# Fractional Snow Cover: Collection 5 vs Collection 6

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## Abstract

Remotely sensed snow products are used for monitoring changes in climate and weather and hydrological forecasting. For example, observations of excessive snow may indicate a high risk of future mudslides and floods, while too little snow can indicate a drought. The MODIS (Moderate Resolution Imaging Spectroradiometer) instrument on the satellites Terra and Aqua is a crucial tool in producing snow products. Unfortunately Aqua's channel 6, which is an important input to the original snow product, was damaged. As a result in the long standing NASA collection 5 algorithms, Terra and Aqua have used different algorithms to identify snow.

Recently, NASA has released an update to the Collection 5 algorithms, called collection 6. The collection 6 snow product from MODIS uses quantitative image restoration to restore Aqua Band 6 with the goal to use a consistent snow algorithm. We present an analysis of how the updated collection 6 differs from 5. For example we have looked at granules in Alaska and the Sierra-Nevada Mountain Range. Preliminary examination has shown that mountainous regions where collection 6 classifies pixels as undecided, collection 5 either recorded a snow cover or labeled these pixels as missing data. Our preliminary exploration of the regions point to a difference in sensitivity to snow cover between collection 5 and 6. We present an analysis of three months of granule data to substantiate these findings both statistically and through case studies.

