**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Improved cloud mask algorithm for FY-3A/VIRR data over the northwest region of China" *by* X. Wang et al.

Anonymous Referee #3

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Review of: Improved cloud mask algorithm for FY-3A/VIRR data over the northwest region of China Authors: Xi Wang, Wanbiao Li, Yuanjing Zhu, and Bolin Zhao MS No.: amt-2012-188

General Comments

The authors present a method for cloud detection using FY-3A/VIRR observations over the varied surface types found in northwestern China. These include desert and mountainous regions with snow cover during the winter that are generally difficult scenes in which to perform cloud vs. clear sky discrimination. Bright and/or cold surfaces often mimic spectral cloud signatures. The algorithm described is a variation of the previously-published CLAUDIA (CLoud and Aerosol Unbiased Decision Intellec-

tual Algorithm) cloud detection scheme that is itself a variation on the MODIS cloud mask (MOD35). The authors develop three statistically-based, CLAUDIA-like reflective spectral cloud test thresholds for northwestern China that are augmented by a visible-infrared bi-spectral test, NDSI, and NDVI indices to further sharpen cloud vs. clear boundaries. The cloud tests, NDVI, and NDSI thresholds development is sound, being based on previous work that is thoroughly documented in the text. The algorithm itself is reasonable and shows good potential for improved cloud detection in this area; however, the paper is weak on results and validation. The authors contrast their results to the operational VIRR and MOD35 cloud masks and ground-based human observed cloud amounts, but report only two VIRR/MOD35 comparisons (scenes). The human observer comparison is better but shows only ten reports for January, eight in February, and six in March, 2011, but the algorithm was developed using data from four months in 2010 and is intended to be used in all seasons. I would highly recommend adding more validation, at least including some data points from the warmer seasons.

The paper is generally well written and organized but there are many instances of incorrect tenses and awkward English construction that should be addressed (there are too many to list individually). The paper should have another good editing by a native English writer.

Specific Comments

Lines 159-160: The text mentions "diamonds" that are apparently seen on a computer screen. This is not germane to the topic and should be removed.

Lines 178-181: Mention should be made here of Figure 4. Also, the word "settings" in line 178 implies values of thresholds when I think the authors really mean the forms of the thresholds as seen in Figure 4. I think the word "confidence" should be used instead of "overlapping" in line 180. A word like "delineation" should be used instead of "research" inline 181.

Lines 184-185: What is "real total statistical pixels"? Do the authors mean "total num-

bers of pixels"? No mention of T should be made in this sentence since it does not appear in the equation in line 183.

Line 199: "intensive" should be replaced by "narrow"; also, "clear" should be removed.

Line 203: There is still some overlap between classes shown in Figure 1, so I think the word "mostly" should be inserted, as in "surface types can be mostly differentiated".

Line 206: The meaning of the lines in Figure 1b is unclear. I would say something like "Figure 1b also shows where the three specific channel 1 thresholds are located for clear vs. cloud/snow".

Line 217: I would say something like "To separate snow and water into distinct categories . . ."

Line 224: I would write "developed for the discrimination between snow and clouds/surface . . ."

Line 261: "tend" should replace "prefer".

Lines 293-295: This sentence confuses me. What selection is being referred to? Rewrite this sentence to make it clear or else remove it.

Line 310: Refer to these images as "gray scale" rather than simply "gray".

Line 319: What does "specific distributions of clouds" mean? Please rewrite to make clear.

Line 326: Please define H, M, and F in the text.

Lines 327-331: I'm confused here. What does "Focused on the cloudy pixels" mean? In the results that follow, do you consider only cloudy pixels? But then how do you compute FAR? And what determines "truth", MOD35 or something else? Please make this clear.

Lines 345-348: Same question as above but reversed. If considering only clear pixels,

how is POD calculated? And what is "truth"?

Line 359: It is Table 5, not Table 4.

Lines 370-374: It is stated that the cold temperatures and high reflectances of both cirrus clouds and surface make cirrus detection difficult but what about the 1.38 μm channel? It would be nice to see a sentence describing why 1.38 μm data cannot do the job here, since it is stated earlier that it is included in the algorithm specifically for this purpose.

Conclusion section: If you want to publish the paper more or less as is, I think some words should be included that list caveats to your results. There was no validation in the paper concerning results in different seasons (I'm including March as a winter month) and this is a major part of the threshold development. How does the algorithm handle transitions between seasons? This is part of the larger problem of having too little validation. I think there is good potential here but without more validation we can't know how well developed this algorithm really is. This should be stated as "future work" with regards to the algorithm.

References

Section title should be "References".

References should list all authors, rather than simply et al.

Line 477: "Garder" should be "Gardner" (also line 44). Figures

Figure 1: I would substitute the word "shown" for "labeled"; I would also write ". . . the low and high confidence limits for clear skies vs. clouds and snow shown as black lines . . ."

Figure 3: Could the x's in the color key at the top be made boxes or some other filled shape? It is very difficult to make out the colors.

Figure 5: For clarity, I would put the ranges of final confidences of clear skies on the

figure near "Cloud Category" and "Clear Category"; also place "(clear)" under "Snow Pixels".

Figures 6, 8, 9: Use "gray scale" instead of "gray".