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Multi-method based characterization of calving events at Salajiegna glacier - Northern Sweden

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Sea level rise concerns millions of people in coastal areas across the globe. One of the largest uncertainties to project future sea level rise is the frontal ablation (accounting for calving and submarine melt) at marine ice margins, around the Greenland and Antarctic Ice Sheet. High rates of frontal ablation have been observed to imply, through loss of the buttressing effect but not limited to it, increased mass loss from marine terminating glaciers and hence, associated sea level rise. This study focuses on calving processes at a freshwater lake in northern Sweden, which represents a simpler environment to study calving processes than the marine one, because impacts of tides, salinity, and circulation (all known to be relevant at marine ice-ocean boundaries) can be neglected. A multi-method approach to quantify and characterize calving events is presented here, exploring and analysing the underwater acoustic soundscape at a calving glacier front, in connection with optical, image-based methods such as timelapse photography, and photogrammetry based on footage acquired by an uncrewed aerial vehicle (UAV). An acoustic detector is developed, tested and applied to a data set acquired during 2020, and results indicate that the acoustic detector can be an important complement in the range of tools used to observe, and quantify, calving. Applied in remote locations, where continuous monitoring is difficult and where optical methods are of limited use, collecting acoustic data and monitoring calving by means of its acoustic signature could render insights previously not available (because of lacking data and methodology).