## Objective: Fractional Snow Cover

Our goal is to determine what the differences between measurements of fractional snow cover in collection 5 and 6. We evaluated data from the MODIS instruments on Aqua and Terra satellites in the following regions of interest:
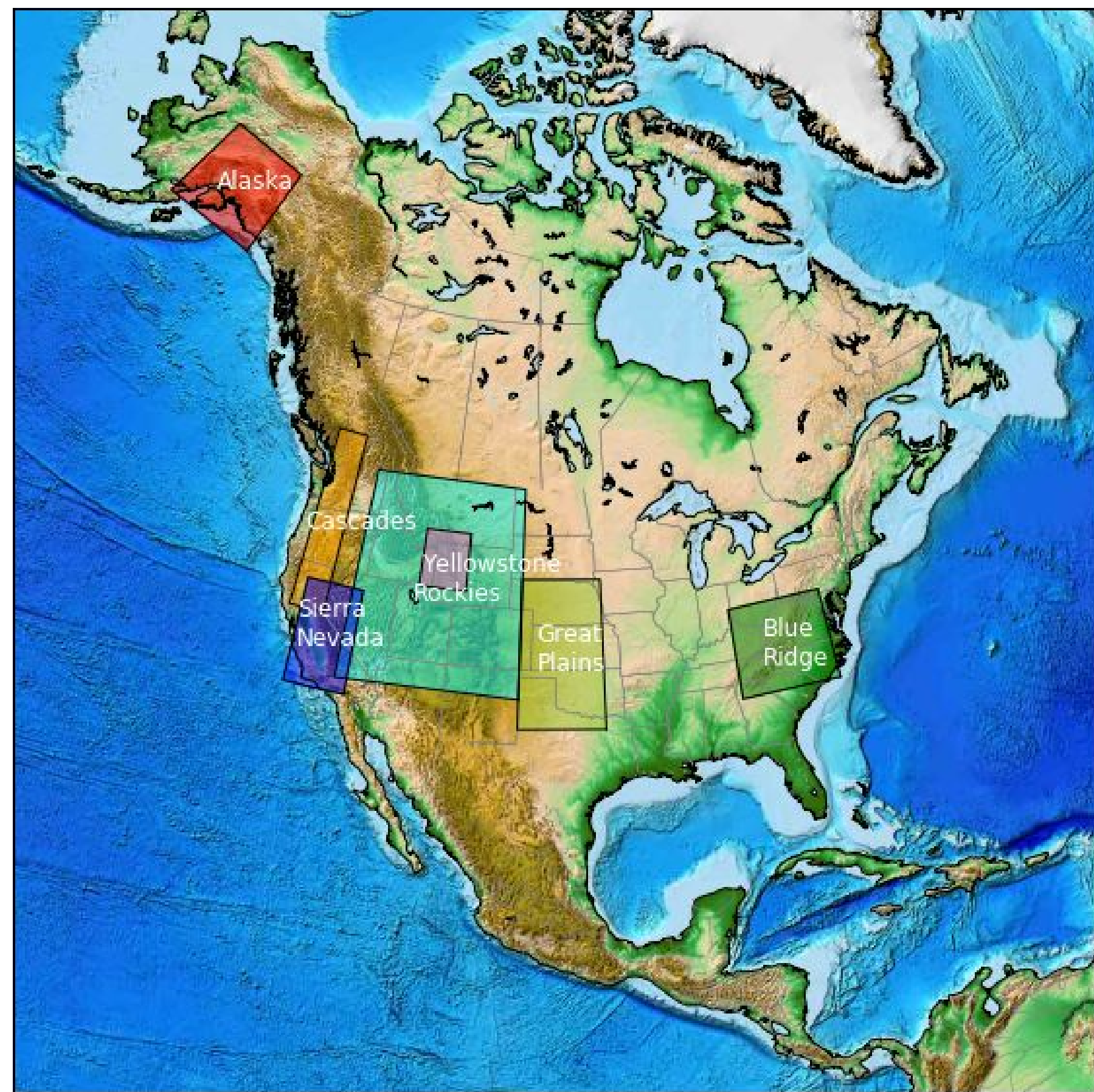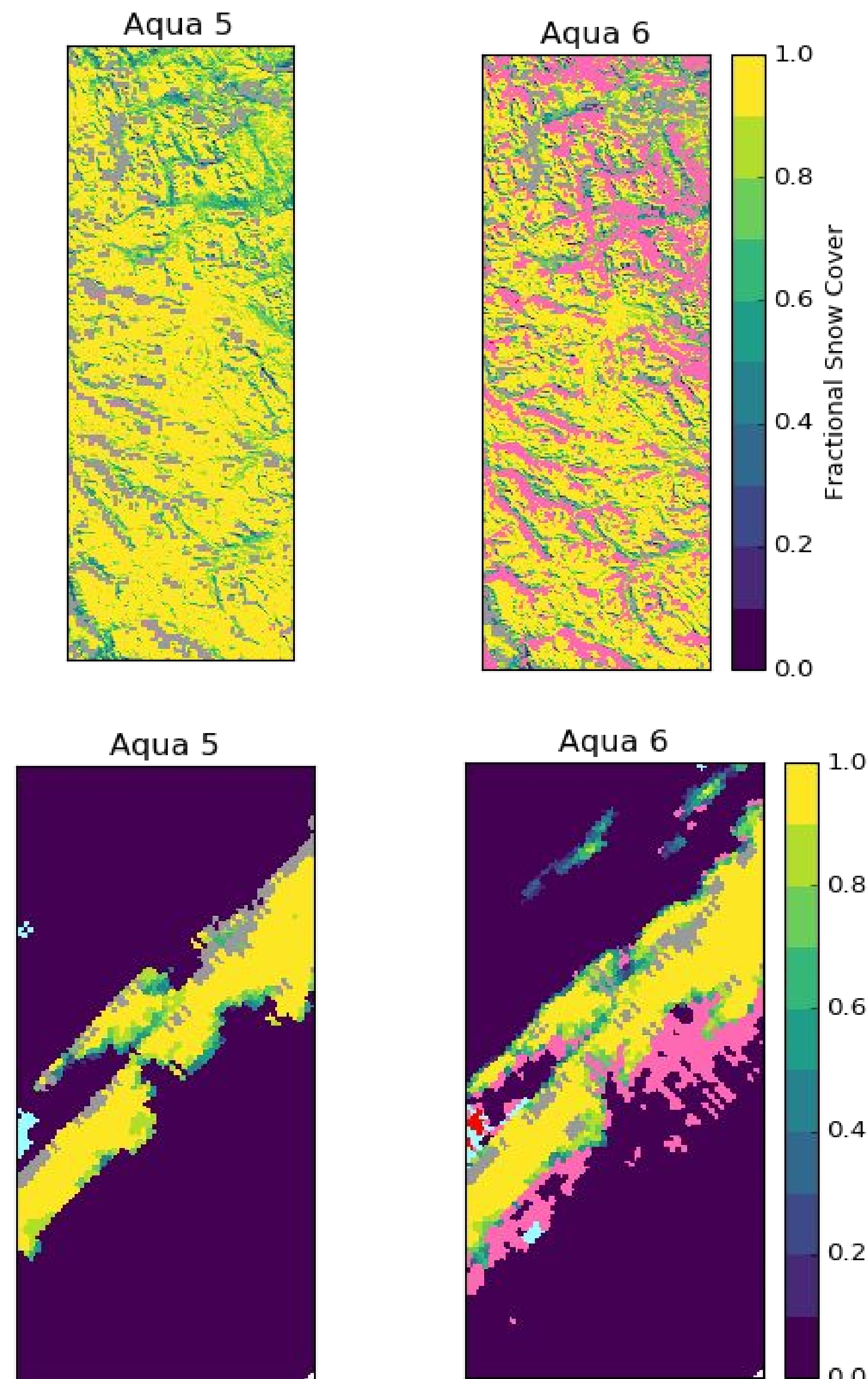


