GC31B-0461 Rapid Arctic Transitions in Relation to Infrastructure and Climate Change: Comparison of the Permafrost and Geoecological Conditions in the Bovanenkovo Gas Field, Russia and the Prudhoe Bay Oil Field, Alaska

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Poster Hall

Many areas of the Arctic are undergoing rapid permafrost and ecosystem transitions resulting from a combination of industrial development and climate change as summer sea ice retreats and abundant Arctic natural resources become more accessible for extraction. The Bovanenkovo Gas Field (BGF) in Russia and the Prudhoe Bay Oilfield (PBO) in Alaska are among the oldest and most extensive industrial complexes in the Arctic, situated in areas with extensive ice-rich permafrost. Ongoing studies of cumulative effects in both regions are part of the Northern Eurasia Earth-Science Partnership Initiative (NEESPI) and NASA's Land-Cover Land-Use Change (LCLUC) research. Comparative analysis is focused on changes occurring due to different climate, permafrost, land-use, and disturbance regimes in the BGF and PBO and along bioclimate transects that contain both fields. Documentation of the changes in relationship to the different geoecological and social-economic conditions will help inform management approaches to minimize the effects of future activities. We compare the area of disturbance in the two fields and some of the key differences in the permafrost conditions. Detailed remote sensing and geoecological mapping in both areas reveal major differences in permafrost conditions that have implications for total ecological function. At BGF, highly erodible sands and the presence of massive tabular ground ice near the surface contributes to landslides and thermo-denudation of slopes. At PBO, ice-wedge degradation is the most noticeable change, where thermokarst is expanding rapidly along ice-wedges adjacent to roads and in areas away from roads. Between 1990 and 2001, coincident with strong atmospheric warming during the 1990s, natural thermokarst resulted in conversion of low-centered ice-wedge polygons to high-centered polygons, more active lakeshore erosion and increased landscape and habitat heterogeneity. These geoecololgical changes have local and regional consequences to wildlife habitat, land-use, and infrastructure. A conceptual model describes how infrastructure-related factors, including road dust and roadside flooding, are contributing to more extensive thermokarst in areas adjacent to roads and gravel pads in the PBO.

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