this? What is under process? Who is doing that where and why? Why is that relevant to the paper?
A: The data acquired during the EAIIST traverse are still being processed, which is why we cannot report GPS-GPR surveys in the area. We report this information and the website to allow the reader to download the data once they become available.

Figure1 - I would find it interesting to see the transects on the images of panels b+c. The figure contains a lot of unused white space. Consider reorganising to show the satellite data in more detail.
A: Thank you for the comment. The figure has been reorganized to show the study areas in detail and the transects more clearly.

L59 - Impossible to see on the figure
A: The figure has been remade and now transects and study areas are visible.

L63-68 - Consider moving the aim and summary to the end of the introduction.
A: The aim of the study has been moved to the end of the introduction as suggested, see comment at lines 25-26 for details on the new text

1.1 Megadune fields - This subsection should be integrated in the introduction with part on megadunes that was mentioned before aim, goal etc.
A: The subsection has been integrated in the introduction section as suggested

2 Material and method - Rephrase to data and methods. Please add a Study area subsection that describes the area, transects, etc.
A: The name of the section has been rephrased to "Data and methods". We have added a subsection 1.1. with the description of the study area as suggested.

2.1 Materials - Rephrase to data section. Reorganise the data section with a more clear and complete overview (e.g. subsections for Landsat, Sentinel-2, wind speed, elevation data) now it is all being diluted in one section and being repeated or reintroduced later. I would add the pre-processing steps (e.g. FCC) to the satellite data section
A: The section has been rephrased to "Data" and has been reorganized to the following subsections: 2.1 Data; 2.1.1. Satellite datasets; 2.1.2 Atmospheric reanalysis dataset; 2.1.3 Topographic dataset; 2.2 Methods; 2.2.1 Automatic detection of glazed snow surfaces; 2.2.2 Megadune movement estimation

L122 - First describe all the data that has been used before explaining all the processing that has been applied on it.
A: We have reorganized the data section by clearly separating data and methods

L129 - Why only Sentinel-2 for migration and why only band 2 It would make much more logical to use all data for all experiments. Now it reads a bit as a patchwork and it is difficult for the reader to keep overview as many experiments use subtle different data sets and/or pre-processing
A: Both Landsat-8 and Sentinel-2 were used to estimate megadune migration. For Sentinel-2, Band 8 NIR was used because megadune are more easily recognized in this band. We now specify this more clearly in the data and methods section, where we have also written why different bands and sensors were used for the different experiments. At lines 134-146, we have

written: "To map glazed surfaces on megadunes, we used Landsat 8 OLI data as the method relies on the calculation of the albedo, which has been thoroughly validated for Landsat 8 OLI (Traversa et al., 2021a). Additionally, Landsat 8 OLI is available for a longer period of time compared to Sentinel-2, allowing us to investigate temporal evolution of the megadune area. In the megadune area, the difference between snow glazed surfaces and snow is higher considering NIR spectral albedo and brightness temperature (Traversa et al., 2021b). To a "higher" amount of solar radiation absorbed by the glazed surface, corresponds also a different brightness temperature on snow glazed surfaces (Fujii et al., 1987; Scambos et al., 2012 and references therein). In fact, these zones show a higher brightness temperature compared to the upwind part of the dune characterised by the snow surface. In detail, we used Landsat 8 OLI NearIfraRed band (NIR band 5, with a ground resolution of 30 m) to calculate NIR albedo and thermal infrared (TIRS 1) band 10 to calculate brightness temperature (with a ground resolution of 100 m, provided resampled to 30 m). To perform the megadune migration analysis (sect 2.2.2), we used the panchromatic band of Landsat 8 OLI, as this band has a higher resolution (15 m) compared to the other spectral bands of the Landsat. For comparison, Sentinel-2 images were also used, specifically Band 8 NIR (10 m spatial resolution), which allows better observing differences between snow and glazed surfaces compared to the other visible and infrared bands."

L131 - This should be in a separate subsection.
A: We now mention ERA5 data in a separate subsection, 2.1.2, as suggested

L141 - Does that mean:

3<x
5<x
7<x
11<x
or
3<x<5
5<x<7
7<x<11
11<x
?
A: We meant 3<x,5<x, etc. We have rephrased the sentence to make this clearer.