## Methodology

To get a preliminary view of how the fractional snow cover algorithm differed between Collection 5 and 6, we explored a sampling of granules from Alaska and Sierra. To verify the case study findings, we looked at the distribution of fractional snow cover and satellite codes across February, March, and April. We also looked at how classification differs between the collections to explore the consistency across them.
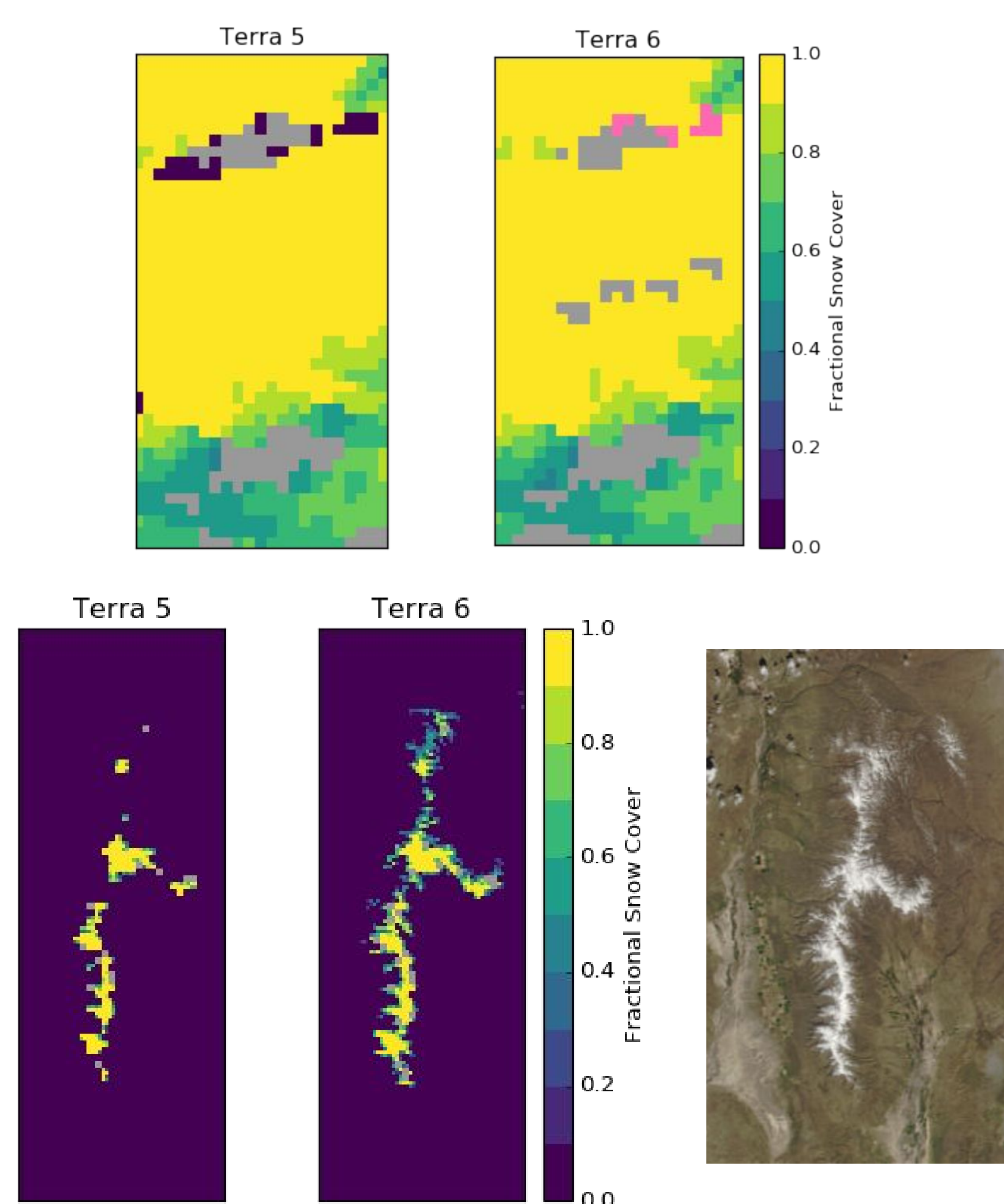
## Acknowledgments

## Case Studies: Aqua and Terra

**Aquaa Granule Comparison**



**Terra Granule Comparison**



Legend:
- missing data
- no decision
- night
- land
- inland water
- ocean
- cloud
- detector saturated
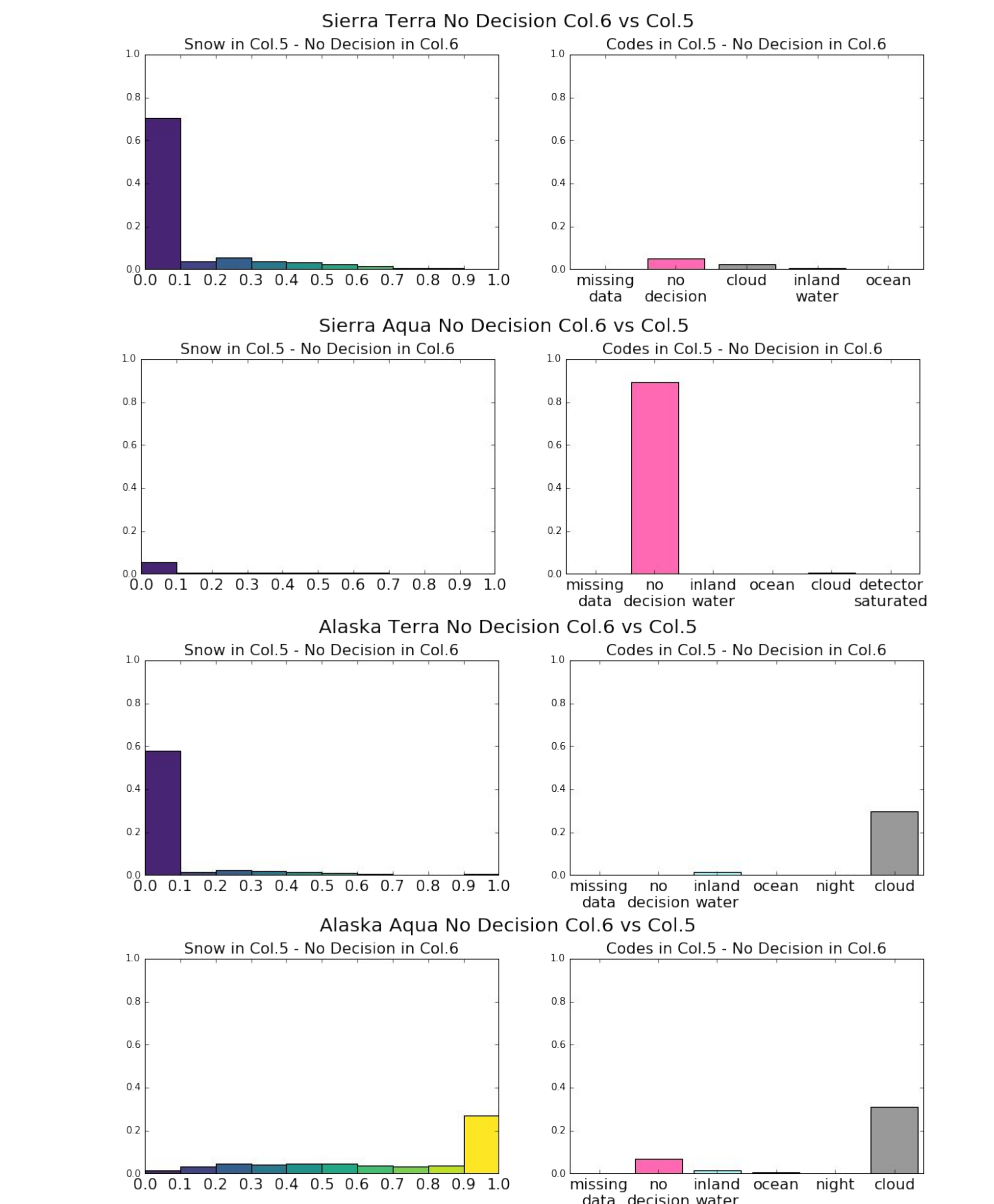- fill

