Comments to the Author
Dear Authors,

This research detects the glacier (supraglacial debris cover also) change in the Greater Caucasus mountains region based on Landsat images. This work is significant because inventorying of glacier (supraglacial and clean ice) area and detects its change can help us understand the implications of continued and exacerbated climate change. However, there have several comments on the methodology part.

There are several methods (selected based on the previous studies) were used to map the glacier in the study area. This research tries to find the best suitable method for accurate detects the supraglacial debris area. Such as Thermal/Near-IR/Mid-IR band ratio methodology (Alifu et al. 2015), semi-automated classification methodology using geomorphometric parameters and Landsat 8, and, manual delineation compared to Red/Mid-IR ratio methodology were tested. However, the application of the method proposed by Alifu et al. 2015 was incorrect.

Frist, (Alifu et al. (2015) devised a compound ratio method to reduce these errors, dividing digital number (DN) values of the thermal band (band 6) by the standard red/Mid-Infrared ratio, for 15 Landsat TM and ETM+ [Ratio = Band 6 / (Band 4 / Band 5)], and applying a threshold value of 2.0.) Page5, Line 15.

Alifu et al. 2015 used DN values in the new band ratio image from 137 to 180 (Figures 4(b) and 6(b)) and 140 to 234 (Figures 5(b) and 7(b)) were used as the thresholds for mapping the supraglacial debris areas in the Koxkar glacier and Yengisogat glaciers.

Second, Thermal/Near-IR/Mid-IR band ratio alone cannot accurately detect the supraglacial debris area. Therefore, additional information was needed such as combination with geomorphometric parameters (Alifu et al. 2015, Alifu et al. 2016), then, manual editing is required.

Third, the improper threshold value used to map supraglacial debris area (example, page9, figure 4). Also, selected bands for generated the Thermal/Near-IR/Mid-IR band ratio using Landsat 8 images is b10/b5/b6 (https://landsat.gsfc.nasa.gov/landsat-data-continuity-mission/). Please see figures below:

Figure 1 (left) is same area with figure 4.a (page9). Figure 2 (right) is same area with figure 4.d (page9).

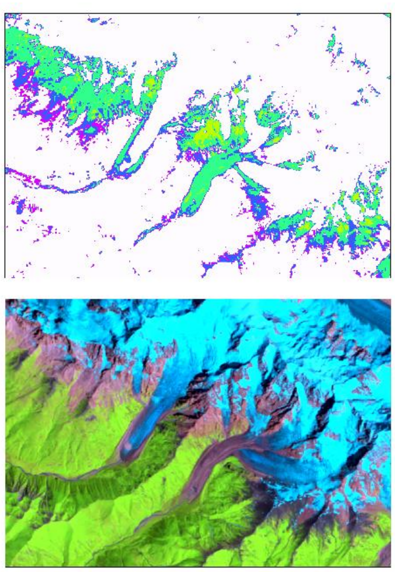

Figure 1.
Landsat TM
(same data)
06/08/1986
DN 137-250

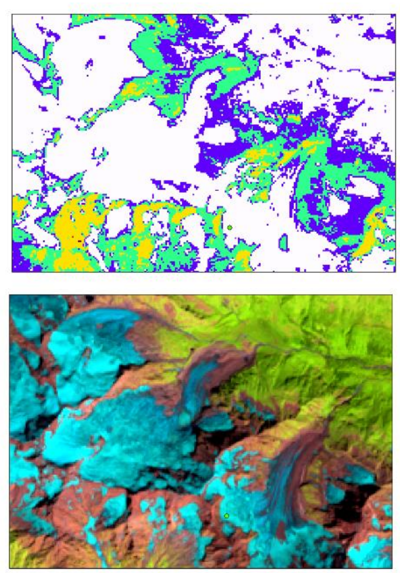

Figure 2.
Landsat 8 OLI
23/08/2013
(same data)
DN 16455-23352

Green colored area in figure 1 and the blue colored area in figure 2 are supraglacial debris area. However, the result of the density slice contained several inaccuracies for the 'supraglacial debris' class in areas where bedrock valley walls were located in shade and/or in higher elevation areas. These classification errors could be eliminated when slope information was also considered. Selecting the threshold values is a critical step for delineating the debris-covered glacier accurately, but the threshold values were shown to differ from glacier to the glacier and Landsat images. Therefore, the thresholds should be selected carefully by overlaying the density-sliced maps with Landsat composite images and other ancillary data.

Forth, although, the method proposed by Alifu et al. 2015 mapping of debris-covered glaciers with promising accuracy, however, the combination of Thermal/Near-IR/Mid-IR band ratio and geomorphometric parameters have limitations, larger inaccuracy occurred in the small debris-covered glacier.

Finally, this is a valuable contribution and with the changes made it will be useful to the glacial community. Also, I do feel your article can contribute greatly to current glacier research and is worth publication.