L148 - I guess the mosaic was used and not the individual tiles? If so, please clarify.
A: Yes, we mosaicked the REMA tiles. We now clarify this in the manuscript

L156 - This is a sentence that does not say anything. Would be better to repeat the aim than to ask the reader to look up the aim (if he/she is reading diagonally)
A: The sentence has been removed in the restructuring of the data and methods section

L157 - I think it is important to clarify throughout the paper that you discuss thermal brightness temperature (to avoid confusion with microwave BT). This can be done easily by always adding thermal.
A: Thank you for the comment. We now always add "thermal" to clarify.

L160-162 - Should be part of the data as it provides motivation for data selection.
A: we have now moved this sentence to the data section, at lines 126-127 of the revised manuscript, where we have written: " Satellite images from Landsat 8 OLI (supplementary Table A1) were chosen at dates close to the first stripe acquisitions of the REMA DEM (2013, Table A2)."

L162-163 - Where is that done in the paper? How?
A: The choice of sample transects has now been moved at the start of the data section, at lines 116-120 of the revised manuscript, where we have written: "We further created 5 sample transects in the EAIIST area (Fig. 1c) and visually identified thresholds of albedo, thermal brightness temperature and SPWD to discriminate between glazed surfaces and surrounding snow. The 5 transects were created in different areas of the megadune field and they show relatively different wind directions and topographic aspect and slope, with the aim of representing the widest possible range of SPWD values.". The choice is based on the transects having different values of wind direction, topographic aspect and slope, with the aim of representing the largest possible range of SPWD values. The transects are now shown in detail in Figure 1c.

L163-165- Should be part of the study area subsection. Why are 7 transects mentioned when the rest of the paper only mentions one transect
A: We now describe the transects directly in the study area subsection. Figure 2 only shows one transects for simplicity, although values mentioned in the text referred to all transects. We now also show scatterplots of SPWD, NIR albedo and brightness temperature along all transects in Figure 3 of the revised manuscript.

L165-166 - Should be added to the plots and not here. What is meant by weigthed? How?
A: Thank you for the comment. The moving average was weighted based on the distance to the central pixel. This is now written directly in section 2.2.1, at lines 205-207 of the revised manuscript: "Moreover, we determined the strength of the relationship between SPWD vs NIR albedo, and SPWD vs thermal brightness temperature (applied on the moving averages of 11 pixels weighted based on the distance from the central point) using linear regression. "

L167-168 - How is done for the different transects? How are they combined?
A: Thank you for the comment. Please note we now report this analysis using linear regression. All transect values were used in the analysis, so we compared each SPWD value at location x against the corresponding NIR albedo and brightness temperature at the same location.

L 175 - why capital A?
A: The title of the section has been changed owing to the restructuring of the manuscript

L181-187 - Preprocessing of Landsat data should be moved to data section
A: Thank you for the comment. Calculation of the albedo is a full processing chain which is necessary for the mapping of megadunes. We have shortened this section and merged it in section 2.2.1 where we explain how megadune detection was carried out.

L188-193 - Preprocessing of Landsat data should be moved to Landsat subsection of data section

A: Thank you for the comment. Calculation of the albedo is a full processing chain which is necessary for the mapping of megadunes. We have shortened this section and merged it in section 2.2.1 where we explain how megadune detection was carried out.

L191 - As regards is no correct English to start a sentence.
A: As the section was restructured, sentences starting with "as regards" have been removed.

L210 - Why? Why these bands and not other?
A: We apologise for the lack of clarity in the sentence. The FCC was carried out to confirm that NIR albedo explains the highest variance, and allows discriminating the different surfaces, as observed in previous studies (e.g. Frezzotti et al., 2002, Scambos et al., 2012). We have rewritten the sentence to clarify that we used NIR band to perform the sastrugi identification and refer to the aforementioned studies early in the data section.

L212-216 - This reads like a lot of hocus pocus without a clear motivation and/or justification. Why are these steps needed? What is their added value? Why were these choices made (and no others)? Was this method benchmarked etc?
A: Please see the above comment

L216 - What is the methodological principle behind the edge detection? Canny? Sobel?
A: It is a Canny edge-detection method. We now state this explicitly in the manuscript

L218 - What are small differences? Differencs in what? Reflectance? Migration? Quantify and clarify.
A: The sentence has now been removed due to the shortening of the manuscript

L220 - how was the interpolation done?
A: this was done using bilinear interpolation and is now clarified in the manuscript

L223-228 - See major comment on SPWD calculation.
A: We have recalculated the SPWD. See major comment for details

Figure 3 - Why is there such a large difference in GPS vs REMA on the windward side only? Does that affect any of the subsequent conclusions?
A: The difference is caused by the fact that megadunes migrate on the windward side. We have added comments to better explain the megadune migration process in the discussion section 4.2, at lines 430-433 and the conclusion section at lines 480-483. See major comment for details

L250-251 - This difference (e.g. with respect to the albedo/thermal analysis) be clarified much earlier in the data section.
A: We now clarify at the start of the data section (section 2.1.1 in the revised manuscript) what satellites and bands were used for the megadune mapping and migration analysis. See comment at lines 129 for details

L257-259 - Again a different data set over a different period. This is confusing for the reader and should be handled more uniformally in the data section.
A: Thank you for the comment. Landsat 7 ETM+ data showed unreliable results and their analysis has now been removed from the manuscript.

L259-262 - This is a motivation for the data selection and should be part of the data subsection.
A: The sentence has been removed as we have removed this analysis, see comment above.

L268 - which previous results? We have not seen results yet.
A: We have removed "with previous results" in this sentence

L269-270 - See also earlier comment: what is the motivation / benchmark for these methods?
A: Please see comment at lines 210 for the detailed answer

L273 - Again a different method on a different data set. The readers gets lost and it becomes difficult to compare.
A: The analysis of Landsat 7 data has now been removed, see comment at lines 257-259

L273-274 - What does that mean?
A: We now report the values that were used to perform the cleaning process of the direction raster at lines 240-241 of the revised manuscript: "(angles < 200° and > 240°, intensity < 5 ma^{-1}),"

L274 - How?
A: Thinning refers to reducing the number of cells used to represent the width of the features, in this case to 1 pixel, to aid in vectorization. We now clarify this in the manuscript at lines 241-242.

L276-277 - What is the accuracy of this product? Can you see meter displacements in 450m products?
A: The average error of Measures Ice flow velocity has been estimated as 3-4% (Rignot et al., 2017). We now report this information in the manuscript.

L281-285 - This reads like methodology and should be moved to a methodology section.
A: Thank you for the comment. Sentences such as this have been moved to the methods section

Figure 4 - Figures are difficult to read (not sharp and small fonts for labels) and lack clear labels to allow the reader to interpret it without reading the caption. Add things like NIR and albedo in large to the titles/labels so the reader should not look up what the subtle differences between the figures is. I don't think that it is necessary to show both original and detrened panels. They seem redundant for the conclusions.
A: We now show a lower number of panels, with one with raw topography (to show the megadune morphology) and two detrended panels with NIR albedo and brightness temperature anomaly. We have increased the font size as suggested to ease readability of the figures.

L292 - quantify? What is smaller?
A: The sentence has been removed to shorten the manuscript

L292 - which tendency? It was not explained yet what tendency was.
A: The general pattern is of higher values in the upwind area and lower ones downwind for NIR albedo. We now clarify this early on in the results section, at lines 255-257 of the revised manuscript: "On average, in the 5 analysed transects NIR albedo ranges from 0.81 to 0.86 (α) in

the upwind area (snow sastrugi) and from 0.73 to 0.81 (α) downwind (glazed surfaces), with differences inside the transects of about 0.07 (α) with a maximum value of 0.1 (α). ”

L293-295 - Sorry, but I do not really understand this sentence. Consider rephrasing. What heterogeneity? What exponential effect?
A: We have removed this sentence, as we now consider only scenes with a SZA < 75°, see your major comment.

L293 - which small difference? Be specific.
A: We have removed the paragraph on the differences between scenes with higher/lower SZA, see previous and major comment

L295 - Which first/last three? Be specific
A: Please see comment above

L298 - ...is 0.03-0.04 lower than in the upwind zone...
A: The sentence has been removed owing to the restructuring of the manuscript.

