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Mapping lake drainage and drained lake basins around Point Lay, Alaska using multi-source remote sensing data

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The North Slope of Alaska is a permafrost affected landscape dominated by lakes and drained lake basins of different sizes, depths and ages. Local communities across the North Slope region rely on lakes as a fresh water source and as locations for subsistence fishing, while industry relies on lakes as a source of water for winter transportation. Lake drainage events are often disruptive to both communities and industry that rely on being in close proximity to surface water sources in a region underlain by continuous permafrost. Drained lake basins of different ages can provide information on the past effects of climate change in the region. Studying past drainage events gives insight about the causes and mechanisms of these complex systems and benefits our understanding of lake evolution on the Arctic Coastal Plain in Alaska and the circumpolar Arctic as a whole.

Lakes and drained lake basins can be identified using high to medium resolution multispectral imagery from a range of satellite-based sensors. We explore the history of lake drainage in the region around Point Lay, a community located on the northern Chukchi Coast of Alaska, using a multi-source remote sensing approach. We study the evolution of lake basins before and after drainage events, their transformation from fishing grounds and water sources to grazing grounds and the geomorphological changes in the surrounding permafrost-dominated landscapes associated with these transitions.

We build a dense and long time series of satellite imagery of past lake drainage events by including a multitude of remote sensing acquisitions from different sources into our analysis. Incorporating imagery from different sensors that have different temporal and spatial resolutions allows us to assess past drainage events and current geomorphological states of lakes and drained lake basins at different temporal and spatial scales. Point Lay is known to be an area where drainage events occur frequently and are of high relevance to the community. In August of 2016, the village drinking water source drained during a period of intense rainfall causing the village to seek alternative sources for a freshwater supply. Our results from the analysis of the

remotely sensed imagery were shared directly with the community as part of a public seminar series in the Spring of 2020. We hope that results from our study near Point Lay, Alaska can contribute towards the selection of a new freshwater source lake for the village.