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Characterizing drained lake basins across the Arctic

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Lakes and drained lake basins (DLB) are common landforms in permafrost lowland regions in the Arctic and widely cover 50% to 75% of the landscape in parts of Alaska, Siberia, and Canada. Lakes and DLBs create a heterogeneous and dynamic mosaic of terrain units, providing unique habitats for flora and fauna. Lakes and drained lake basins in permafrost regions play a crucial role in the regions landscape and ecosystem processes, influencing permafrost dynamics, biogeochemical processes, the hydrologic regime, as well as carbon cycling and greenhouse gas emissions. Depending on time passed since drainage of a given DLB, characteristics like surface roughness, vegetation, moisture, and abundance of ponds may vary between basins. Spatial heterogeneity within a single basin also varies between basins of different age. The mosaic of vegetative and geomorphic succession within DLBs and the distinct differences between DLBs and surrounding areas can be discriminated with remote sensing and used to derive a landscape-scale classification. *In situ* observations of these surface characteristics of DLBs are crucial for a better understanding of these features but can only describe a small percentage of existing DLBs.

In this study, we use a novel pan-Arctic assessment on DLB occurrence and the ESA Permafrost_cci circumpolar landcover unit data set based on Sentinel-1 and Sentinel-2 satellite imagery to assess the inter and intra-DLB spatial heterogeneity of surface characteristics. Building on existing research, we sort DLBs into distinct groups corresponding to previously published DLB age classification schemes (young, medium, old and ancient DLBs). DLB groupings show different landcover distribution within the basins, allowing for assumptions about the relative time passed since a drainage event occurred. To compliment and verify our remote sensing-based approach, a wide array of field data was collected at multiple sites across the Arctic, including on the Alaska North Slope. First results show distinct differences between DLBs within the study area, based on the landcover occurring within basins and other surface properties. Comprehensive mapping and characterizing of DLBs on a circumpolar scale will allow for improved parametrization of regional

to pan-Arctic modeling efforts and improve our understanding of DLBs as a crucial landform in Arctic permafrost landscapes.