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# Characterization of icebergs and floating sea ice in the Yung Sund fjord in Greenland from satellite radar and optical images.

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At the Zackenberg site, sea ice starts to move between June and September resulting in icebergs flowing freely on the sea. Splitting into smaller parts, they reduce in size. Icebergs represent a risk for maritime transport and needs to be studied. In order to determine iceberg density per surface unit, size distribution, and movement of icebergs, we need to observe, detect, range and track them. The use of SAR images is particularly well adapted in regions where cloud cover is very present. We focused our study on the Yung Sund fjord in Greenland, where lots of icebergs and sea ice are generated during the summer. In the beginning of July, sea ice breaks up first, followed by icebergs created by the different glaciers based in the ocean. During our investigation, we noticed that the iceberg and sea ice were drifting very fast and thus, we needed to adapt our methodology. To achieve our goal, we collected all remote sensing data available in the region, principally Sentinel 1/2 and LandSAT 8 during one ice free season (from July 1st 2016 to September 30th, 2016). We developed an original approach in order to detect, characterize and track icebergs and sea ice independently from data. The iceberg detection was made using a watershed technique. The advantage of this technique is that it can be applied to both optical and radar images. For the latter, calibrated intensity is transformed into an image using a scaling function, in order to make ice brighter. Land data is masked using a topographic map. When data is segmented, a statistical test derived from the CFAR approach is performed to isolate an iceberg and floating sea ice from the ocean. Finally, a method, such SIFT or BRISK is used to identify and track the different segmented object. These approaches give a representation of the object and make the tracking easier and independent of the scale and rotation, which can occur because icebergs are dependent on ocean currents and wind. Finally, to fill in the gap between acquisition, mainly due to cloud cover or no image available, we use an ocean current and wind models to estimate the position of some icebergs. The used models are constrained using observation data.