MAPPING AND MONITORING CLEAR-CUTS IN SWEDISH FOREST USING ALOS PALSAR SATELLITE IMAGES

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1. INTRODUCTION

This paper will cover mapping and monitoring of clear-cuts using SAR images from the PALSAR (Phased Array L-band type Synthetic Aperture Radar) sensor onboard the Japanese satellite ALOS (Advanced Land Observing Satellite). The Japanese satellite ALOS was successfully launched on 24 of January 2006 and through Sweden's participation in JAXA's ALOS Kyoto and Carbon Initiative and Calibration and Validation activities, SAR images have been acquired over two different test sites in Sweden.

The objectives of this study are to investigate the possibility to detect and if possible to delineate clear-cuts in Swedish forest, using PALSAR images acquired in high-resolution and polarimetric modes. This will be accomplished by comparing SAR images acquired prior and after the fellings have been performed. If successful, the developed methodology will also result in a tool available for interested parties such as the Swedish Forest Agency.

2. MATERIAL AND METHODS

The test sites are located in the northern and southern parts of Sweden and constitute a representative area of managed forest. They are both characterized by boreal coniferous forests, with Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*) as the dominant tree species. The ambition is to present results of clear-cut detections and delineations from the test sites, as well as the method used for generating those results. The two test sites are Remningstorp in the south and Krycklan in the north of Sweden. Clear-cut information has been gathered from the Swedish forest company Sveaskog and they have supplied two sets of vector layers for the two test sites. These vector layers constitute fellings performed from the beginning of 2006 until August of 2008. There are clear-cut polygons available for each of the test site ranging from 2 ha in size and upwards.

Since Sweden participated in ALOS Calibration and Validation activities, there are a large number of SAR images acquired in different modes available from these activities during 2006 as well as images acquired in operational mode from October 2006 and onwards through Sweden's participation in the ALOS Kyoto and Carbon Initiative. A time series of PALSAR images in these different modes has been acquired over the test sites. To date the acquired images have a temporal coverage from May 25, 2006 to October 5, 2008. This constitutes a large dataset with many different possibilities. The present study will concentrate on using images acquired in ALOS operational mode. Thus, the possible image types are: FBS34, FBD34 and PLR21, where FBS stands for

Fine Beam Single, FBD for Fine Beam Dual and PLR for polarimetric polarization, respectively. The attached figure stands for the used look angle in degrees.

An analysis of recently felled areas revealed that clear-cuts can present a drop in SAR backscatter up to about 2 to 3 dB, thus showing that clear-cuts seem to be detectable [1-4]. Nonetheless, the SAR backscatter signal presents significant variations depending on environmental conditions, which needs to be taken into account when developing an automatic method for clear- cut detection. Thanks to the strong forest/non-forest contrast and the temporal consistency of HV-polarized backscatter in summer/fall, a simple thresholding algorithm seems to be sufficient for clear-cut detection as described in [5].

3. CONCLUSION

In the present paper, we have investigated mapping and monitoring of forest clear-cuts in Sweden using ALOS PALSAR L-band satellite images, expanding the knowledge gathered so far [1-5]. After more than two years of operation a large dataset of ALOS PALSAR images acquired in different modes and under several environmental conditions has been built up. The strong forest/non-forest contrast and the strong temporal consistency of HV-polarized backscatter data have been exploited in a clear-cut detection algorithm using PALSAR data. The first results indicate the capability of the algorithm to detect clear-cuts.

4. REFERENCES

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