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Interactive comment on "Glaciers change over the last century, Caucasus Mountains, Georgia, observed by the old topographical maps, Landsat and ASTER satellite imagery" *by* L. G. Tielidze

Anonymous Referee #1

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Review comments on "Glaciers change over the last century,Caucasus Mountains, Georgia, observed by the old topographical maps, Landsat and ASTER satellite imagery" by L. G. Tielidze

Summary. This work presents results of measurements of Georgian glacier area changes comparing early and mid 20th century glacier numbers and glacier areas to satellite record in the early 21st century. The paper gives the more detail picture of glacier changes in the part of Caucasus. The article is appropriate for Cryoshere but needs major revision before it is acceptable.

Recommendation.

Priorities in addition to the editorial needs are

- thoroughly analyze the sources of two data sets - R.Gobejishvili (1989) and The Catalog of Glaciers of the USSR, Vol. 9, (1975): it seems that they are the same –air photos (1955-1957) and topographic maps (1960s)

- evaluate errors of glacier delineation on K. I. Podozerskiy (1911) map which have been found by the author (..some defects in the shape of the glaciers. . .)

- evaluate quality of glacier delineation on topographic maps (1960) and glacier area estimation in Glacier inventory of Georgian glaciers (1975)

- to include more on methodology for determining area using Landsat and ASTER images,

- give algorithms and results of error estimation for each step of calculations: space images and maps co-registration, glacier boundaries placement, presence of debris cover on glacier termini

- improve the argumentation of possible reasons of glacier changes

Specific Comments:

Page 3778

Line 11 change “space images” to “airphotos”

Page 3778

Line 13 change “glaciological catalog” to “glacier inventory”

Line 13-15 . . .(The Catalog of Glaciers of the USSR, Vol. 8–9, 1975), where the statistical information about the glaciers of Georgia was obtained on the basis of the space images of 1970–1975.

- Inventory of Georgia glaciers (The Catalog of Glaciers of the USSR, Vol. 9, 1975) was based on the topographic maps published in 1960s , air photos (1955 ,1957) and

TCD
9, C1436–C1439, 2015

results of field studies by Vakhushti Bagrationi Institute of Geography (1958-1968yy) – See Catalog lednikov USSR, Volume 9, Issue 1, parts 2-6, Vakhushti Institute of Geography , 1975, page 3, last paragraph

Page 3780

Line 19 change “svaneti” to “Svanety”

Page 3781

Line 20-23 “. . .of the data showed that there are some defects in the shape of the glaciers of that time; particularly the inaccessible firn valleys of the valley glaciers are depicted incorrectly. Naturally, this fact will cause a slight error in the identification of precise areas of the glaciers of that time,. . .”

Errors have to be estimated and taken into an account in the final results.

Page 3782

Line.1-3 “. . .with the depiction of quite precise contours of the glaciers of the Caucasus. R. Gobejishvili gave us new statistical information about the glaciers of Georgia. . .”

Evaluation quality of glacier area estimations has to be added to the text.

Line 7-8 - ”. . .the statistical information on glaciers of Georgia was obtained based on the satellite images of 1970–1975. . ..”

- Inventory of Georgia glaciers (The Catalog of Glaciers of the USSR, Vol. 9, 1975) was based on the topographic maps published in 1960s , air photos (1955 ,1957) and results of field studies by Vakhushti Bagrationi Institute of Geography (1958-1968yy) – See Catalog lednikov USSR, Volume 9, Issue 1, parts 2-6, Vakhushti Institute of Geography , 1975, page 3, last paragraph

Line 15-19 “. . .As we had the information of the last century only in printed form and not electronically. After maps scanning, we used standard transformation parameters (for

TCD
9, C1436–C1439, 2015

both period maps 1911, 1960) to re-project the maps in Universal Transverse Mercator (UTM) zone 38-North on the WGS84 ellipsoid, to facilitate comparison with modern datasets (ArcGig 10.2.1 software)...”

Errors of transformation - ? Have you delineated glacier boundaries and estimated glacier areas from old maps or evaluated quality of Podozerski and Gobejishvili statistical results?

Page 3784

Line 14 – “...Landsat aerial images..” – remove aerial

Page 3785

Line 8 change “central” to “Central”

Line 9-11 “There are the river basins within the Central Caucasus such as the Enguri, Khobiscckali, Rioni, Liakhvi and Aragvi river basins.” – edit the sentence

Line 13-15 “Here can be found the largest glaciers of Georgia such as Lekhziri (23.3 km2), southern and northern Tsaneri (12.6/11.5 km2)” –give the source and the year of glacier area estimation

Page 3792

Line 26 remove “aerial”

Fig. 1 ASTER 1B – 1B means the level of image processing. Change “ASTER 1B...” to “ASTER...”

Explain why the level 1B has been used for the analysis –now ASTER ORTO products are available for scientific community.

Interactive comment on The Cryosphere Discuss., 9, 3777, 2015.