

Interactive  
Comment

## ***Interactive comment on “An inventory of glacier changes between 1973 and 2011 for the Geladandong Mountain area, China” by J. Zhang et al.***

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This submission presents the results of a multi-temporal inventory of glacier extents in the Geladandong area of China, 1973–2011. The authors use Landsat and CBERS satellite imagery and a combination of an unsupervised classification algorithm and visual interpretation to map the glacier boundaries. Their data appear to show that the glacierised area has reduced by ~12% over that period, but at a reducing rate through time. A small number of glaciers were detected to have advanced.

Unfortunately, while the paper is generally well-written there are fundamental weaknesses that make it unsuitable for publication. These are detailed below, followed by

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more minor comments.

## Major comments

1. While I accept that the justification for this type of study is important (i.e. potential changes in water supply with glacier recession) I am not in favour of submissions that present areal changes acquired at several points in time spread across several decades, particularly when similar studies have already been published elsewhere. For the results of this particular study to have real meaning there needs to be at least a rigorous and quantitative analysis of changes in mass balance (or volumetric change) or they do not contribute to the ongoing discussion on which the study is justified.

2. I am unconvinced by the error analysis at the end of section 3. In particular there appears to be a significant mis-match in the calculated error percentage at the end of section 3 vs that quoted in the results section – section 4. I am suspicious of the claim that extents can be mapped with an accuracy of <1 pixel in optimum conditions. And are the overall uncertainty estimates a lumped analysis for both automatic and manual techniques?

3. There is no discussion of the results. Without a rigorous analysis of the data in relation to previous findings and consideration of cause and effect this manuscript fails to advance our knowledge in the subject. This is the greatest weakness of this submission.

## Minor comments

P508

Line 4: 'warming climate' - precipitation changes are just as important as temperature

Line 6: CERBES or CBERS

Line 16 and throughout: hectares is a strange unit to choose – how about km<sup>2</sup>?

Line 19 and throughout: shrinking/expanding or retreating/advancing/receding? Maybe

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just stick to ‘increasing/decreasing in area’?

P509

Lines 8-10: has it been proven that glacier disappearance would cause ‘serious consequences’ for water availability? This claim is often made but with little substance. . .

Line 10: ‘non-ice-sheet-type’ – would ‘mountain’ or ‘valley’ glaciers be a better description?

Line 24-25: I disagree that the findings in this paper allow inferences to be made about future frozen water resources.

P511

Line 3: do you mean surface elevation information rather than ice thickness?

Line 17: rogue url – remove

Page 512

Line 9: rogue url – remove

Line 18: rogue reference and url – remove

Page 513

Line 6: what was the quality of the geometric correction? Did the imagery already have topographic distortions removed? If not, how did you deal with these?

Line 24: rogue url – remove

Line 29: which unsupervised algorithm did you use? Did you quantify the accuracy? Were there holes in the mapped area? The reader needs a lot more information before the quality of these data can be assured.

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Lines 6-17: is this a lumped error analysis for both manual and automatic techniques? Since you are quoting areas in this study, it is not only the accuracy of the glacier boundaries you should be interested in... what about the classification as a whole? And how can a classification accuracy of  $< 1$  pixel be achieved?

Line 20: why do your plus-minus uncertainty estimates not agree with your calculated percentage errors from the previous paragraph?

Page 515

Lines 1-7: this is confused/confusing. How have you calculated drops in loss rate? I don't follow this. All of these numbers would be better tabulated rather than described in text.

Line 10: you mention surging here several times. Are all of these advances from glacier surges? Could they not just be advances? You need to be sure of this interpretation and provide evidence accordingly.

Lines 8-21: all these numbers could be tabulated – easier to digest and removes this lengthy explanation.

Page 516

Lines 3-20: I'm not sure how this more detailed analysis of the three largest glaciers contributes something more to the paper. Maybe some discussion of the results would help...

Page 517

Lines 13-14: yes, I agree, and this is a fundamental limitation of your paper unfortunately.

Figures 3, 4, 5 and 6: present exactly the same data in four different ways. Can you rationalise?

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Figure 8: y-axis label; here and in other figures – are you sure the changes 2004-2011 are significant? Are they not within the uncertainty in the data? Referring back to P514 you acknowledge that they are. Is it right to be presenting these data without any further acknowledgement or error bars included on your figures?

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Interactive comment on The Cryosphere Discuss., 7, 507, 2013.

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7, C178–C182, 2013

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