L307-309 - This is not shown in Figure 2. Figure 2 show false colour images and there you can easily discriminate them.
A: The sentence has been removed in the shortening of the manuscript

L310-312 - Should be part of the method and not being introduced in the results.
A: We have removed scenes with SZA > 75°, see previous comments about this

L313-315 - Appendix figures should not be essential to interpret the main paper. If the reader needs to look at them, they should be part of the main paper.
A: **We have removed scenes with SZA > 75°, see previous comments about this**

L313-320 - Based on this difference I would consider only using images with SZA<70 throughout the paper. This will make the interpretation/flow of the paper much more logical.
A: **We have removed scenes with SZA > 75°, see previous comments about this**

L322 - Should be moved to methods section.
A: We have removed this sentence as this information was already in the methods section

L326 - what is a farthest date?
A: We meant the date farthest from the summer solstice. We have rephrased the sentence as: “The difference increases on the date farthest from the solstice, 28-Jan-2014” to clarify this.

Figure 5- Same comment as Fig.4:
-make figure sharper (pdfs are better for line plots)
- increase text size
- add labels/titles (e.g. Band 10, Band 11)
A: Thank you for the comment. We have remade all figures to make them more readable

L363-364 - This seems an artefact of the method and should require a better way to calculate SPWD that also accounts for subtle differences in wind direction.

A: We have recalculated the SPWD as suggested, see major comment for details

L368-369 - I guess these values highly depend on the methodology and should be recalculated with wind/slope directions that have better resolution than 22.5 degrees.
A: We have recalculated the SPWD as suggested, see major comment for details

L371 - Should be part of the methodology
A: The sentence has been removed in the shortening of the manuscript

L371-379 - I don't think this analysis adds a lot. It is already clear from the previous figures that the variables correlate so what is the added value of knowing which one correlated "better".
A: The added value is to identify whether NIR albedo, brightness temperatures and SPWD can be used together to perform a classification of megadune areas. We now report our aims more clearly in the manuscript.

L385-388 - This should be part of the methodology, not result. How is this classification done? Which methodology? Much information (that should be part of the methodology) is missing here.
A: Details about the methodology employed to detect snow glazed surfaces are now included in the methods section, see major comment to Figure 7

Figure 7 - What do we see in this figure? What are the colors (legend?)? What are the purple dashed areas? What are the two dates on the bottom? At the moment this figure lacks all context to read it.
A: The figure has been remade taking into account suggestions by both reviewers. Please also note we now show the detection of snow glazed surfaces with/without SPWD on the entire Landsat tile and when using threshold identified on the entire Landsat tile and on a narrower area, see major comment to Figure 7.

L407-409 - Should be part of the methodology
A: The sentence has been removed as the information is already in the methods section

L414 - Does that mean we cannot draw conclusion from it? Please clarify
A: Yes, feature tracking using the two different satellite sensors together was unreliable and has been removed from the study

L425 – 427 - This creates a potential problem: see also earlier comment.
A: We have added comments in the discussion and conclusion sections, at lines 430-433 and 480-483 of the revised manuscript, to better explain the megadune migration process. See major comment for the full text.

L441 - ERA5 might also be far from perfect! It is a reanalysis dataset: not reality
A: We have added: "as well as inaccuracies in the ERA5 wind direction" here to clarify the possible errors in ERA5.

L444 - This cannot be concluded on 8 cell SPWD (see earlier methodological comment)
A: We have now recalculated the SPWD. See major comment for details

L448-450 - This should be addressed in this study with a better SPWD method and not be postponed for later work.
A: Please see comment above

L452 - Where did you show this? I have never seen that in the paper?
A: We have removed this sentence

L454-456 - The methodology for this approach is completelt lacking. Moreover it
A: Methodological details on the detection of snow glazed surfaces are now provided in the methods section, please see major comment to figure 7 for details.

L472-493 - These are all results and should be part of the results before the discussion section.
A: The information in this section has been moved to the results section 3.1 as suggested

L547 - I would advice to deposit the data corresponding to the paper in a open access repository (with doi) and not rely on requests to the corresponding author.
A: The data will be placed in an open repository as suggested