## Increased FSC Sensitivity in Collection 6
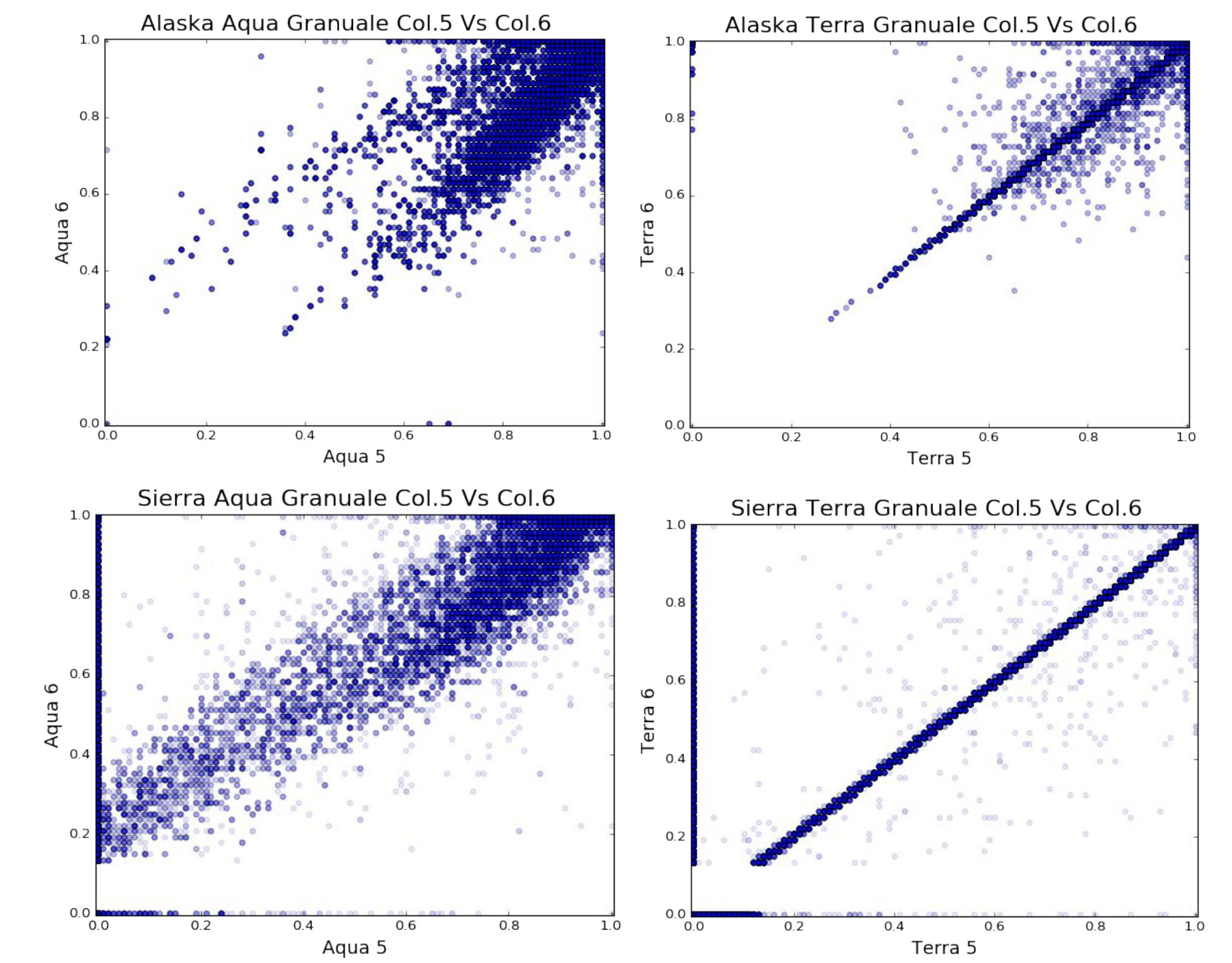


## Increased Conservatism in Collection 6



## Discussion

From the statistics that have been computed, we conclude that collection 6 more often marks pixels as undecided. For Terra, in both Sierra and Alaska, areas that were marked as cloud or little to no snow in collection 5 were instead marked as undecided in collection 6. While most of the pixels marked as undecided in Sierra by Aqua in collection 5 were also marked as undecided in collection 6, in Alaska collection 6 marked pixels that collection 5 had classified as snow or cloud as undecided. This suggests that collection 6 is more cautious than collection 5, as the overall number of undecided pixels had increased between collections.