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THE VARIATION OF HIGH LATITUDE WATER BODIES ALONG ALASKA COASTAL AREA OVER DIFFERENT PERMAFROST TYPES

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The Arctic is warming at a rate about twice as fast as anywhere else on Earth. This warming is associated with the increased thaw of permafrost, release of greenhouse gases, climate driven disturbances, the decline of sea ice extents and high latitude greening. Arctic tundra ponds are dominated by small water bodies with surface area smaller than 10^4 m^2. These fragile ponds and lakes are particularly susceptible to the warming climate. Previous studies show that Alaska water bodies experience significant change over the last half century but the study areas were small and limited. To detect the water body dynamics due to climate change during the past fifty years along Alaska coastal area, historical aerial photographs with about 1 m spatial resolution acquired by the US Air Force during 1950s were downloaded from USGS and 2 m spatial resolution Quick Bird and World View satellite data during the past ten years were collected from National Geospatial-Intelligence Agency (NGA) with different permafrost types. The latitude of the study areas ranges from 60 to 70 degrees. The historical aerial photographs were first registered with the World View and Quick Bird data. Orthorectification was then applied over all the historical aerial photographs and Quick Bird and World View satellite data using the Digital Elevation Model (DEM) data which increase the accuracy of detecting the change of water bodies. The Hierarchical Image Segmentation (HSEG) algorithm was applied to the black and white historical aerial photographs to identify water bodies. Spectral information was used to classify water bodies for the multi-bands Quick Bird and World View data. The change of the number and area of water bodies were then detected from the two datasets. The results show different water bodies dynamics over different locations and permafrost types.