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Surface classification and melt pond characterization using aerial photography of Arctic sea ice during summer melt

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The surface of the Arctic sea-ice cover changes dramatically with the onset of melting: the highly reflective snow cover disappears, absorptive melt ponds evolve, and the albedo drops. Images with high spatial resolution acquired with airborne cameras are an important data source to understand this summery sea-ice surface transition. The data is used as reference to describe and evaluate the transition in model simulations and to develop retrieval methods for satellite remote sensing products aiming at evaluating the stage of melting.
We use a comprehensive airborne image data set, collected over melting sea ice in the Arctic since 2008, to compile contemporary reference data of Arctic sea-ice surface classes during summer melt. To this end, we use the open source sea ice classification algorithm “OSSP” (Wright and Polashenski, 2017, in "The Cryosphere Discussions") with several modifications to separate the ice image area into snow covered and bright ice, shadows from ridges, wet snow and dark ice, submerged ice and melt ponds, and open water. Based on the large data set we obtain statistics of surface parameters such as melt pond coverage for first-year ice and multi-year ice conditions at different regions for different melting stages. An advantage of our analysis is the use of a constant camera setup. In this poster, we give a brief overview about the available data and the OSSP algorithm, which is based on a segmentation and random forest classifier approach, and present more in detail our modifications of the OSSP, which include orthorectification of the image data, changes in the input feature list and an improved segmentation. Our primary focus here is a thorough study of classification errors for sea ice under melting conditions. Furthermore, we provide classified images from a 2017 measurement campaign north of Svalbard with derived geometric parameters such as, for example, melt pond fraction and pond size distribution.