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Interactive comment on “First Sentinel-1 detections of avalanche debris” by E. Malnes et al.

Anonymous Referee #1

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Comments on “First Sentinel-1 detections of avalanche debris” Authors: E. Malnes, M. Eckerstorfer, H. Vickers Submitted to The Cryosphere Discuss., March 2015

The authors report on a case study dealing with the detection of avalanche deposits by mapping changes in backscatter intensity in C-band SAR radar images, acquired by the European Sentinel-1A satellite that was launched in April 2014. The study is limited temporally to one avalanche episode that took place in late December 2014/early January 2015, and spatially to a sub-region of northern Norway. Manual delineation is applied for detecting the extent of the avalanche deposits, searching for areas with increased backscatter intensity. Colour composites of repeat pass SAR images from dates before and after the avalanche events are used to detect changes in backscatter. In a sub-section of the study area the avalanche sites detected in Sentinel-1 images are compared with avalanche deposits identified in high resolution SAR images of Radarsat-2. Because for Radarsat-2 no repeat-pass data are available, the

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authors use single SAR images to search manually for avalanche deposits, assuming that elongated features of high backscatter (relative to the surroundings) are avalanche deposits. Considering the lower spatial resolution in the Sentinel-1 IW mode data and the less stringent requirement (single image backscatter) for detection of deposits in Radarsat-2 images, it is not a surprise that fewer avalanche deposits are detected with the Sentinel-1 data set than in the Radarsat-2 images. Validation is limited to photographic documentation of a few avalanche sites, inadequate for a sample that includes several hundred avalanche sites, and insufficient for assessing the probability for correct/incorrect classifications and for quantifying the percentage of missing detections.

The manuscript does not report any substantial and new scientific results, thus failing to meet the basic requirement for research articles to be published in The Cryosphere. It has been reported before that avalanche deposits can be detected in C-band SAR images due to increase of backscatter intensity. The manuscript does not provide any progress in this respect, neither describing the physical background for the observed signatures of avalanche deposits and surrounding terrain, nor presenting any objective method for detecting the avalanche debris. The procedure used by the authors for detecting the avalanche deposits is subjective image interpretation, lacking a sound and reproducible scientific basis. Besides, the analysis lacks comprehensive validation and deals with a single avalanche episode, not suitable for assessing the potential for operational applications addressed by the authors as a main motivation for this work.

Interactive comment on The Cryosphere Discuss., 9, 1943, 2015.

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