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Earth System Science Data Discussions

Interactive comment on "A consistent glacier inventory for the Karakoram and Pamir regions derived from Landsat data: distribution of debris cover and mapping challenges" *by* Nico Mölg et al.

Anonymous Referee #1

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General Notes The paper aims at generating a consistent glacier inventory for the glacierised mountain ranges of Pamir Alai, Western and Eastern Pamir and Karakoram for the year around 2000, using Landsat TM/ETM+ images of around 2000 and ALOS-1 PALSAR-1 data of around 2007. Additionally, the manuscript also attempts to highlight the mapping challenges encountered in the study region. The manuscript is well-written, methods are well-presented and uncertainties are defined in detail. The outcomes of the work are of significant scientific interest. However, few points mentioned in specific notes to authors need due consideration.

Specific notes to authors Page 4 Line 79-83: 'Key challenges. . ...study region'. These

issues have not been tackled any differently in the manuscript. Page 8 Line 186: 'GDEM2' should be replaced by ASTER GDEM2 throughout the manuscript. Page 10 Section 4.2: Much of the details and information given in this section are already known to the glaciology community and authors do not even offer any new solution to these issues. For instance, author indicate that usability of the ALOS-1 PALSAR-1 coherence images decreases with the decreasing glacier sizes (Page 10 Line 246-247). Nevertheless, their results indicate that about 83% glaciers in the study region are < 1km2. This leaves authors with the only solution i.e. very high-resolution google earth imagery. Again, in the case of rock glaciers, google earth images were used as an active source (Page 11 Line 280-281). So Section 4.2 can be either obliterated or merged with Section 4.1. Page 11 Line 268-284: Since rock glaciers were separated from debris-covered glaciers, their status may be quantified. Page 11 Line 287-289: 'For larger glaciers. . ..consistent glacier outlines'. What is meant by this? When the debris-covered portion is mapped/corrected by using 2007-09 coherence data then what about temporal consistency. A proper discussion needs to be added. Page 12 Line 296-297: 'Despite. . .seasonal snow'. By how much %? At least a rough estimate may be provided. Page 12 Line 298-310: Why a topographic correction method has not been applied to minimize the shadow effect? Page 12: Section 4.3: If the clean ice/snow area were mapped using band ratio and debris covered parts were delineated manually, one can expect that the debris cover area is readily measureable. Then why a separate methodology has been adopted to calculate debris-covered area share of the glaciers? Page 13 Line 329: Replace 'Chapter 6' with 'Section 6'. Page 13 Line 343-344: 'Snow fields. . ...as glaciers'. Why? Inclusion of seasonal snow patches instead of perennial snow introduces large errors. Therefore, multitemporal analysis is recommended to separate seasonal snow from perennial snow or glaciers (Paul et al., 2009). Page 13 Line 354-355: 'We assigned. . .regenerated glaciers'. Meaning not clear. Page 14 Line 384-387: What about the PALSAR images of 2007 to 2009. Here authors talk only about temporal consistency of Landsat images but do not consider/quantify the temporal uncertainties stemmed from correction of debris-covered

part using coherence data which have a considerable temporal separation. Page 20 Line 556-557: 'The different. . ..were small'. This seems to be an over simplified statement. The changes in glacier geometry over the period i.e. 2000$\pm$2 to 2007$\pm$2 need due consideration and discussion. Page 21-24 Line 597-676: The discussion section is quite weak and should be strengthened. Only the last paragraph (line 652-666) discussed some interesting ideas.

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