# Response to Reviewer Comments

We would like to thank the reviewers for their time and valuable feedback. We believe we have addressed their concerns. The original editor and reviewer comments are included below with our responses in red. Where reviewer comments are not responded to below, they have been responded to in the manuscript.

Changes to the original version of the manuscript have been marked in the revised version. Insertions are marked in red and deletions in strikethrough red, while layout moves were left unmarked for readability.

Editor   
The reviewers agree that this paper is generally well written and the problem considered is important. Reviewer 1 suggests some reorganizations of the sections while Reviewer 2 has issues with the novelties of the techniques employed. Besides addressing the comments raised by the reviewers, I suggest that you may also explain why and how very high resolution (0.5 m) imagery is essential as opposed to moderate to low resolution imagery such as landsat 8 or sentinel 2 or modis.

Very high resolution (VHR) imagery was chosen over moderate to low resolution imagery for the following reasons:

* Spekboom typically grows in small clumps (around 1 m canopy diameter) amongst a heterogeneous mosaic of other vegetation. Moderate to low resolution imagery does not have sufficient spatial resolution for distinguishing individual plants or plant clumps from surrounding soil and vegetation.
* VHR imagery provides the option of using texture features to help separate Spekboom from surrounding vegetation. As distinguishing textures occur at the scale of individual plants or plant clumps, moderate to low resolution imagery does not have this capability.
* Thicket restoration work requires the accurate monitoring of small (about 3 ha) Spekboom planting stands. VHR imagery covers these small areas more precisely than low to moderate resolution imagery.

The above points are made in the introduction.

Reviewer 1   
Major comments   
Introduction is complete.   
Starting the section 2 (methods) with description of study area seems wrong for me. Reader could think that your method is specific to your data and your study area, which is wrong from my point of view as your methodology seems to be adequate for other similar application. I suggest you to rename section 2 and merge with section 3 and call the new section "Methods and experiments". Section 4 will be section 3 and be called "Discussion".

We believe that restructuring the manuscript to keep method independent from data is a useful suggestion – thank you. Combining sections 2 and 3, would however create confusion between method and results. Instead, we opted instead to create a new “Data” section, consisting of the data-related content of the original section 2 (“Methods”). The original “Methods” section was reduced to content describing only the method and experiments, and renamed to “Methods and Experiments”. The rest of the sections have remained as they were. We hope the new structure now addresses the reviewer’s concern.   
In section 2.2, could you give details of spectral bands.

A graph of the MODIS and DMC relative spectral responses (for each band) has been added.

Why did you use Modis data instead of Sentinel-2 data for example?

The calibration reference is required to be concurrent (or near-concurrent) to the aerial imagery. As the aerial imagery was acquired in January-February 2010, no concurrent Sentinel-2 data was available. A concurrent cloud-free Landsat image was also not available.   
In section 2.3, you say that computation time is important but you didn't discuss or present computation time in your article. Could you add this information in your results (table 7 for example)?

The classifier computation times have been added in Table 8.   
In section 2.7, you can use terms "parametric" and "non parametric" to differentiate methods which make respectively assumption and no assumption about data.

Figures 6 to 9 could be improved. You can overlap classification results on aerial imagery. For example, you can draw spekboom contours on imagery to help user understand results. And if visual results are not significant, reduce the number of figures to significant ones.   
You mention cross-validation (ten fold cross validation to be precise). What are the variability in classification results? If so, could you add these results (+/- xx%) in table 7 to 10?

Standard errors have been added for all cross validated performance measures (evaluated on the labelled pixel data) in Tables 7, 9 and 10. The standard deviation of absolute errors (SAE), given in Tables 7 and 11, provides a measure the variability in canopy cover performance over the study area.  
To improve your illustration, could you add the resulting global map of spekboom in your study area?   
  
Details   
L70: spectral bands   
L115: spectral bands   
L227: only one pixel   
L.245-246: if you give that kind of details (700 nm), you have to describe spectral bands characteristics in section 2.2.   
L305: no assumption   
L356: to as the Maximum Likelihood (ML) classifier   
L364: no assumption   
  
Reviewer 2   
This paper describes the tasks of classification and mapping of the spekboom canopy cover of Little Karoo, a large semi-arid region in South Africa using very high resolution aerial images. These maps are required for assisting in the restoration process. In this study, 2228 high resolution multispectral (R, G, B and NIR bands) aerial images were used. The images were radiometrically homogenized and some optimization techniques were applied for computational efficiency. In the classification, three classes were considered: spekboom, tree and everything else. From the classification, different features were extracted, as for example, radiances, vegetation indices, entropic and statistic measures in sliding windows, etc. The classifiers considered were decision tree, random forest, SVM, Bayes normal and kNN, with a post-processing step of morphological operators. In the discussion, the influence of the different features and the performance of the classifier were considered.   
  
The paper is well written and organized. The problem considered is important since the determination of the vegetation conditions in the semi-arid regions is essential to determine the actions required for their conservation. From the point of view of the methodology, the techniques used for extraction of the features and for classification are correct and adequate. However, I do not see many novelties in this work, since the techniques described are standard in classification using remote sensing images.

It is fair to say that the features and classification techniques used are standard in remote sensing. We believe the main aspect of novelty is in vegetation mapping over a large region (5893 km2) with thousands of VHR aerial images (2228 images). There are few similar studies. In addition, a novel feature selection method was used that addresses the problems of feature instability and sub-optimality associated with high dimensional redundant feature spaces. These aspects of novelty are discussed in the introduction.  
  
In the discussion section, the presented method could be compared to others previously considered, for example,   
  
Su, Lihong. "Optimizing support vector machine learning for semi-arid vegetation mapping by using clustering analysis." ISPRS Journal of Photogrammetry and Remote Sensing 64.4 (2009): 407-413.

The results are compared to similar studies in the final paragraph of the discussion, and related methods are reviewed and compared in the introduction. The above study has been cited as an example of the use of ancillary data (elevation) for improving vegetation mapping accuracies.  
  
In summary, the manuscript consists in the description of the techniques used for the classification and mapping of the vegetation conditions in a semiarid region at regional level, which is a very important problem. On the other hand, the novelties are scarce.