Geophysical Research Abstracts
Vol. 21, EGU2019-4288, 2019
EGU General Assembly 2019

Towards an automatic delineation of Antarctic glacier and ice shelf fronts from Sentinel-1 imagery

Celia A. Baumhoer (1), Andreas J. Dietz (1), Claudia Kuenzer (1,2)

(1) German Aerospace Center, German Remote Sensing Data Center, Department Landsurface Dynamics, Germany (celia.baumhoer@dlr.de), (2) Department of Remote Sensing, Institute of Geography and Geology, University Wuerzburg, Germany

Extents of Antarctica‘s ice shelves and ice streams are sensitive indicators of glaciological and environmental change. Retreat of glacier fronts and break ups of ice shelves have been linked to oceanic and atmospheric warming. Weakening or disintegration of ice shelfs reduces buttressing of their tributary glaciers, leading to ice flow acceleration and increased sea level rise contribution. Hence, monitoring changes in ice extent is of keen interest. So far, ice fronts have mostly been delineated by manual extraction. However, this time consuming approach does no longer allow coping with the abundance of modern satellite imagery. For example, Sentinel-1 provides year-round cloudless data with weekly revisit times. Therefore, it is necessary to fully automatize ice shelf front extraction. We propose a new approach to extract calving fronts from Sentinel-1 imagery with a combination of image processing techniques. First, the deep learning architecture U-Net is used to perform a semantic segmentation on the satellite imagery. Each pixel is assigned to a probability for being either water or ice based on backscatter as well as contextual and spatial information. Second, an active contour model delineates a continuous front based on the output of the U-Net. For different test sites satisfying results are obtained. Nevertheless, still some improvements of the algorithm are necessary for example in regions where glacier margins are enclosed by ice mélange. The future implementation of the developed algorithm for Sentinel-1 imagery will provide a valuable source to monitor fluctuations in Antarctic ice shelf and glacier front locations.