Preliminary ALOS Data Analysis of Thaw Lakes and Polygonal Soils in the Kobuk River Valley, Northwestern Alaska

D. Marius Necsoiu, Donald M. Hooper, Cynthia L. Dinwiddie, Ronald N. McGinnis, Gary R. Walter

Geosciences and Engineering Division, Southwest Research Institute®
6220 Culebra Rd., San Antonio, TX 78238-5166

The study uses ALOS data to characterize and quantify expansion and contraction of thaw lakes as well as polygonal soils in the floodplain of the Kobuk Valley National Park in Alaska. Thaw lakes are a type of thermokarst feature that are formed by ground subsidence and/or backwearing of river and lacustrine shorelines in permafrost areas1. They grow slowly in size (the maximum lake diameter in the area is approximately 1.3 km), coalesce or amalgamate with nearby lakes, and can drain rapidly due to breaching1,2. A coherence map derived from a pair of summer ALOS PALSAR datasets, acquired 46 days apart, shows that the highest coherence regions are associated with areas of polygonal soils between the thaw lakes. A dissected alluvial fan and stream terrace3 has intermediate coherence values and is surrounded by sections of flood-plain alluvium and combined aeolian and alluvial sediments. Regions of active dune sand (i.e., Great Kobuk Sand Dunes), thaw lakes, and the Kobuk River show the lowest coherence in this mapped region.

Image interpretation based on AVNIR-2 data reveals that thaw lakes of the Kobuk River floodplain do not have the distinctive pattern of elongation typical of thaw lakes of the Arctic Coastal Plain of northern Alaska. The Kobuk River floodplain is an inland continuous permafrost zone and ponded water in low-lying areas may foster increased melting of the substrate, perhaps in response to the disruption of the vegetation cover. Once established, thaw lakes are enlarged by a combination of melting, slumping, and wave erosion of the shoreline, generally becoming more circular where the substrate is homogeneous1-4. These interpretations are preliminary and will be verified by field work in the near future.

References: